



Lost Wax Casting



by bcyrjewelry

This is a brief outline of my lost wax casting technique. There are several ways to cast, this is just the way I do it as a one woman show! Also, this was my set up about 13 years ago and some things have changed - I have a slightly updated longer version [here on my website](#).

Most importantly, my fingers (and finger nails), and I started out with a tiny needle in the end of a pencil and made a little denatured alcohol lamp out of a baby food jar. The wax I use most of the time is a soft brown wax. It's my favorite.

You can view a lot of my finished work at BethCyr.com

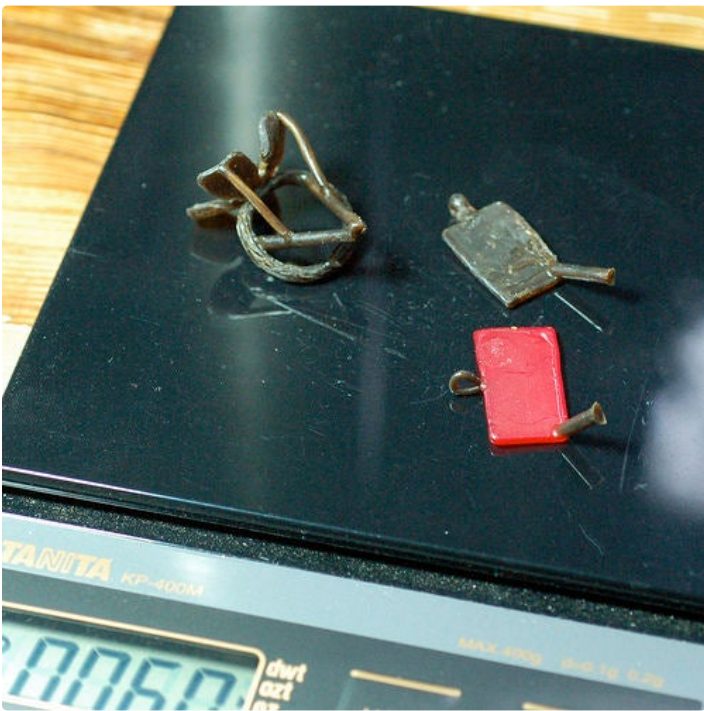
If you're interested in getting your own casting set up - check out my [supply list](#)!

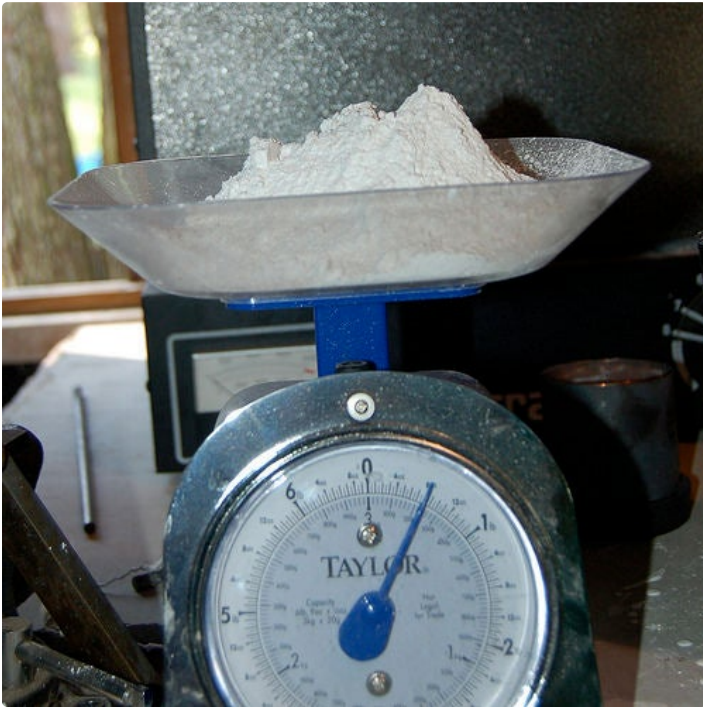
I use all sorts of random tools for my wax working.



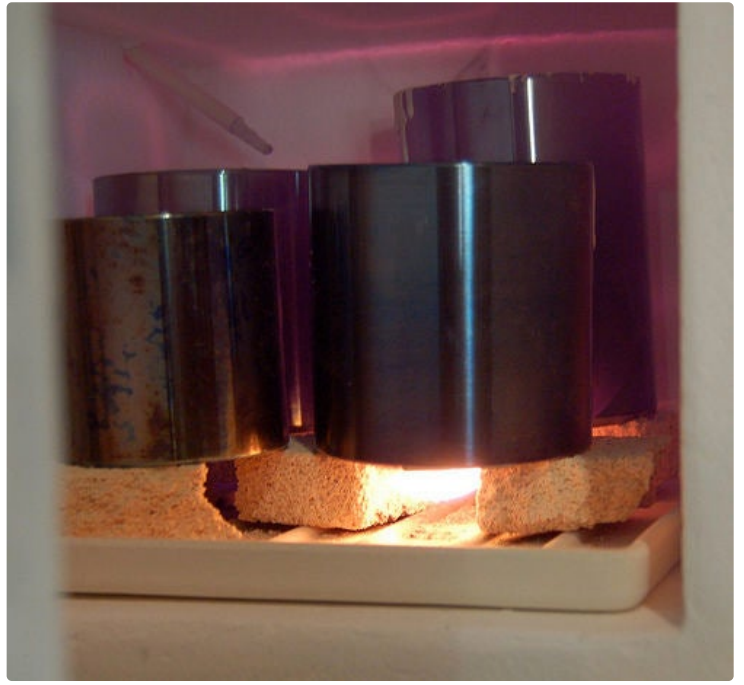
1. random wax tools
2. wax beginnings
3. homemade alcohol lamp - denatured alcohol ONLY















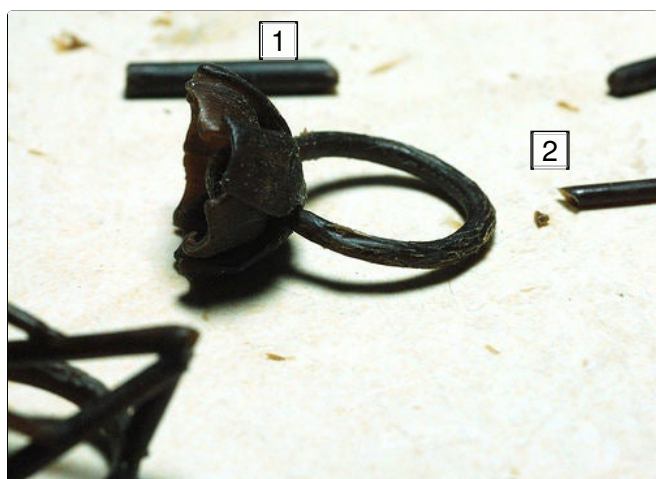
Step 1: Wax Work 1

The beginning of one of my flowers



Step 2: Wax Work 2

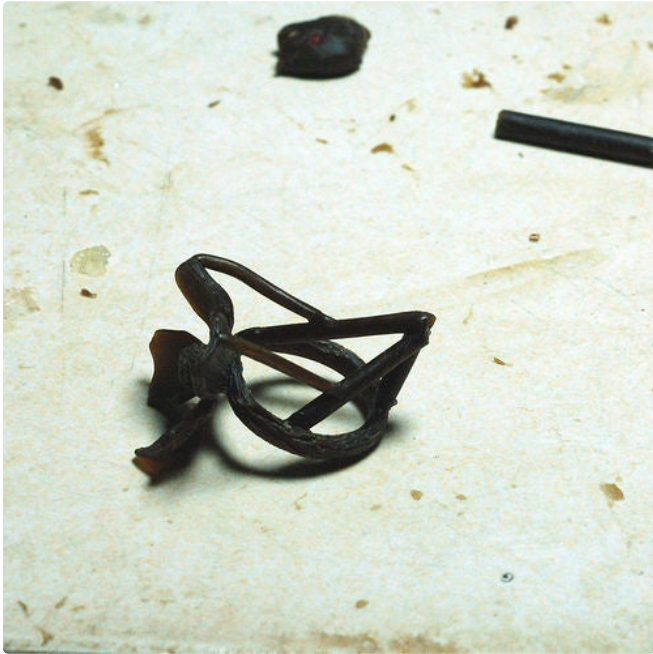
Another flower ring, almost finished



1. sprue to be used....
2. sprue

Step 3: Wax Work 3

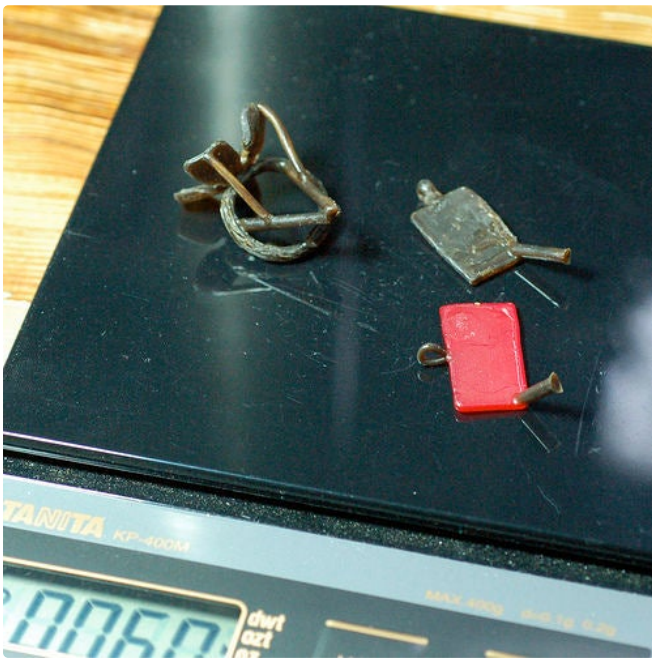
This flower is all sprued! Spruing allows the wax to melt out of the mold and for the metal to get to your piece! not having enough sprues or having them in the proper location can cause your piece to not turn out.



Step 4: Weighing Them Out

After all sprues have been attached its now time to weigh them. This is very important and is often forgotten. The weight of the wax is used to determine how much metal you will need for the casting. Because each metal has a unique specific gravity - you will need to know what number to multiply your wax weight by. For sterling, you can do it two ways - you

can multiply by 10.4 and then add a half ozt (troy ounce) or you can simply multiply by 15. I usually do both to be on the safe side and figure something in the middle. For very small or very large, using the 10.4 plus half ozt is usually best.



Step 5: Attach to Sprue Base

After the waxes are weighed, its time to attach them to the sprue base or button.



Step 6: Place Flask on Base

Then the flask is lowered over the waxes. It is important that there is at least 1/4" of space between the edge of the flask and the waxes. Now believe me, I've pushed it and nothing bad has happened, but that doesn't mean that it won't. You can have a blow out where the hot molten metal breaks through because there was not enough investment. Same with

the top of the flask, if the wax is too close to the top, the metal can break right through. And for vacuum casting, this could be very bad as the metal would most likely damage your casting table.

now you are ready to invest!



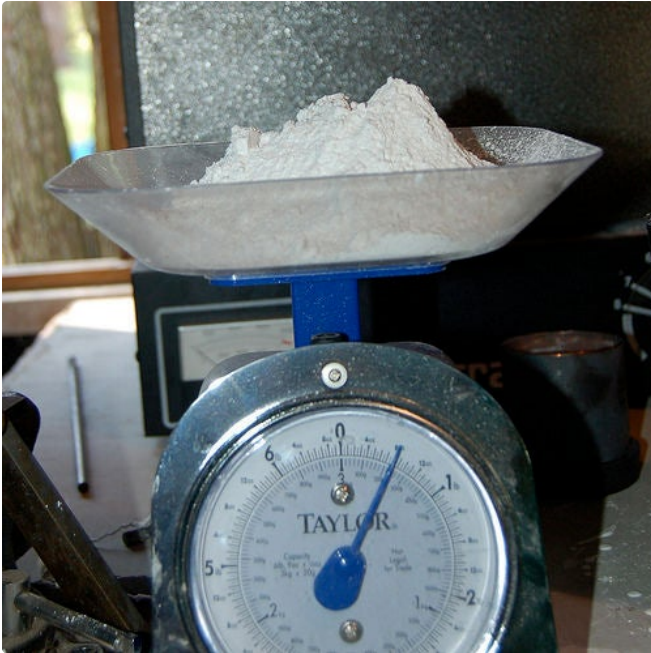
Step 7: Set Up for Investing

You need to know the size of your flask and how much investment you will need. For this sweet little flask, I only need a 1/2lb and 3.5oz of water. Measure the water out first and pour it in the rubber mixing bowl.



Step 8: Weigh Investment

Now weigh out the investment. Investment contains silica - so you should wear a dust mask if you don't have exhaust. I got this cute blue scale for very cheap - and its blue! no need to spend big bucks on an expensive scale - it just needs to work.



Step 9: Time It and Start Mixing!!

Set the timer for 8 minutes. This is the longest that your investment should be disturbed. Once it starts setting up, you don't want to be messing with it. I start the timer and then pour the investment in to the water. Mix for 3 minutes - right when it turns to 5 min, its time to vacuum.



Step 10: Vacuum Investment in Bowl

Now that you've mixed for 3 inutes, vacuum the investment for 2 min - this is the first step in vacuuming. Bubbles are good - this is the vacuum getting all the air out of the investment



Step 11: Pour Investment in Flask

Now, pour the investment in to the flask. Its a good idea to have tape around the top of your flask to keep the investment from bubbling over and making a huge mess. When pouring, pour down the edge of the flask, not directly on the waxes as it could cause the wax to move slightly and perhaps against another wax or too close to the edge.



Step 12: Vacuum Investment in Flask

Now for the vacuuming of the flask! If you are vacuuming more than one flask of the same size, make sure to mark them. I use a piece of chalk to write a number corresponding to the wax weights - the chalk doesn't burn off in the kiln so its easy to distinguish when getting them quickly. This removes air that might have been trapped around the waxes and still in the investment from pouring - vacuum for approx 1.5 minutes - don't go over your 8 minutes.

It bubbles up and over like an ancient tar pit! The rings were pretty small in this flask, so I didn't fill it up all the way to reduce the bubbling over.

If there was a little bit of investment left over, after the time is up, pour the little bit on top. With vacuum casting, you need to leave at least 1/8 of an inch at the top to aid in the suction during the casting. if doing centrifugal casting, it can go over the top of the flask.

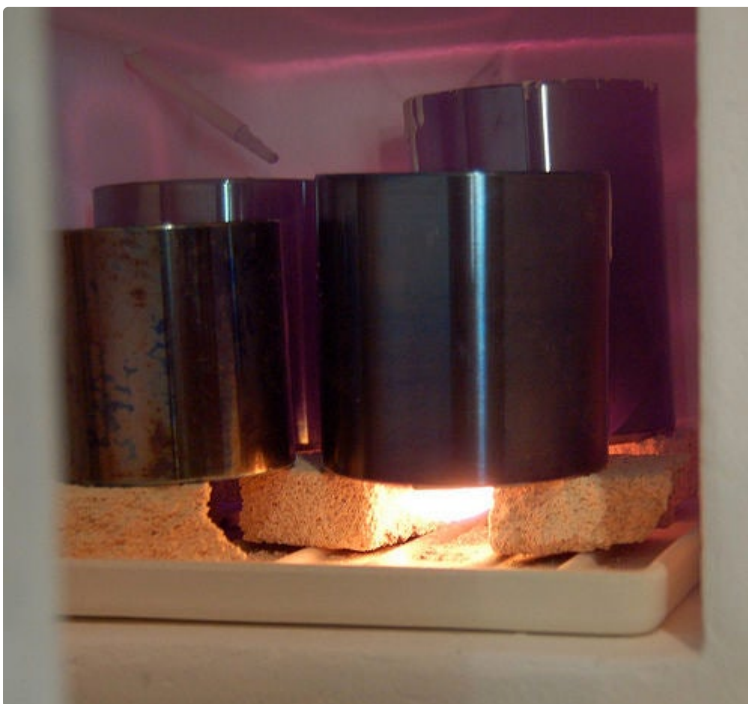
now it needs to sit for about 10 - 15 undisturbed until it sets up, then it needs to sit for about 1.5 - 2 hours before you can start the burnout process in the kiln.



Step 13: In the Kiln!

Once the flask is ready - it goes in the kiln and starts the burnout process. Burnout times are anywhere from 5 - 12 hours. The 5 hour burnout is perfect for just doing a couple of small flasks. Since I'm just a small time operation and didn't have the extra \$900 to spend on an automated system, I have to manually

adjust the temperatures to make sure the burnout process moves along smoothly. Hour 1: 300 degrees, Hour 2: 700 degrees, Hour 3 and 4: 1350 degrees, Hour 5: 1000 degrees - and hold.



Step 14: Heat the Crucible

Once the kiln has been holding at 1000 degrees for an hour, its time to start heating up the crucible and the metal. Make sure the crucible is red hot before adding the metal.



Step 15:

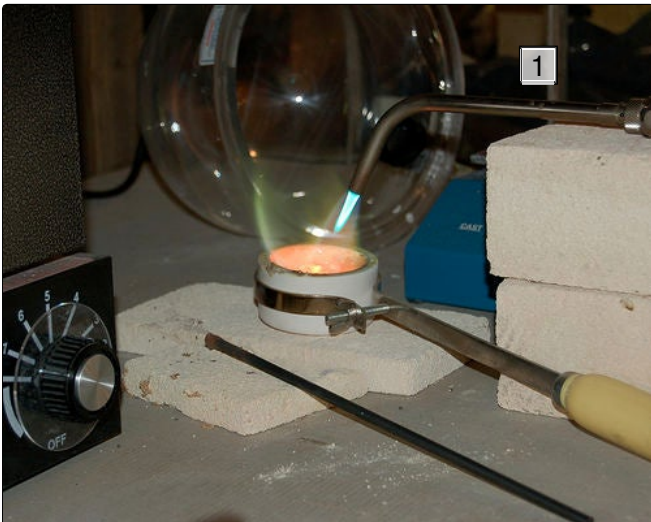
When the metal has melted, give it a pinch of flux, a stir with a carbon stirring rod (and make sure to heat it up first or the metal will stick to it)





Step 16: Hands Free

Note the hands free set up I made with some nice fire bricks!



1. look! no hands!

Step 17: Get the Flask Out of the Kiln

Now with my hands free, I can get the flask out of the kiln. Make sure to check to see that the pathways are clear - if burning out natural material, some ashes might be stuck. You can check it before you start melting the metal if you think there might be an issue you'd need to clear up, otherwise, a quick check on the way to the casting table is just

fine. Also note the giant fireproof glove. I wish they made them in smaller sizes!



Step 18: Place Flask and Turn on Vacuum

Place the flask upside down on the casting table (same as investing table, just make sure the toggle switch is flipped to "Cast") with the holes facing up. Turn on the vacuum pump.

There is a small hole in the table that allows the vacuum to actually pull against the flask and create the suction needed to pull the metal in to the mold and every tiny detail of the mold - even fingerprints

show up in the detail captured in the mold material. Pouring the metal in to the mold w/o the suction will result in loss of detail and loss of your piece. How do I know? I accidentally forgot to turn the vacuum on one time. The piece turned out, but much of the fine detail wasn't there. The vacuum is truly needed to get the metal where it needs to go - and fast!



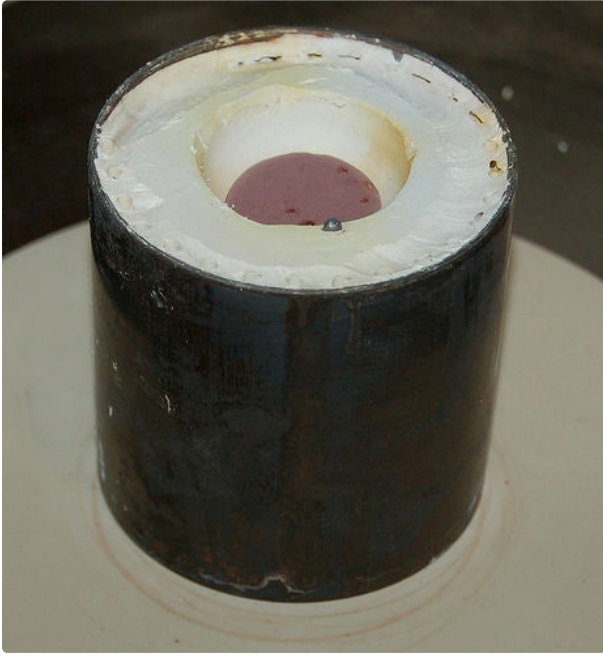
Step 19: Start to Pour... and Pouring!

Position the crucible over the flask - make to always keep the torch on the metal. Removing the torch can cause oxygen to get in and that is bad. As you are pouring, keep the torch on the metal and pour quickly. Pouring too slowly or moving the torch can cause the metal to freeze up and your casting won't work



Step 20: Cool It...

Once the metal is poured, turn off the torch and the vacuum pump. Release the vacuum by flipping the toggle off of cast and move the flask away to let it cool. Wait until the metal is no longer red hot. I check it under a dark area of the table before quenching.



Step 21: Quench It!

Now that the metal has cooled a bit and is no longer red (generally 2 - 5 minutes) it is time to quench. Make sure the flask is completely under the water. You want it to all be bubbling completely underneath the surface of the water. If you have used cast in place stones or some alloys you don't want to quench when

the metal is hot. You need to let some completely cool up to an hour so as to not crack the stones or cause the metal to be shocked. Regular sterling is fine to quench after a few minutes.



Step 22: Dirty Casting... Clean the Investment Off

I use a toothbrush to get the bulk of the investment off.

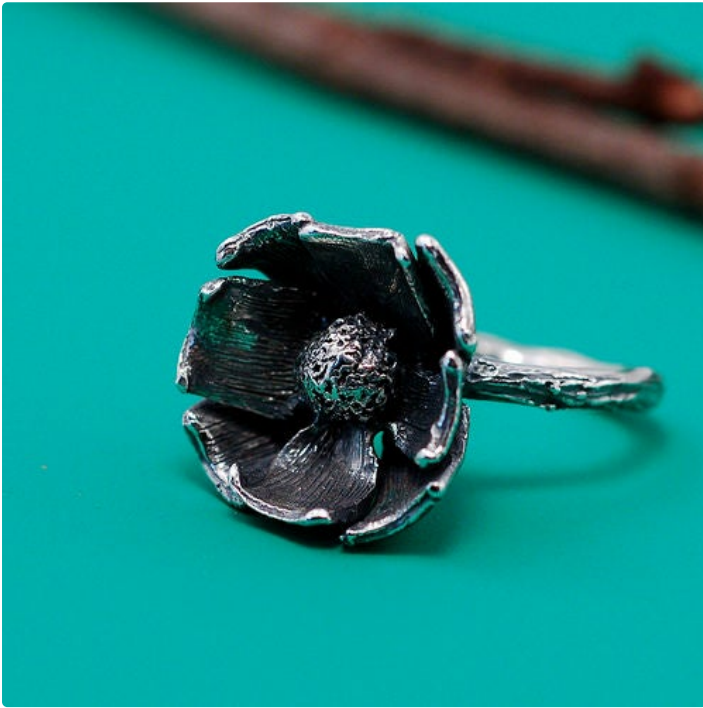
Soaking them in vinegar is a great inexpensive way to remove the investment and to clean the metal! I often leave them in there over night or longer depending on small detail areas. And its nice to have the metal clean already! It does take longer than an ultrasonic cleaner, but if you don't have the money or the space, vinegar works just fine.



Step 23:

And now its time to clean them up! removing the sprues, grinding, filing, sanding, adding texture to camouflage where the sprue had been, adding a patina, and the final polish all await your piece!





Do you do castings at customers request? I have, well had, a pendant that was very special to me, and the company where it was purchased it isn't in stock. I am trying to find someone who could make this pendant for me, at a reasonable price.



Did you ever get your pendant made? What is the material it's made out of? I am preparing to do some lost wax silver casting, and I'd love to do gold when I can afford it. But also some larger lost foam casting of aluminum, but more so Brass and Bronze. Maybe copper.



Hey I'm getting ready to be in the business of making gold grills, could you please provide the steps you roommate did to achieve such quality work, thanks



Can you recommend a vacuum table to use for casting? I'm interested in making rings and such but have had issues with the detail not showing up. Vacuum casting seemed like a clear solution.

P.S.

Great tutorial!



From what I can tell the investment mould is destroyed each time to get your piece out. If I wanted to cast multiple copies of an item can I use silicone rubber moulds to cast multiple wax masters?

I've tried pouring carving wax (not decent jewellers wax though) into a mould and it was far too thick.



Yes the investment mold falls apart when you put it under running water or a large vessel of water which can be done about 30 seconds after the poured metal has hardened. If you are making a ring, or something small like this you have it out of the mold and are inspecting it within 5 minutes of heating the metal to molten; the process is quick.

To make multiples in jewelry making what is usually done is a rubber mold is made from a positive metal piece using heat time and pressure. With this rubber mold which has been either sprayed with mold release or coated with a thin layer of baby powder, molten wax is injected then the mold is carefully pulled apart and sequential, nearly identical wax positives are taken out. These wax pieces are cleaned up if required and often put together in a tree like pattern of screws and mounted onto a rubber canister lid, put inside a steel canister and poured with investment.

If you want to make a repeatable mold of an object from nature like a bug or a leaf, one must first pour a plaster mold with investment, pour a metal positive from this and then make a rubber or

silicone mold from that. if you wanted to make a mold of say a walnut, or something from wood or stone you may be able to cast the rubber mold directly from the object.

The rubber mold to make all the wax molds from, is made with a thick metal plate that has a hole in the center in the shape of a soft square and 2 thin plates that serve as end caps. laying the thick piece on top of one of the sheets of metal makes a container within which one builds up rubber sheets that are sticky on 1 side.along one narrow edge one inserts a turned triangular cone and a rod made out of brass, this will serve as your injection port and your sprew for casting. touching this sprew one adds the metal piece of jewelry to be cast with gems removed. small pieces of rubber fill any gaps created and then smooth layers of rubber cover the item so it is uncased within layers of stuck together rubber. there should be just a little too much rubber to ensure solid contact when it begins to melt... (also note there are different types of rubber, primarily non shrink is more expensive but yields most exact results and there is a more standard rubber sheet which causes a small amount of shrinkage in the final mold.)

Then a top plate makes the rubber mold sandwich and the whole works is places in a heated vice where the vice is turned every few minutes as the rubber melts to make a tighter mold. after about an hour the mold is aloud to cool and all the rubber sheet has melted together.

Using a scalpel, the mold is carefully sliced down the middle revealing the metal positives.

From this the wax may then be injected and as myriad multiples of the small jewelry object can be made in wax to then be poured in investment, burned out, and poured with molten metal.

i don't seem to be able to arrange these attached images in a sequence but here are several images of mold making and pours i did using this process. the very last image is a lizard i found deceased in a pool skimmer so decided to honor its life with a death mask of sorts. the detail picked up by the investment was really amazing. Poor little thing.

The last row shows some grills my roommate made which involves even more back and forth mold making...ending in the lost wax process...so take an impression using either alginate or 2 part polymer clay. Alginate gets more detail but the mold dries quickly, so if using alginate immediately pour a positive using dental stone if using 2 part polymer you have a bit more leeway, some brands shrink more then others. but pour a positive of the teeth by making a little dam back at the molars. with the positive, put a mold release and build up with either dental wax and a flame and wax building tools or press thin sheet wax over the positive and trim with scalpels till desired shape add sprews and pour the investment.





sarah, how much would you charge to make a silicone wax mould for a ring I want made? pictured is the ring. I could send this very ring to you for the mould "blank".



Hi there! So sorry for just responding - You can definitely make a silicone mold for making multiple wax copies. I prefer to make each wax individually (to make them all slightly unique) so I like the one time use. There are a lot of different mold types/materials. I don't make many so I'm not a great source of information on that topic... Most people use some sort of wax injector for their molds. I have a friend that uses a syringe and pipes it in to the mold that way. There are different types of wax for using in a mold though - with better flow most likely than just a basic carving wax.

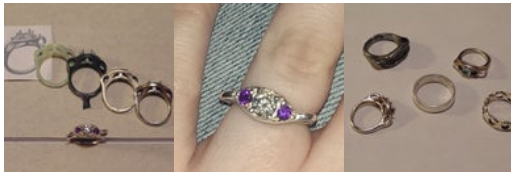


How did you manage to create such a fragile and intricate piece without it breaking, whenever i try to make a piece such as that it just breaks the wax (I use Green wax).
If its just my poor carving skills can someone link me to a tutorials to carving intricate details?

Thanks



Thanks for providing this Instructable! It was one of the key documentations I used for my engagement ring, and I really appreciated being able to reference this document.



Whats the vacuum machine called by the way?

I've been thinking about doing this for a while now and was hoping to get some gear together.
Great tutorial btw :)



It is actually fairly easy to make your own vacuum chamber and kiln - take a look at the way I did my engagement ring (<https://www.instructables.com/id/Casting-Rings-From-Startup-to-Finish/>).



Out of all the tutorials I have been looking at on the lost wax casting process, yours has been the clearest and most helpful of the process from wax to finish. Thanks much!



Safety eyewear is important. From the torch pics, it's clear no safety eye wear is being worn. Visorgogs are inexpensive and provide splash and impact protection. They can be found on amazon. Your eyes cannot be replaced. Accidents are called accidents for a reason. If we knew they would happen, then we wouldn't have them.

The tutorial is well done otherwise. Safety is important.



Wonderful. I am definitely going to try this. Thank you for sharing.



I made a lil video of me making a few things , Great instructable by the way, Very detailed .

<https://www.instructables.com/id/Lost-Wax-time-lapse-silver-casting/>



This is a great guide to lost wax casting and I really enjoyed it. I do have one question though. How do you determine how much metal (in my case white gold) you need by the weight of the wax? What is the equation I need to use? Thank you for the great instructable and your time.



Hi there!

Each metal has a conversion factor - the "specific gravity".

I use this chart on the H&S site since there is where I buy my metal.

Standard nickel white gold in 14k is 12.7. Which is different than 18k or palladium white gold.

<https://beta.hooverandstrong.com/casting-grain-specifications>

There is also a phone app I have that does conversions called iMakeJewelry.

Multiplying the wax weight by the specific gravity will give you the metal needed for the piece. Then you need to add extra for a button. My buttons for gold tend to be a lot smaller than sterling - especially with vacuum casting - generally around 4 - 6dwt depending on the size of the piece.

Hope that helps!! Let me know if you have any other questions!



Have you considered "steam casting" as an inexpensive alternative to vacuum casting? It is a more primitive method but requires less expensive equipment. Might be considered for experimental lost wax casting trials. Would allow trying the process without buying equipment first. Adding equipment later always an option.



If you have a sec - would appreciate any news / tips re process and gathering tools to do steam casting. send to bridlacy at gmail.com - w my thanks!!



Brian,

Guess I don't know how to get my info to ya.....Any suggestions?

Don



Brian tried to send some stuff to your e-mail address and am getting "non-deliverable" messages, is everything OK?

Don



hm... I'm not sure if it's the one through my website - I get emails to that address all the time and I guess have no way of knowing if someone get bounced back when others make it through?



Hello and thanks for this share. I haven't had much experience with casting, but am. About to try and cast some rings using the soft brown wax that you love so much :) Before this I had used the hard carvingwax a few times. Can you tell me how thin is too thin? The theme we are working with it to "give volume to a ring" so there has been folding, hammerng and milling. I have a few quite thin areas because i wanted to avoid a50gram ring :)

Thanks for any advice you can offer!



Hi there! I'm so sorry for just seeing this - you've probably cast already?

It really depends on the metal that you're using as well as what areas might be thin, so it is a little hard to just give a simple answer. I personally wouldn't go below 18g (1mm) for sterling, although some areas could be thinner. My rings are usually between 1.5 - 2mm. If there are some thicker areas and some thinner areas, you can make sure to sprue appropriately to make sure the metal

casts all the way. so if you have a thicker band and some small thinner details on top, that would cast fine as opposed to a thin band and even thinner details.



One more echo of 'great instructable' plus – any forums / equipment sites to find used tools to do lost wax? Any replies appreciated at bridlacy at gmail.com.



i don't actually... I'm sorry! Maybe try checking the forums on <http://www.ganoksin.com/>? Someone there may know of used tool forums...



I'm interested in how you vacuum the metal in. Is there a hole in the bottom of your plaster mold and you put that hole over the vacuum piece?



Hi there!

No, there is no hole in the mold. Some people use a wax web around the inside of the flask - so when the wax burns out there is a web of holes that allows the vacuum to pull better. i think that may be useful for larger flasks... i use pretty small flasks and the wax webs just weren't worth it for me. The vacuum just creates suction and slight porousness of the investment is enough. I'm always kind of amazed that it works!

If the investment didn't set up properly or there was not enough investment between the negative space of whatever you're casting and the top, the vacuum can pull a chunk off the mold. It is important to leave about 1/8" at the top of the flask, allows for better pull.

hope that helps?



I think it makes sense now. The vacuum pulls the metal into all the pores of the investment, by pulling the air out.



I have not cast anything since grammar school when I made 1 sided lead quarters and passed them to the NUN who was my teacher, (she was highly impressed, cause I recieved neither punishment or wupp'n). I have heard of centrifuge machines , but cacuum?

I are beez confuzzled, you make the mold using wax positive and some kind of plaster (investment?). I understand you suck the air out of the plaster while it is wet, then bake out the "wax" , but how does one get a vacuum to stay that way when you pour in molten silver? or does one do it real fast and then bell jar it and suck air? The mold being so hot the metal does not solidify while you pour, ALLOWING the bell jar to be used with vacuum, after the monolithis pour, (no dribs and drabs)?

sorry if I am too dense for this. I want to cast a few simple shapes out of silver soon and this looks cool. May I also ask does "investment" material have less of a "shrinkage", Or none perhaps when compared to plaster of paris?

I think I need a primer on this !



hey there!

The vacuum for the casting part does not actually use the bell jar. The vacuum has a toggle switch that changes where the vacuum pump pulls from - for investing it is through the bell jar and for casting it is through the table. If you look at the image #15 - right above my hand you can see the hole in the rubber mat and table. The vacuum creates suction through the investment and pulls the metal in to the fine details once the pump is turned on (it is actually turned in before the metal is poured b/c yes, the metal cools extremely quickly)

There is a tiny bit of shrinkage, though not very much.



I will definitely recheck it all out, since I would think th evacuum would suck liquid metal into the vacuum bore and chamber below (the pump). no?

Is the vacuum system good for casting liquid resin and epoxy goops as well? I know all the non understanding on my part is due to total lack of knowlege. But I would like to make a few item and any info I read first will help in the end.

thanks



i totally missed this! I'm not sure about casting other things... I think it would really depend on the mold maybe?



Awesome instructable, but what sort of investment do you use, and if you didn't have a kiln but stuck it in an oven on high, (around 5 hundred or on the self clean thing) for a while would it work to cure the investment, or would it depend on the investment. also could you use paraffin wax



hey there! I use an investment called 'satin cast' by kerr - it is specifically for jewelry casting and gives amazing detail (down to a finger print!) it also is designed to take the extreme temperatures of the kiln.

I would definitely not use a regular oven for a couple reasons - one is that I usually burn out up to 1300 degrees. For the investment I use, the kiln needs to get much hotter than 500 - sometimes it only goes up to 1150 if I'm casting stones in place.

There might be types of investment that are formulated to cure properly at lower temperatures? I've never looked in to it.

The other thing is that the wax fumes are pretty toxic and I wouldn't want the wax burning out in an oven that was in a house or would be used for food.

You can use any kind of wax and even burn out natural materials and some plastics. (again, that can be pretty toxic too) I have friends who experiment with all kinds of things - some work and some don't.

hope that helps!?



if your using wax not plastics! you can also pre burnout your waxes with steam to remove maybe 95% of the wax! less wax means less toxic fumes.

Chris: cc_tazman11@yahoo.com Owner Mad Scientist's Laboratories & Cavender & Kin Jewelers

OOps! also if you want to reproduce almost anything plastic in metal IE: tin or plastic soldiers, you can sprue them up and gate them for better flow but you will need a high temp burnout!



This is fascinating, excellent Instructale. Lots of great details.
Bravo!!



i really want to try this! haha

It seems that those Tables are kinda expensive? Do you really need one like this or can you use an vacuum former used for plastic or a bell jar? also where did you get yours?

thanks :)



Very informative! Thanks!

How do you create a seal between the vacuum table/machine and the flask during casting? Looks like maybe a special gasket of some kind, is that right? It looks like there are rings burnt in the surface from previous castings, implying that it might be something that wears out with repeated use and gets replaced. If so, can the gasket be purchased separate from the device?

I have a vacuum setup for resin casting, and it would be super simple to DIY a benchtop unit like that for use with the same pump, if I could figure out or source a seal that could take that kind of heat.



Is there any way to do this without a kiln?



i'm not sure about doing lost wax casting w/o a kiln - the investment needs to 'cure' and the wax needs to melt out. there are definitely ways of casting that don't require a kiln. There is cuttlefish casting and sand casting (which i've only done large scale, but i imagine the principle is the same - I have a few friends that do it a lot) With cuttlefish casting, you prepare the cuttlefish and actually pour the metal in to it - it's a one time shot, but no kiln! there may be a tutorial about it on here?



The magazine "Backwoodsman" had an article on cuttle fish bone casting a few years ago. If you google the mag they might have an article index.



ok, thank you



Very informative. One thing I didn't understand was about the vacuum. I could see when you were vacuuming out the bubbles under the glass dome ok, but how did you use the vacuum during the actual pour of the metal? Also, what type of material is it that is used for the investment?



This is making me nostalgic. I loved casting in my jewelry class at college. Made a miniature rifle for a friend using brass tubes cast in place in an aluminum stock. My favorite piece, though, was a sterling ring covered in little mushrooms. I used a hot iron to melt drops of wax that I dropped into cold water. The hardened droplets looked like mushroom caps. Then I rolled tiny stems, attached them to the caps, and "planted" them in a ring form on the mandrel.

We used a vibrating table and centrifugal caster. I ended up with a few bubbles in between the stems, but they looked like puffballs. :-)



I've only done lost wax a couple of times. In class on a centrifugal machine and once at home with my vacuum. Which one do you think is better? More flexible or more forgiving? I have a dismantled centrifugal machine, but I never liked the idea of spinning molten metal around my workshop.
-m



This is one of the best descriptions for the vacuum lost wax method I've seen. The one handed torch set up.. brilliant. Great work! I've tried this before. Both with vacuum and centrifugal methods. A critical mistake I made was not having enough space at the top (then bottom) of the flask. One time, the vacuum pulled loose investment into its filter and hoses. How do you avoid that problem? Do you have a filter or something on your vacuum?



oh thank you! i've actually been meaning to update it too w/ some more details and better photos.

unfortunately, I have no tip on having the investment go in to the table/hoses etc... and am quite fearful of that happening! well, more terrified of having the metal go straight through... the only time i had the top of the investment come off was a HUGE wax that i knew was risky and only had about 1/4" of investment above the wax. I would say just make sure that there is plenty of investment above the piece. I normally have between 1/2 and 3/4" above the wax - particularly if the wax is large and creates a large open area.



wow incredible work!!!