

# Experiment A: Egg Whites and other binders

[needs refining]

## Key recipes:

**85v "Sand Experiments"**

**84v "Eau Magistra"**

**68r-69r "Casting"**

Other related recipes:

49r "Sand for Lead Casting"

82r "Egg White"

82r "Other Sand"

85v "Casters"

86v "Excellent sand for lead, tin and copper"

87v "Sand of Toulouse"

step 1. make list of ingredients

step 2. transcribe into modern list of instructions / steps

step 3. formulate initial investigative questions

## Notes on recipes

### **49r sand for lead casting : problem: lead!**

ingredients :

½ lb lead

1 lb of tin (looking glass tin?)

stone frame

rosin candle (to smoke mold)

copper mold

resin

glass

sand

calcinated oyster shell

sand

rye straw

egg white (to alloy it)

copper, latten? , others

burnt and calcinated pumice stone

burnt and calcinated cuttlefish bones

walnut tree/vine ashes

[specifically for pewterers]

one lb. of glass tin

one quintal of fine tin, which makes the tin thicker.

thick and solid tin molds or, chisel-engraved copper molds, or stone or earth [molds].

Latten scrapings

resin candles to perfume their tin molds

salmons, easy to work with and melts

### **folio 69r (lots of promise!)**

hardly used sand

hot copper matter - lead for large works not necessary for small (yes!)

bulls' feet

pure wine

elm tree roots

burned linen

olive oil

beaten egg white

latten

box frames

molded tripoli/bruned felt /salt ammoniac (something fatty to act like glue)

### **folio 87**

Sand of Toulouse or

Sand, slate, and burned earth

roots of a young elm when it is sappy

wine, or better yet vinegar. T

double sieve,

molten

porphyry to pulverize it

lead or tin

a sponge

strong vinegar. [That way]

sort pour remplir de chasses with water, salt, or vinegar,

>

**84v - "Eau Magistra" \*Could be interesting to try these different binders with the same sand, observe differences**

different options for magistra:

Salt water (not good, because releases gas when heated and causes bubbles)

wine boiled with elm root

- what kind of wine? where to source elm root?

try burnt oysters [boil with wine instead of elm root?]

#### **84v - "Sand, for the most excellent lead of all, for large and small reliefs"**

**\*lets not work with crushed lead, yeah?**

crush white led, moistened with egg white, let it dry on a flat, well-clean table, reduce it to a powder and mold it with sand?

molded a clean impress

probably can't do this because of the lead

#### **85v - "Casters"**

**\*evidence that egg white can be mixed with "earth" or sand**

beaten egg white mixed with earth

make the first layer of the crown of a bell in pieces

make pieces with the egg white too

egg white is also good for the core of a small pieces

#### **85v - "Sand Experiments"**

**\*example of elm root infusion working very well with the sand of Toulouse -- might be interesting to try this one?**

sand of Toulouse

"well recooked two times in a skillet"

passed through a fine tammy cloth (like a double sieve that apothecaries use)

moistened with an infusion of elm root

it worked well "without having to tire myself"

molded cleanly on one side of the relief and on the other concave

thickness: coin of forty sols

cast very hot

Noted: sand from a mine is best, receives all metal, it will bubble when used hot, not the best for large works

#### **86v - "Excellent sand for lead, tin and copper"**

**\*what is mache de fer? this recipe confuses me; is burned bone, felt, mache de fer mixed in with the "sable de mine"? egg white used as binder here.**

**\*can we mold with copper...?**

molded with burned bone, mache de fer, burned felt

ground on marble and mixed together

very wet w/ beaten egg white

covered teh medal, filled the box frame with "sable de mine"

- sand from the mines?

it molded really nicely; let it sit for a night

reheated it over the course of seven or eight hours

2x cast copper and alloyed it with?

sand held up; cast afterwards sweat lead and tin

best and neatest of any others

Potin from sernique? 1/2 copper, 1/2 latten

## Recipes from Ms. Fr. 640

### <title id="p082r\_a3">Egg white</title>

<ab id="p082r\_b3">Egg white gives strength to sand so that many casts [can be] made from it</ab>

### **BnF Ms. Fr. 640 fol. 83r "other sand"**

<ab id="p083r\_b3">[Take] charcoal made from vine shoots and clay earth, both well seared, and mix them with well-beaten egg white. Next calcinate it [the resulting paste] in the oven and to use it, dilute it in vinegar.</ab>

### **BnF Ms. Fr. 640 fol. 84v "Eau Magistra"**

<ab id="p084v\_b2a">Some people think that salt water is not good, because the salt releases gas when heated and as a result causes bubbles. [In this case], there is only wine boiled with elm root.</ab>

<ab id="p084v\_b2b">Sanding charcoal makes [things] come off well. But one finds that willow charcoal creates bubbles, but oak or beech charcoal does the job without making bubbles.</ab>

<note id="p084v\_c2">Try burnt oysters.</note>

### <title id="p084v\_a4"> Sand, for the most excellent lead of all, for large and small reliefs</title>

<ab id="p084v\_b4a"> I took white lead and crushed it dry on porphyry, to make it very fine. Then I moistened it a lot with **very well beaten egg white**, so that it became like a paste, by making it stick together perfectly with the flat of a knife. I let it rest for a while. </ab>

<note id="p084v\_c4"> Mix it well with the knife.</note>

<ab id="p084v\_b4b">and place it on a flat well-clean table, and since it has a desiccative quality, I knew it would dry out. I left it to dry for a while to reduce it to a powder and mold it with sand, it having been ground into small pieces with my fingers and the sharp side of a knife. I oiled my medal because oil cleans it without damaging it. And after cleaning and drying the medal with a cloth and ribbons of pork skin, I lightly oiled it once more with clear walnut oil, and gently swiped it with a cloth so that [the medal] would not be too oiled; having already considered that in this way [the medal] should come out easily, because the white lead, **wet with egg white water**, which would not damage the oil. This worked very well. I molded a medal very cleanly in high relief,

without it having any lumps, which a lot of good sands such as felt, burnt bone, and scoria failed to do on the first attempt. I re-cooked it and my mold became hard like marble. And then I knew that sands used to mold big relief must be very moist with some kind of water, which gives body and firmness, **like egg white**, gummed water, [or] one [water] boiled with elm root. And lightly oil your medal. It can take as many firings as you want because it is as hard as glass. But soft lead and sour tin must be cast at a very hot temperature.</ab>

<ab id=p084v\_b4c">Since that moment, I have realized that even though this sand is excellent, can be cast often and molds very neatly, it is fat and it makes bubbles. In this way, the soft lead does not suit the mold well. But I have tried to mix it with lean sand, such as pumice, metal scrapings, and similar things, in order to give it body, and to help it come off easily, because lean sand [alone] does not come off easily; and yet it takes metal well.</ab>

<note id=p084v\_c4b">Try to mix white lead or minium with other sands.</note>

<note id=p084v\_c4c">Oil and smear with aspic oil, which will disappear when reheated, because the oil causes bubbling.</note>

<note id=p084v\_c4d">**It is necessary to mold with egg white, and then mix it well.** And once it is in the box mold, beat it well on the top with a pestle, or something else clean. This helps to make molding better and come out more easily.</note>

<note id=p084v\_c4e">It is best to fill the box mold in one go, because the mixture made of several sands, and the one from mines, that you use to fill the box mold, damages it.</note>

### **BnF Ms. Fr. 640 fol. 85v "Casters"**

<ab id="p085v\_b1a">**They mix beaten egg white** with earth of which they make the first layer of the crown [of a bell] in pieces. [They also make] bells and all other said pieces which the said [egg] white. This makes [it] come clean and sets and stabilizes the material. For the core of a small piece, egg white is also good.</ab>

<ab id="p085v\_b1b">Red copper, in order to make it come clean, wants the mold to be a little hot and lead which is mixed with the red copper [is] therefore chiefly for small pieces.</ab>

### **<title id="p049r\_a2">Sand for lead casting</title>**

<ab id="p049r\_b2">Rye straw ashes well boiled, dried and then well sieved. **alloy it with egg white.** One can add copper, latten and others.</ab>

### **<title id="p049r\_a3">Other</title>**

<ab id="p049r\_b3">Burnt and calcinated pumice stone, burnt and calcined cuttlefish

bones, in the same quantity; and ashes of walnut tree or vine, [boiled, dried and finely sieved alloy with egg white](#).

### <title id="p068r\_a3">Casting</title>

I have tried four kinds of **sand** for **lead** and **tin**: **chalk**, crushed **glass**, **tripoli** and burnt **linen**, all four are excellent. As to the **chalk**, it needs to be of the softest kind available, like the **Champagne chalk** used by *painters*. It releases very cleanly, needs not be dampened with **magistry** or with anything else, but is used in its natural dry state and finely pulverized. The first cast is always cleaner, however it will sustain two or three castings. Should you only cast once, keep in mind, while remaking your box mold, to take powdered **chalk** that has not yet been used, since the one previously used in the box has dried out and will not bind and hold together as well as fresh **chalk**. Crushed **glass** can be made from ordinary **glass sand**, however **cristallo glass** is more excellent, because **common glass** contains **saltwort** only, while **cristallo glass** contains both **salt of tartar** and **saltwort**. Both of them help the fusion, during which the glass is calcinated and reduced to its prime matter. In order to calcinate it perfectly, throw your pieces of **glass**, of whichever sort, among the largest possible glowing **coals**, unless some other violent heat source is available. And once the glass is red hot, throw it into **water**.

<note id="p068r\_c3">**Putty** is considered excellent for these two **metals**.</note>

The sand near my area is very excellent. But in order to make an excellent work, take it fresh, hardly having been used. Because it dries out after having done a casting several times & is arid & has no body at all. If you cast some fine work which has hardly any thickness, your copper matter must be very hot so that it penetrates and runs. Some people mix lead within this molten metal, but this is for large works & not for small ones.

Sand from bulls' feet twice-burned and finely ground melts more neatly with copper, & without a coating, than sand that I've seen. I cast a medal with quite high relief in it, and slender, with the thickness of a knife blade or a card. And there being a hollow on one side, the obverse, with the relief being on the other side.

Lean sand needs to be more moistened than others, that's to say with *magistra* or good pure wine or wine boiled with elm tree roots or something similar. But very fine sands, like burned linen which is fat and soft of its own accord, want to be applied dry.

All moistened sand needs to be very beaten and tumbled in order to make it fine & flattened of the little globules that it makes in itself when it is drenched.

<ab id="p069r\_b2f">The olive oil that some people mix in with beaten egg white makes it puff out.</ab>

<ab id="p069r\_b2g">Sand of calcined glass lasts for many fusions. But there are only the first ones. It also puffs out.</ab>

<ab id="p069r\_b2h">Latten works well on its own, but it charges. It is good to mix it with some copper, about a quarter part, with frying pan material.</ab>

<ab id="p069r\_b2i">Founders cast box frames well up to about 30 or 40 pounds. But no more.</ab>

<note id="p069r\_c2c">It is good for big work. But for small it is troublesome to take away. This is because it crumbles. It would be good for it to be a little glued together with something fatty that binds, like molded tripoli or burned felt or salt ammoniac or tripoli & similar things.</ note>

#### **BnF Ms. Fr. 640 fol. 85v "Sand Experiments"**

<titled id="p085v\_a4">**Sand Experiments**</titled>

<ab id="p085v\_b4a">X I have tested **sand** of Th{oulous}e, and after seeing it well recooked two times in a skillet, I passed it through a fine **tammy cloth**, like the double [sieve] which *apothecaries* use, without grinding it further on the **porphyry**, as I have done other times. I moistened it [the **sand**] in infusion with **elm root**, and in it, I molded a big piece of a portrait of Jesus. I found it unmolded very well without having to tire myself out by hitting it from behind and it molded cleanly on one side of the relief and on the other concave. And [it was] of the thickness of a coin of forty sols. I cast [this] very hot</ab>

<note id="p085v\_c4">**Sand** from a mine, well chosen and well reheated, is the most excellent of all without trying to find all other mixtures because it receives all **metal**. It does not like to be used hot because it bubbles the more finely. For large works, it is not the best because it does not have enough body to sustain [it],</note>

<ab id="p085v\_b4d">[or **metal**] fills with bubbles. Most of all, make sure that the cast is always higher than the molded thing, since the **sand** swells very often when reheating, even in the middle, and therefore with the molded thing remaining higher than the cast, the **metal** cannot run easily or at all nor enter at all. Also make sure that the mold & the cast are indeed reheated. Also cast in one go & outside of the wind. And if your medal is really thin, when you want to mold it, put a **card**, or two or three thicknesses of **paper**, so that the mold will be lower than the cast. Also cast in the place where your medal is least thick & where the relief is lowest.</ab>

## BnF Ms. Fr. 640 fol. 86v "Excellent sand for lead, tin and copper"

<ab id="p086v\_b1a">D</ab>

<ab id="p086v\_b1b">Since, I molded with **burned bone**, **mache de fer** & burned **felt**, really crushed and ground on **marble** and mixed together. I got them very wet with beaten **egg white**. And, as in the other [casts], having covered the medal and filled the box frame with **sable de mine**, I gave it a little tap. I found it really stripped & molded quite neatly. I let it sit for a night. The morning after next I reheated it little by little for over the course of seven or eight hours (because if possible there must not remain any humidity at all in the box frame). Two times, I cast **copper** alloyed with  $\zeta$  there, as old **K**. The material came out really lustrous & resonant & without a coating. And my **sand** was not corrupted at all. Since, I have cast in there many casts of **sweet lead** and **tin**, which came out the best and neatest of any others I have yet found.

<ab id="p086v\_b1c">When you mold make some grooves around your mold in the box frame, so that you draw in this manner the matter from all sides.</ab>

[image]

<ab id="p086v\_b1d">**Potin** from **sernique** & other works runs yet better than fine **latten**. But I believe that half **copper** and half **latten** is better, which has served & been in very thin works, like frying pans & similar ones. I've seen come out quite well this mixture of half...</ab>

<ab id="p086v\_b1e">In order to mold well, you should cast several medals together in a large box mold, because when there is a lot of material and the crucible is almost full, it becomes hotter. Then, if you do not succeed with one of the medals, another will be good.</ab>

<ab id="p086v\_b1f">It is better to melt with a bellows furnace than with a wind furnace, because it heats more vigorously. It is true that **latten** melts better in the wind furnace, because it is more sour than **copper**.</ab>

<ab id="p086v\_b1g">Some *founders* superstitiously believe that there are only three days in a week that are good for melting, that is, Tuesdays, Thursdays, and Saturdays. For them, the others are unlucky.</ab>

<ab id="p086v\_b1h">When you mold, do not excessively pound on the medal that is in **sand**, because that prevents it from being cleanly stripped, and cracks the mold.</ab>

<ab id="p086v\_b1i">See to it that **sand** does not go over the edges of the box mold, because if the molded medal is higher than the cast, **metal** will not easily enter the form. Therefore, always take care that the surface of your cast surpasses the mold in a straight line. To accomplish this, if you wish, put a piece of **cardboard** of whatever thickness you please on top of the mold.</ab>



<ab id="p086v\_b1j">To prevent their large casting works from becoming too porous, *founders* are careful to heat their molds very well. And to know if the molds are heated enough, they tap them with their finger, and if they start ringing like a pot, they are heated enough.</ab>

<ab id="p086v\_b1k">In order to cast their canons cleanly, they mix with their *founder's earth* some fine casting **sand**, if they can get any.</ab>

### **BnF Ms. Fr. 640 fol. 87v "Sand of Toulouse"**

<title id="p087r\_a1">**Sand** of Toulouse</title>

<ab id="p087r\_b1">The [**sand**] generally considered good is the one found in a vineyard near Pech-David. But the best is the one is from the Touch, a river close to Saint-Michel and Blagnac, in a vineyard at a high altitude. This [**sand**] is thinner, and a bit greasier than the other, and better for small works. It should not be overheated.</ab>

## Experiment B: Wax

### **p042r Seal and print wax**

<ab id="p042r\_b2">For large **wax** seals, you should always have tepid water handy, and keep your **wax** in it. Yet previously you should have kneaded it with your hands, so as to make it very smooth and even, for otherwise the water would penetrate the **wax** and prevent it from holding together. Afterwards, you can stamp whatever you want. Cover the **wax** in three or four sheets of **paper**, and, with a round and smooth stick similar to a pestle, roll it out as if to polish it. It will then stick to the **paper**, helping you to take it off from the seal. In this way you will stamp better than if you were dripping molten **wax**. You can carve figures and color them in gold, in silver, or paint them with **couleurs à vernis**, and transfer them onto a **glass** pane painted with **couleurs à tourmentine & mastic**. And if you want to apply these designs by inlaying, use **ammoniacum** mixed with **vinegar**, and it will stick well.</ab>

### **p109r Working in rough with wax**

When the **wax** is too hard, **one mixes in some turpentine or a bit of butter**, which renders the **wax malleable, and cleaner than tallow**, which the *Italians* mix in, because oftentimes, it is necessary to put the tools into the mouth, [tools] which are better when made from **box wood** or **antler**.

### **p120r Impress medals made from wax**

You can mold your relief with **wax** mixed with a bit of **resin** to make it harder and firmer, whatever relief that you wish, either an animal or a medal. And then, fashion a hollow out of this relief in **brass** or **copper**. Or mold your [wax] in relief and strike it in a sheet of **tin**. And fill [your final product] with **lead**, and heat it. Try [to use] blades of **stone leaf** to make the hollow for lizards &

## Experiment C: Tallow

see 109 above in wax section

folio 80 (although this may be too complex)

**casters tin box molds tallow folio 166**

<http://gallica.bnf.fr/ark:/12148/btv1b10500001g/f166.image>

<title id="p080v\_a1">Casters of small tin work</title>

<ab id="p080v\_b1">They usually cast from solder the things that should not become hollow, because these require fine and soft tin. However, these things would not otherwise lose their coat or become hollow if they are mixed or include glass tin in them, just like they mix a little [glass tin] in the soft tin. They engrave their work on stones of which the sharpening stones or barber's files are made. These are found in great flakes near the mountains, and resemble slate. You can find these [rocks] in three colors: one reddish, that is not as perfect as the others because it does not sustain heat; [another] one is the color of dark slate, and the other is whitish. When they work a relief, first they print it on paper maché, which is one finger thick, to serve as a pattern. After planing the stones and rubbing them together, they use a compass or little iron tools to engrave their figures. They make their moulds with three or four stones, to make a circle or a square with the stones which join perfectly because the stones are of equal size. Before casting, they rub the mould over with tallow, and it [the mould] absorbs it quickly because it is hot. [Then, having [put] fine powder of quicklime into a cloth, they rub the mould using pounce in beating the linen on top, then blow it a little on top; this prevents bubbles [from forming].?] The main thing is that you make some vents. If the work is big, they do as it is shown [on the picture]. They make a hole in the medal, somewhere where it is least visible, and with a bit they pierce the mould on the side of the medal. And if they want their work to last, they pierce [it] somewhere and fit in a piece of cork. Lead or tin will not damage it. </ab>

<note id="p080v\_c1a">Make sure the pegs of your frame fit in easily so it will open with ease without moving anything else. Your tin box moulds should fit well, and the table should be very flat. </note>

<note id="p080v\_c1b">Try to engrave with distilled vinegar.</note>

<note id="p080v\_c1c">Try calcinated oyster shells; they are said to be excellent for moulding.</note> [image]

### notes about tallow in other Manuscript recipes

folio 13

#### <title id="p013v\_a4"> SNAKES </title>

<ab id="p013v\_b4"> It is said that if you say to a snake in greek Snake snake, it will run away, as well as if in Greek you will call a swine uon and it will come </ab>

#### <title id="p013v\_a5"> CANDLES </title>

<ab id="p013v\_b5"> Candlesticks are never good candles when it is windy because it always melts however good is the tallow used. </ab>

tallow fruit for a year  
folio 50

<note id="p081r\_c1a">Tallow makes things fill with bubbles</note>

The opening of the scabbard is called the mouth and on top of it is the shape of the knife. </ab>

<ab id="p096r\_b1c"> The stitch which is a leather rim set on the edge of the knife shape is made to stop frogs. </ab>

<ab id="p096r\_b1d"> When the estelles are well flattened, the sword is laid down on them and with some black stone the width of the blade and the length is marked and then with a chisel, the excess is cut, And a plane is used to even properly following the marks. </ab>

<ab id="p096r\_b1e"> Then the two estelles are stuck edges to edges and all along only following the knife shape and not elsewhere, And that is to make the scabbard velvet leather hold. </ab>

<ab id="p096r\_b1f"> Then the sword is put in the estelles and they fit it in that way perfectly in the scabbard which is all sewed, And they rub what is glued directly on the knife shape with some tallow to run into the scabbard. </ab>