

Secrets of Craft and Nature in Renaissance France

BnF Ms. Fr. 640 - English Translation

List of names

Margin Notes:

[LEFT-MIDDLE] **Mestre Nico**[illegible] **Costé**,^[1] in the Rue de la Heaumerie,^[2] at the sign of St Claude / Mirrors.

Mestre Jehan Cousin,^[3] who resides in the Faubourg Saint-Germain,^[4] knows of the MASTER.

Mestre Jehan Garnier,^[5] in the Rue des Escrivains by St Jacques de la Boucherie,^[6] CURRIER. Try pastel woad flowers.

List

Margin Notes:

[LEFT-MIDDLE]

The HARVESTER that leaves some ears is not blamed.^[7]

Sacra Eleusinæ deæ^[8] propalare nefas.^[9]

Trumpets, see the book of funerals.^[10]

List of books and authors

Margin Notes:

[LEFT-MIDDLE] **Vuolfangus Lazius**^[11]

Petrus Appianus, [12] *mathematicus*

Ingolstadiensis, Comment. urb. rom. [13]

Hieronimo Ruscelli^[14]

Hermolaus Barbarus^[15]

Angelius Bargæus,^[16] *De aucupio et venatione*^[17]

Nicolaus Damascenus^[18]

Caresariensis.^[19] *De rebus Persarum*^[20]

Isidorus^[21]

Osorius^[22]

Eupolemus.^[23] *HISTORICUS* *gentilis*

qui de rebus Davidis & Salomonis

scripsit^[24]

monsieur^[25]

- Catalogue des villes^[26]

Calendrier des fêtes Calendrier des BERGIERS^[27]

Grammaire italienne^[28]

Grammaire italienne *Arithmetique*^[29] of Savonne^[30]

Arithmétique de Savoie

Instruction pour la faict des finances^[31]

Instruction pour le juge des Questions acciaziennes [32]

Questions de synthèse[33]

Des préceptes

Symposium^[35]

Syntaxis [36]

Olaus Magnus

[RIGHT-TOP] **Alexander Aphrodisæus**^[39]

Polydorus Vergilius^[40]

Appianus^[41]

Athenæus^[42]

Pausanias^[43]

Statius^[44] *Thebaidos*^[45]

Servius,^[46] *in Aeneidem*^[47]

Macrobius^[48]

Aulus Gellius^[49]

Alexander ab Alexandria^[50]

Festus^[51]

Nonius^[52]

Magius,^[53] *Miscellanea*^[54]

Pollux,^[55] *Onomasticon*^[56]

Higinus^[57]

Berosus^[58]

Suetonius^[59]

Valerius Maximus^[60]

Cornelius Tacitus^[61]

Xenophon^[62]

Seneca^[63]

Dionisius Halicarnassensis^[64]

Sabellicus^[65]

cum permultis

aliis^[66] **Julius Capitolinus**^[67]

Budæus^[68]

Spartianus^[69]

Blondus^[70]

Volaterranus^[71]

Herodotus^[72]

Paulus Manutius^[73]

Strabo^[74]

Julius Firmicus^[75]

Quintus Curtius^[76]

Dion^[77]

Cornelius Nepos^[78]

Flavius Vopiscus^[79]

List of books

Margin Notes:

[LEFT-MIDDLE] ^[80] *Aquatilium animalium historiæ, Hypolito Salviano* ^[81] *Typhernate authore, Romæ 1554* ^[82]

Margin Notes:

[LEFT-MIDDLE] *Les Annales de Normandie* ^[83]

For loosening the belly

Prunes of Saint Antonin, &, if you like, you want put among them leaves of mallow & gilliflower, adding in sugar &, if one wants, a little cinnamon for the stomach.

marshmallow root in a chicken broth. The fresh kind is more mollifying.

syrup of sweet jujubes with water & taking it *in the morning* loosens the belly.

[84]

Ruffinus^[85]

Irenius^[86] in *Exgesi*^[87]

Paule Emile^[88]

Paule Jove^[89]

Polydorus^[40]

Bergomensis^[90]

Philippe de Commines^[91]

Against pains

Turpentine oil, oil of Jacob, and salt extracted from cabbage ash.

List of books

Practica, cioè nova inventione di contegiare,^[92] stampata in Brescia per **Vincenzo Sabio.**
^[93]

[94] **Emeralds of Brissac**

minium 26 ȝ, crystal^[95] [illegible] and ground on marble 12 ȝ, verdet 3 | ȝ|. Incorporate all together, put in a crucible^[96] covered with another, well luted, that has a hole in the top. Fusion 7 hours without blowing. The mass was of a beautiful green.

Margin Notes:

[FULL] I have taken **minium** 12 ȝ, **crystal** 6 ȝ, **verdet** 2 grains. Soft fusion vi hours, refired 24 hours. The mass was green, yellow & red.

| **Sapphire**

Pebbles or **crystal** 8 ȝ, **minium** 16 ȝ, **BLACKSMITH's salt** 4 ȝ, sparkling **coryal** 4 grains. Fusion 6^[97] hours.

Counterfeit coral^[98]

+

wood or take a bizarre **thorn branch**, then melt a lb of the most beautiful **clear pitch resin** and put in one ounce of **subtly ground vermilion** with **walnut oil**, and if you add in a little **Venice laque platte**,^[99] the color will be more vivid, and stir everything in the **resin** melted over a **charcoal** fire and not of flame, for fear that it catches fire. Next dip in your branches while turning, & if any filaments should remain on it, turn the branch over the heat of the **charcoal**.

Margin Notes:

[LEFT-TOP] **Colophony** is nothing other than recooked **rosin**. To do it well, take a **leaded pot** & melt the **resin**, & boil it over the **brazier** a good **hour**, & until it appears not to be thick, but clear & liquid like **water**, & easily runs & flows from the tip of a **stick** with which you grind it, & test it. Then pour it through a **coarse canvas** or a **very light tammy cloth**, such that when pouring it falls into the strongest **vinegar** that you can find, for the **vinegar** gives it strength & prevents it from being so fragile. Reiterate this two or three times & it will be beautiful & well purified. For counterfeiting your **coral**, you can mix a quarter part of **mastic** into your **purified rosin** to render it more firm and more beautiful, & if you were to take a single tear of **mastic**, it would be all the better, but it would be too long.

[LEFT-TOP] **Sulfur** & **vermilion** makes the same effect.

[TOP] The coral made of gules red enamel endures the file and polishing.

[RIGHT-TOP] It is made like cement that is stronger mixed with pestled than-of glass rather than with brick. Thus, here one mixes well pestled gules red enamel, which is red in body, with the vermillion. Thus with all colors of enamels.

Varnish for panels

lb of Venice turpentine & heat it in a pot until it simmers, and put in half a lb of the turpentine oil of the whitest you can find, and stir it together well on a charcoal fire and take it off immediately. And *elle* it is done. But if it seems too thick to you, add in a little more oil. Similarly if it is too clear, you can thicken it by putting in a little turpentine. Thus you will give it whatever body you want. It could be made well without fire, but, when heated, it is more desiccative. It is appropriate for panel paintings and other painted things without corrupting the colors or yellowing. And it dries both *in the shade* and *in the sun*, and *overnight*, and *during the winter* as well as *in the summer*. It is commonly sold 15 sous a lb.

Margin Notes:

[LEFT-BOTTOM] A little more turpentine than turpentine oil is needed in order to give body to the varnish, which needs to be applied with the finger in order to spread it thinner and less thick, for when it is thick, it turns yellow and sticks. One does not varnish to make paintings shine, for it just takes the light out of them.

Thick varnish for planks

varnish that takes a long time to dry & drips more than two *months* after it has been applied to the planks. But this one does not drip like that of *times past*, which was made of linseed oil, garlic boiled in it to extinguish it & rid it of grease, & with wheat. And this one yellowed & rendered greenish the blue color of paintings. This one is made like the other one except that one puts coarse common turpentine

Margin Notes:

[LEFT-MIDDLE] But it is used to heighten colors which have soaked in and to keep them from dust. **Mastic varnish** does not resist **rain**, whereas that of **oil** and **rosin** does.

fine turpentine. And you can put into two 1b of **toe** common turpentine one 1b of **fine turpentine oil** & do everything as with the other one. This one will cost you no more than five or six **sous** per 1b & is sold for 40 **sous** per 1b.

[Figure: fig_poo3v_1]

vessel is for making large quantities of **turpentine oil**, that is to say a bucket an **hour**, and no matter which **turpentine it may be**, whether **fine** or **crude**. One needs to give, as you know, a little fire at the beginning and always keep **cold water** in the cooler on the top. The 1b is sold at xii **sous**, & at the bottom of the vessel remains the **colophony**, or *pix græca*.^[100] In this vessel, **eau-de-vie** is also made well, and there is no need to distill it again. You do not need a oven for this **copper** vessel, but only **charcoal** around it if it has a flat bottom, but if it is round, you will place it on a trivet.

Margin Notes:

[LEFT-MIDDLE] It is better to heat the **varnish** a little bit, rather than to put it out **in the sun**, because this makes the panel *warp*.

[LEFT-MIDDLE] Some say it is not good to distil in this **copper** vessel because it makes things green. However, when **tinned**, it is good.

Turpentine varnish does not need any **glue** because it is fatty & viscous & it is not absorbed in the **wood** like that of **spike lavender** & **sandarac**. Also, that of **spike lavender** does not require any **glue** on **iron** & similar things that do not absorb. But on **wood** & on colors which have do not have **gum** or **distemper glue**, it is necessary to lay one coat of the said **hide glue** & to let it dry & to varnish.

Varnish of spike lavender oil

spike lavender oil & as it begins to simmer, put in **powdered sandarac gum** so that it soon melts. And over a **charcoal** fire stir continuously until the **sandarac** is well melted, which you will know by taking a little of the said **varnish** on a plate, and if it is fatty when you handle it with a **finger**, it is ready. And for one 1b of **spike lavender oil**, you will put five ounces of **pulverized sandarac**, although some only put in four ounces, but this is neither so good nor so fatty. This one is promptly dry. **FRAME MAKERS**, to avoid the trouble of polishing their **ebony**, varnish it with this, as do **GUITAR MAKERS**. This is not as appropriate for panels as that of **fine turpentine**, though it is good for the moldings of panels. One did not use to varnish the landscape of a panel when **linseed varnish** was in use, because it yellowed the landscape. But with that of **turpentine**, one varnishes everywhere. You can put in **pulverized mastic** extracted in tears or otherwise, & it will be more desiccative, in place of **sandarac**.

plaster or a wall, first put on your very hot **hide glue**, because if were cold it would not penetrate the wall, & when you would put your **varnish** on, it would come off.

Margin Notes:

[LEFT-MIDDLE] Varnish of spike lavender oil is not as appropriate for colors as that of **turpentine**, for **spike lavender oil** makes them die eats the colors since it is too penetrating.

varnish from an old panel that is yellowish & varnishing it anew

white soap & sieved **ashes**, & soak both in **water**. And with a sponge, take the said **ashes** & **soap** & rub the panel with them. And as you see that the old **varnish** is removed, throw a bucket of **water** against the panel to clean it. Next put it for a quarter of an hour **in the sun** to make it dry and to revive the colors. Next, once the panel is dry, you can spread your turpentine varnish on it.

Margin Notes:

[LEFT-MIDDLE] Make sure the colors do not come off.

Black varnish for sword guard, bands for trunks, &c

linseed oil or more cheaply, **walnut oil**, and rid it of grease with **garlic** & **onions** +**hog's fennel**, some also add **bread crusts**, which you will boil in it for a good quarter of an hour. Next, put in one lb of the **oil** thus boiled the size of a **walnut** of **black pitch** & a double **handful** of **grains of wheat**, without removing the **garlic** & **onions**, and let it boil together for a good quarter of an hour. And when the **pitch** is well melted & when the **oil** has body, you can remove it from the fire. Then, to varnish, place your **iron** over a low **charcoal** fire & apply your **varnish** with a feather or a brush. And when you see that it no longer **smokes**, it is done and your **varnish** is dry.

Margin Notes:

[LEFT-MIDDLE] For excellent **black varnish**, add two or three paternoster beads of **jet** among the rest.

[LEFT-MIDDLE] Some consider **walnut oil** better.

[LEFT-MIDDLE] If there is a lot of varnish, it needs to boil for at least half a day, for it is better the more it boils. It is dangerous if it catches fire, if it goes over the top, and is hard to extinguish. Make this therefore in a **courtyard** or an **open space**.

[LEFT-MIDDLE] In five or six lb of oil, one must put one lb of galipot, which costs 4 sous, & some peeled garlic cloves. This varnish in and of itself is not black, but it blackens over the fire.

[LEFT-MIDDLE] See below, around the 3rd part of this book, after **sands**, in the chapter on **FURBISHERS**.^[101]

Black varnish without fire, without disassembling the harnesses^[102] or removing the bands from trunks

varnish of spike lavender oil & mix in soot black or lampblack, & without fire it will mix in by itself. Varnish with a brush & it will soon be dry. Turpentine varnish will be quite good, but it does not dry as soon.

Varnish of IRON ENGRAVERS^[103]

linseed oil or walnut oil &, in place of black pitch, you will put in a little pitch resin, & it needs to be cooked in the fashion of black varnish on fire. And for applying it, heat your iron & give it only one layer of varnish, & when it no longer smokes, it is dry. Next engrave with a steel point whatever you want. Next take salt & verdigris & mix as much of one as of the other in quite strong vinegar & leave it for xx4 hours before using it, & all will be tempered. Next spread some of this liquor or sauce on the engraved object with a sponge

linen & leave it thus for xx4 hours & it will be engraved.^[103] But if you should want to engrave promptly, varnish all your work & boil it in the said liquor, & it will promptly engrave.

Steel mirrors

X^[104] They are called of steel because in times past they were commonly made of steel polished with emery putty. But more easily, various kinds are made with cuivre franc, which

is **rosette** & **tin**, because it is cast in a **mold** & made round, concave, convex & however one likes, to represent various forms.

half **rosette copper** & half **soft tin**, that is to say fine, which has not yet been used. Put them in a **crucible**, & first melt the **copper** well. And once it is well melted, put in the **tin** and mix together. Then cast in the mold, of **white stone** with no eyelets, & anoint the **mold** with **oil**, & let it be moderately warm. Then, having **molded** your mirror, you can polish it in this way.

plaster in order that it holds firmly, & then put the other one over it with **thin sand** in between, & rub one against the other, whether it be concave or flat, & thus you will polish two at once. And if you want to polish them on both sides, you only need to switch them, that is to say put the one that was polishing into the **plaster** & the one that was in the **plaster** to polish. After having polished them with the **arene** you can smooth them with **Venice tripoli**, which should not be sandy, & next with **putty**. You polish with **arene** using **water**, but polishing with **tripoli** & **putty** is done dry. Once polished, you can set it.

concave mirror on the ground on its foot, & let it be at a slant; next, look at it from one pace away. But if you look at it close up, it will represent you the right way up but with your face quite large & the hairs of your beard as thick as

nipple as large as a plate, and **WOMEN** can see the **secret places** that they do not want to show to **SURGEONS**. It casts the representation out of itself, and if you **touch** **the placee** the eye of the representation with your **finger**, another **finger** will come against yours.

at night for someone quite far away, if you place the **concave mirror** behind a **candle** placed on the **window**. You will be able to read and write quite far from the **candle** if you place it behind the **candle** & place & turn the concavity toward you. If you put the **mirror** at the end of a **table** & a **candle** on it, it will represent two lights on the **table** for you. To see what is happening on a **street**, shutter the **window**, whereby the more of it you can shut the better it will be. Make a hole at the lower one, as wide as your **little finger**, perfectly round, from one side to the other. Then place a sheet of **paper** on the **window** & let the **middle of the sheet** be over the hole. Pierce the **sheet** in the same place as the hole & the same size. After, place the concave face of the **mirror** toward the hole, & it will represent to you all those who pass by in the **street** on the sheet of **paper**. Similarly with the **pierced door of a closed room**.

You can make wavy ones & triangular ones, in the fashion that **Ptolemy**^[105] describes, & **Archimedes**.^[106] The concave one also sets fire to **straw** from quite far away, and lights a **candle** with the **sun**. Also, it heats through the reverberation of fire.

looking-glass tin and melt it. On half a lb of this, put half an ounce of quicksilver, and remove it all at once from the fire & grind it, and it will be like ash. Grind Wash it quite well in clean water. Next, grind it on marble & temper it with water of ret hide glue. Next, apply to your wooden candlesticks & any other work you like, & burnish with the tooth. You can grind pin filings & apply them with the said glue.

burnished gold and giving red or green or blue

Ceruse & **lead white** is not appropriate for polished white nor for burnishing because it is fatty, but it is quite good for **or mat** which is made with **oil**, mixing it with yellow **ocher** & mine **pe** & tempering all of it with **oil**. And this **or mat** thus applied keeps **in the rain** like gilded lead work & similar things. Therefore for **burnished gold** take **good chalk**, quite white, well ground, & tempered with **distemper glue**, & make four layers of it, one after the other, on the **wood**. And once the last is dry, rub it with **prele**, which is a plant otherwise called **horsetail**, to render it well polished. Next take **fine boli armeni**^[107] & **sanguine**, as much of one as of the other, also **lamb tallow** the size of a **bean** or a **pea** depending on the quantity of **bole**, and a little **willow charcoal**, or as much as the **tallow**, & half a **walnut** shell full of half-burned **saffron**. Some put in a little **candy sugar**. Grind all together with **water**, & apply it without **gum** or **glue**, & let it dry, & rub the place that you want to gild with a piece of white cloth to better smooth it, & when the rubbed place is a little shiny, it is a sign that the **gold** will be carried well. Having rubbed, wash with a clean paintbrush soaked in **clear water** the place that you want to gild & immediately apply the **gold**, which you will burnish once dry. And if you want to lay in **rouge clair** & glaze with it **de**, grind **Venice laque platte**^[99] on **marble** with **walnut** or **linseed oil**. Once ground, mix **turpentine** or **spike lavender varnish** & apply on the **gold** with the paintbrush. **Brazilwood** & **laque ronde**^[108] die. For green, temper **verdigris** with **walnut** or **linseed oil** & grind it, next mix in **turpentine varnish** and not **spike lavender varnish**, which is not suitable for **verdigris**. If you want to glaze with **azure**, it needs to be set on

burnished silver and take *azur d'esmail*, &, without grinding, temper it with turpentine varnish & apply it.

ga eaeh cages^[109]

enamel cannules of various colors by covering the latten or iron wire with the said cannules. These you will break neatly to the length that you want if you slightly notch with a cutting file the place to be broken, and they will not break at any other place. You can bend them with a wood model over a chafing-dish or else by the heat of the lamp. It can also be drawn as long as you want in a small furnace made like a reverberatory furnace but which is pierced on both sides. And when the large cannule is red, they seize the hot end using small pincers with a long beak, such that one prong of the beak of the small pincers enters inside the end of the cannule, & thus it is lengthened without becoming stopped, & the other end of the cannule is held with the hand, because it is not hot. When the cannule is stretched enough, the one who works seated, having his furnace the size of a carnation pot before him, breaks it off & continues. This is for making cannules for capes, which are cut, as said, with a file. GLASS BUTTON MAKERS also avail themselves of the said furnace.

[Figure: fig_poo6v_1]

Margin Notes:

[RIGHT-MIDDLE] Under the door is a grate that supports the lit charcoal, & the ash is emptied by turning the furnace upside down.

[110] to embellish and encrust or cover the edges of mirrors, the tops of chests, or the friezes of bed valances

[103] with aquafortis on iron or copper whatever you have pounced and drawn there, next clean it up with a burin or chisel. Then pour soft tin which has not been used onto polished marble & with a wooden board, flatten it quite thin. Or else cast it in tablet form like lead, or

put it through a roller press. Next lay your **tin** plate over the engraved thing, & over the **tin** plate put a piece of **felt** and strike on top with a hammer. Then **gild** it in this way.

gold color and **tinsel**

gilded colored, make your stamping either in **tin**, as is said,^[111] or in **iron dest** or **copper**. You ought not to put a layer of **glue** there as on **wood**, but take only **fatty oil**, which is made in seven or eight days **in the sun** with **walnut oil** and **lead white** &~~with~~, stirring it often, or cooking it on the fire if one is in haste. Then, with the **oil** thus made fatty, grind a little **lead white**, **massicot** & **mine de plomb**^[112] *[illegible]*, at discretion, as much of one as of the other. **Minium** gives color to the **gold**. Next, with this, you make a layer of it evenly on your stamping, taking care not to fill the hollows. And once it is almost dry, lay the **gold leaf** on it with **cotton**. Such **gold** will hold up **in the rain** on houses & elsewhere. And if you have gilded with **tinsel**, color it with **smoke of partridge**^[113] or of yellow or red cloth, & it will be beautiful like fine **gold**. You can cover trunks, mirrors, valences & bedposts with colored **velvet** or **satin**, then apply the gilded stampings on top with **strong glue**.

sheets of copper or latten is made on engraved & carved service tree^[114] **wood**, if one wants to spend less. And next, the stamped object is colored with the aforesaid colors of **lake**, **verdet**, **azur d'esmail**, & tempered in **turpentine varnish**. But in the place you want to **azure**, lay down **fer blanc**, which is more appropriate for an **azure** background.

[115]

dragon's blood soaked in **eau-de-vie** carries its **mastic** or **glue** in itself, as do **sap green** & **saffron**.

Fish glue or isinglass and mouth glue

codfish skin, boiled rather than being salted. JOINERS glue their masterpieces with it and GUITAR MAKER [ILLEGIBLE] use it for delicate works. It wants to be strongly beaten, then soaked gently in barely boiling water.

Mouth glue is made of parchment scrapings and one uses it without fire, for glueing paper or similar things, wetting it with the mouth.

Margin Notes:

[LEFT-MIDDLE] One beats it and soaks it in in eau-de-vie of vinegar white wine for one night, then one melts it on a slow fire. Others soak it in eau-de-vie.

metals to wood & other things

touchstone & pumice stone as much of one as of the other & grind them together & mix with a hide glue stronger than that used for painting, & paint it on whatever you like. Once dry, rub this layer with any metal whatsoever, then burnish it.

Against windy colic

dozen dried common walnuts & throw them one after another into a good brazier where they may catch fire, & take them out with small pincers, and let them burn & flame well in the air, and extinguish them in a glass of good wine. Next, let the wine cool and strain it, & pour half of it, for six extinguished walnuts are for one dose. Excellent cure against the suffocation of the matrix.

For relieving the pain of G. [116]

half a lb of finely pulverized golden & yellow marcasite, half an ounce of storax, 4 lb of urine, incorporate everything well together, little by little, in a mortar, then boil all together quite thoroughly. But the pot needs to be well covered in order that the fumes do not exhale. Next distill the it is urine, imbibed & separated by inclination, in an alembic, well-luted &

covered with a **copper** helmet & soak a **linen** cloth with the said **water** & apply it lukewarm on the pain.

Against gonorrhea [117]

Aquæ FABRORUM antiquæ 1b i., **boli Armeniae** in **tel** tenuissimum pollinem redactæ ȝ.i., **mellis communis** ȝ.iii. coquantur ad **mellis** despumationem. Tum refrigerata colentur cum forti expressione & de colatura utatur per **injectionem**. [118]

gold on paper

fig tree milk then let it dry a little, next lay the **gold leaf**, & once quite dry, rub with a **linen** cloth and only the lettering will remain.

grenades and giving force to fireworks

powder ~~six times as much of~~ **quicksilver** and a sixth part of **quicksilver**.

[119]

lead ball as much as you can without melting it, and when it will be very hot, temper [120] it in the **strongest vinegar** that you can. And do this four or five times. Next, chop some **lard** very small & some **linen** also very finely, mix all together & use it as **wadding**, and by a little force & very precisely, force it into the **arquebus** or **pistol**. And before firing, **che** if possible, make it so that the ball is hot.

wall by night

wall as you know, put a **petard** [121] inside, charged with **powder**, which should be as if lying down, & the other upright, then plug the hole & give fire.

balas ruby

tripoli but like the others, but with marcasite powder & oil.

Or and argent moulu

fine gold with ♀ and then cleanse your amalgam well & make the said mercury fly off. Next grind it on marble with gum water. As for silver one needs to take it as is^[122] & eat away at it with aquafortis, then take it out with a copper blade & rinse it thoroughly and next grind it with gum water.

stones

wheels for doing this, one of tin, one of lead & one of fine copper. On the eu copper wheel only the diamond, the ruby, sapphire & oriental jacinth are commonly cut eo or polished. The tin wheel is for more tender stones like emerald, amethyst & others.

[illegible]ixture of PEWTERERS

fine tin they quite often mix a half of lead, which renders the tin deaf, to correct this, they mix in latten filings to render it sonorous.

grais^[123] you can & hollow it in the middle. Put in an eighth part of ♀, in & into this, while adding water, rub & wear down your ♂ or ☼ until the substance becomes like paste & even harder. Next, if you want, eat it away with good aquafortis, if it is ♂ or ♀. Then remelt it, having taken it out as you know. The ♂ will have a tint and, once melted, will leave some grains of ☼, & the ♀ will be very beautiful & will have almost no crust.

Plowman

millet is by nature very dry, HARVESTERS beat it most often *at night in the cool & by moonlight*. Which could not be done with another grain that is more humid, for one le must let the sunbeams pass through, and one scarcely beats it until the *sun is approaching midday*. Quickly after the millet is cut, one needs to plow the earth because the root eats it & makes it lean as much as if the millet was still standing. The ground where the millet has been sown diminishes much in its fertility & e, which one knows well *at the next sowing* that one makes after that. But above all the grain called pomole^[124] in Gascony or baillard in France,^[125] makes the earth shake seven years later, according to the common saying. Beans improve & correct the soil, provided that one lets the roots & stems rot in it.

Painter

feather. But the large paintbrush is best.

Merchant

tyrant, which is a formulary for APPRENTICES, by which they can know how much every item of merchandise costs & eo for how much it should be sold. The second is the waste book, where they put down in rough what they sell daily. The third is the sales book, where they reduce to clean copy and put the retail account of what is contained in the waste book. The fourth is the account book, which mentions the sale, the balanced account, the bill & the term of payment, & to this one l credence is given in court.

Painter

orpiment in a **glass** bottle on very **hot ashes**, but it would be more appropriate to sublimate **orpiment** in a long-necked matrass as for making **garnets**. The **orpiment** thus turns red like **red enamel** & one needs to first grind it moist because once completely melted it is very lively & difficult to grind. Next, one can *bri* thin it, once dry, with **oil** & it will make a deep yellow of heightened color. But to prevent **orpiment** from dying with the other colors & to render it compatible with these & to make it dry promptly, it is a secret held to be very rare to calcine **common salt** & to grind it in. **Vert de terre** is not used with **oil**.

Merchant

[126]The rule that **MERCHANTS** are accustomed to keep in their books, that is to say, the waste book, the sales book, and the ledger, otherwise called the account book.

François du Cros^[127] owes from 2nd September 1581 / for 1
cane of cambric at 8 livres per canne, I make this _____
_____ 8 lb t.^[128]

François du Cros owes from 2nd September 1581 / for 1 canne
of cambric at 8 livres per canne, as appears in the waste book
at c.^[129] 25

François du Cros owes from 2nd September 1581 / for the
merchandise taken by himself, as specified in detail in the sales
book no. 7 / at c. 55 / the sum of 8 livres / of which the said du
Cros has made a bill on the said day, to be paid on St. Andrew's
day^[130] next, I make this _____ 8 lb t.^[131]

Margin Notes:

[LEFT-MIDDLE]

Moved to the sales book at c. 25 /

[LEFT-MIDDLE]

Moved to the account book at c. 55 /

Counterfeit^[98] jasper

Thin glass for this effect is very beautiful.

horn from which one makes lanterns, quite thin, & underneath make the figure of your jasper, cornalines, & other stones, which will be a work more appropriate than on glass, which is too shiny. And the horn presents a luster & fatty polish like jasper.

horn, roses can be imitated. The horn colors for this jasper want to have a base with clear turpentine or spike lavender varnish. And colors matte in body are not so appropriate here, although they are very beautiful. One needs to oil the unpainted reverse with spike lavender oil.

Margin Notes:

[LEFT-MIDDLE] You can encrust beds with it & on the joints you can throw the filings of talc or of pins on the fresh cement of the said joints. One needs to join them with gum ammoniac soaked in vinegar. To better counterfeit mottled jasper, apply wool with thick hairs dyed in diverse colors & intermingled. After you have layered all the colors, scrape oblique lines on them, then layer gold & silver leaf. If you layer on the horn colors of turpentine, give it a base of silver or of tin leaf. You can also file horn & mix it with strong glue, & layer it onto the joints of the piece of horn, then even it with a joiner's plane.

Stil de grain yellow

Lyon from the juice of weld & chalk mixed together or better yet with ceruse, which is appropriate for distemper and oil.

Roses

[illegible] horn used for lanterns, or with scrapings of parchment, very clear & delicate & dyed & employed as you know.

Painters make it beautiful, making the first ground of common azur, or better yet *azur d'esmail*, & next they glaze it with lake, which will be more appropriate for this if you mix in alum, which gives it a violet tint depending on the quantity that you mix in.

Powder for hourglasses

lb of lead, melt it and skim and purify it from its filth, then pour into it four ȝ of finely pulverized common salt, and take good care that there be neither stones nor earth. And immediately after you have poured it, mix continuously very well with an iron until the lead and salt are well incorporated, and lift it immediately from the fire, stirring continuously. And if it seems too coarse, grind it on marble and pass it through a fine sieve. Then wash it so many times that the water *sembl* becomes clear, throwing away that little powder which will swim on it, renewing the water so many times that it stays entirely uniform.

oil on taffeta without the oil running

batture, which is made of well-cooked honey & turpentine of strong glue soaked for 24 hours in water then gently brought to boil so that it is hardly strong. Next stir in a little honey to soften it, & make it boil all together. And on top of this layer, which will soon be dry, you will be able to paint in oil, which will soften the layer even more, and which can also serve you to make a seat for gold. Alum water also keeps oil from running.

gold leaf on parchment or paper

starch glue & which does not show itself to have body. And make thereof six or five layers, & on the last, once it is half dried, apply your gold.

gold leaf applied to iron

dry horse dung.

ceruse

eggs, divide them in half & take the yolk out, & between the two halves of the white put a piece of **ceruse**, & tie them together with thread. Then boil in **clear water**, & it will become entirely black, & thus the **ceruse** will be left well purified. Some reheat it over fire & it becomes very white.

esmail d'azur in oil

common painters. Some take the most delicate they can & grind it with **ceruse**, which binds it, and next prick with an **awl** in several places the area they want to paint with **azur d'esmail**, in order that the **oil** enters & leaks in, & does not cause the **azure**, which in itself is heavy, to run. Others lay the panel flat & put down the **azure** on it, which is also done in distemper. The main thing is to grind it well on **marble**, and before that, to have washed it thoroughly. Some grind it ~~with~~ thoroughly with an **egg yolk** & then wash it in five or six **waters** and lay it on not with a **paintbrush**, which would be too soft, but with a brush thoroughly softened & crimped, & layering it thickly as if one were putting it down with a **trowel**; settling down it evens out and flattens. I have experienced that grinding **azur d'esmail** with **egg yolk** & next washing it in several **waters** is good. However, it loses a little of its vividness in the grinding of it. I have also washed it in several **waters** &, when it had settled a little, I removed the **water**, still ~~q~~ blue, with a **sponge** and squeezed it into another vessel ~~thus~~ where it settled, & from the residue I had the ash, flower, and subtlest part of the **azure**^[132] without grinding it, which is the best, for in the grinding of it, it loses some of its tint. Those who make it in **Germany** compound it like **enamel**, in large pieces which they pestle, & pass through several **sieves** & wash.

azures beautiful, they wash or soak them in a **rock water**, as they call it; it is a **water** distilled from mines where **azure** or **vert d'azur** is found, which distills naturally through the **veins of the mountain** or is distilled through an alembic **par** from mineral stones of **azure** or **copper**.

Azure ashes are only good for landscapes because they die in **oil**. Only true **azure** holds on. **Azur d'esmail** cannot be worked if it is too coarse. Try it, therefore, on the **fingernail** or the **oil palette**. If it **Filleable** happens to be sandy, do not grind it except with the **egg yolk** or, better yet, wash it in **clear water** & with a **sponge** remove the **colored water** after it starts to go to the bottom, and in this manner you will extract the very delicate flower, which will be easy to work with.

Damascus steel on knives

steel with common aquafortis, mixing the said water with earth [gap] & next rub the whole with ashes or sand & the gold & the silver will touch as on a touchstone.

For getting rid of the redness of eyes or bruising

raw mutton flesh, & with a head band, apply to the eyes *at night*.

or mat

furbishers to make a seat because it dries immediately & makes the gold appear very beautiful.

diamond points for engraving

stones & engraving, & when these points are fatty & cannot bite, one needs to rub them diamond against diamond. One rubs them with diamond pumice stone powder. One needs also to unpolish on a lead wheel either the stone or the glass on which you want to engrave, for the polish, which is like varnish on glass, prevents the diamond or sapphire from biting well. But This is why it does not bite easily on the nail, which is polished & fatty. But when the polish is taken off, it bites easily.

Polishing wheel of copper

stone on it, it is necessary to degrease *ter* it well, rubbing it with a piece of leather *en-tour* on the flesh side while spinning the wheel, if you have not worked on it in a *long time*.

sulfur

Sulfur is made beautiful mixed with soot black or with pulverized sanguine, which renders it harder and stronger. Having let it melt well until it becomes liquid, like oil, mix it with verdigris, and you *m* will very neatly cast in plaster a lizard or something else.

Margin Notes:

[LEFT-MIDDLE] One ought not to cast unless it is well cooled & unless it has lost all its pustules & bubbles, and has settled down well & become smooth like *fillegible* water. The **soot black** gives it a fine sheen & makes it neater. The most beautiful yellow **sulfur** must be used, for the greyish & lively one is not good. Do not cast **in wind** & **in cold**, for it would become porous.

Chimolée

terre chimolée, otherwise known as **FULLER's earth**, with which they dress the **cloth**, is excellent for molding hollow or in relief; & if you want to reheat it, it must first be warm, & reheat it on a gentle fire at a distance & little by little, otherwise it would crack. Put the figure to reheat in a pot in an **oven** or in a **covered oven**. It is very soft, neat & beautiful. You can make a hollow form of animals from **chimolée** & cast **lead** in it.

Margin Notes:

[LEFT-MIDDLE] The work needs to be dried for 4 or 5 **days** before you reheat it. When you mold & make a hollow form from **chimolée**, do not press suddenly, but gently, for it would crack.

Paper

sulfur or **cooked chimolée**, it is made very neatly. You can give it one or two layers of **white** with a border of **gold** to imitate **alabaster**. And after you have applied the **white**, you can burnish it with the tooth. But in order for it to be burnished, one needs to temper the **lead white** with **glaire of egg** & **peelings from the fig tree**. Or better, varnish your work with **white varnish**. Also, when you are molding with **paper**, as it starts to dry, burnish from the back with the tooth.

Plaster

mountains is greyer, and the one from the region of Albi is whiter. It must be cooked with a closed fire, such as a reverberatory furnace or BARBERS' ovens.^[133] And the most freshly cooked is the best to put to use. One needs to finely grind it on marble. After having prepared your hollow form from sulfur or something else, & having oiled it & enclosed it in a circle, temper not too thickly your plaster with water, & separate it well with your finger, and if it makes pustules, throw on top more powder of the said plaster & *fillegible* [illegible] grind it with the finger until +^[134]

Margin Notes:

[LEFT-MIDDLE] +^[135]

it makes no more pustules. Then cast & sprinkle once again with **plaster powder** & let it take well, then scrape the powder.

stucco promptly

brick or Armenian bole or sanguine & incorporate it with melted wax, & thus melted, cast like the others on a relief medal, & thus you will have a hollow form where you will be able to cast with **plaster**, pestled paper, or *terre chimolée*.

Margin Notes:

[LEFT-MIDDLE] Finely sieved **brick** is better, because the **bole** is too fatty.

yellow pearls

GOLDSMITHS' *bouteure*^[136] then, with **tripoli** & a piece of **leather**, sprinkled on the flesh side with the **powder of the said tripoli**, rub & polish the **pearl**.

enilanroc [137]

ceruse-colored crust which is on top is natural, others say that it is a secret of ANCIENT LAPIDARIES that is lost, others say that it is **refired enamel**. And by means of the said crust, several ciphers, letters, circles *st* & other bizarre things can be formed. As for the method, I have practiced it thus. Once I wished to give it a layer of **arsenic** ground on **marble**. However, I experimented without this, and I put the aforesaid thing, **enilanroc**, in a small **iron** casket on the fire of my **GOLDSMITH**'s forge with three or four small half-burnt **charcoals**, and blew only with my **mouth**. And nonetheless the thing came to **redden** & ignition & turned completely white, not only on its surface but also inside, & then I let it cool on its own **near the fire**, for otherwise, exposing it suddenly to cold air, it would have burst. Once all white, I passed it through my **lead**^[138] **tin** wheel, where I found it as hard as before, & uncovering the white a little, I found it a fair flesh color. Finally, I polished it & saw that it took a very beautiful polish & could paragon a very beautiful **agate** for cutting some beautiful face on it & bringing it on **the** a table of

agate of various color. But because this total whiteness did not respond to make this white crust on the surface that I was seeking, leaving the rest of the thing of its natural color, I made an opening in a **brick** of the exact size of the thing & put it inside. Then I reddened two GLASSWORKERS' solders, & as they were red, I presented them one after the other onto the surface of the thing until I had the white crust that I required, on which I made such drawing as I wanted, uncovering up to the red base with a **diamond** point, and I polished it with small **hog bristle** brushes and **tripoli**. I do not know if it would be better to reheat it under hot **ashes**, & if it would be good to encase it in **alabaster**, which is very cold, as I encased it in the **brick**.

arsenic

Sublimated arsenic, that is to say, the white one that is sold as **stone**, when ground on **marble**, mixed with **vermilion** or **lake** or **minium**, makes a beautiful flesh color that is always shiny. **Yellow arsenic** has a very beautiful color, the white one is good in **oil** and agrees well with the **lake**.

sal ammoniac & vitriol & boil them together. Then mix in lake or verdet & azure or similar, & dye. This will not come off unless the animal sheds. Non bona. [139]

stones

Engraved *tai* stones are not polished on a copper wheel, but with brushes and tripoli. Yet stones cut in facets and flat are polished on the aforesaid wheel.

Fine sieves of raw silk

tammy of raw silk on a loom, to make fine & delicate sieves. And for that effect, you must not choose raw silk whitened by sulfur smoke, which renders the silk *ehas* charged with a sticky vapor that would hold the flour & in the end would prevent it from

yellow raw & natural silk because it is stronger & casts out flour like horsehair.

cendrée^[140] of azure for oil

oil darkens it. Certain SOPHISTICATORS mix them, but you will know this if you pour some onto a piece of paper & press it & spread it with the finger since, if it is mixed, it will be found variegated & as if striped with a pale one & a darker one, but if it is unmixed it will be even & of one color.

pearls

soap water.

Toadstone

toad & has the figure of the **toad** painted naturally, as you have seen, is the most excellent. It is held that if one puts the powder of it on a brazier in the **chamber** of some persons *at night*, they will be neither able to move, nor speak, nor thwart **THIEVES**.

Snakes

snake in Greek, saying *OΦH OΦH*,^[141] it will flee. Likewise, if one *nom* calls a **swine** in Greek, *y ion*,^[142] it will come.

Candles

Candlemakers never make a good **candle** when the ***Autan wind***^[143] blows because the candle always tends to melt, however good the **tallow** they use for it.

earth and rustic construction^[144]

Swallows have taught us this craft, making their nests out of **mud** mixed with **wisps** & **stalks of hay or straw** to make it bond. Therefore, in places where **stone** & **brick** are lacking, one can use **earth** to make partitions & walls. And for this, **light earth**, which does not form clumps when plowed, but which is as if intermixed with **arene**, holds first rank, because it can be beaten & tamped down better. It is true that one needs to moisten it & *la* cut it into the shape of sods with a *ditch-spade*, and thus place & arrange it. This one lasts longer and there is not as much construction work, and **not** dryness does not make it crack & split. But, because such kinds of **earth** are not found everywhere, those who are on **good & fertile land**, after marking out with a measuring line the width & length of their foundations, drive ~~into the ground~~ in along the edges, on this side & that, long *eh* poles & or chevron beams to support boards between which they throw the **earth**, making each layer one **foot** thick or thereabouts, intermixing it as if **S.S.S**^[145] with **branches of heather** or similar things, then with beaters of three different forms they *tamp* it & beat it. One is called the **mallet**, which has a triangular form like A, and with this, one first *tamps* the **earth**. Next one uses one which is made of **blocks of wood** pointed at the tip & helved to a large stick, & this one is for pressing the **earth** well at the extremities and edges of the wall, which adhere to the boards, & is called.^[146]

bat, which is for flattening & beating the **earth** for the last time, as shown in .C.^[147] Then one makes another layer of **earth** & **heather** and beats it as was said, & continues thus until the wall is complete, which one covers with **heather** & then with **earth**. Some *m* intermix rows of **bricks** in the said wall. They also make the wall tapering, giving *a* width to the foundations according to how high one wants to raise the wall. Which, when old, whitens, & thereby shows that it has **salt peter** in it. That is why, when they fall down, **GUNPOWDER MAKERS** profit from them.

Margin Notes:

[LEFT-MIDDLE] A

[Figure: fig_p014r_1]

[148]

Damasked cloth

cloth with two different colors and imitate embroidery without adding anything to it, in this way. Once it is **dyed** yellow, pounce onto it such a pattern as will please you. Then you will baste some **string** or a thicker **cord** onto the pouncing and thrust it into a **dye of guesde woad or pastel woad** & it will become green, except that which is beneath~~ts~~^[149] the **string**, which will remain yellow because the **green dye** will not have penetrated there. And you can do thus with other colors, and instead of **cord** or **string**, add some pieces of **paltry cloth**, cut into moresque^[150] shapes, on top of the first color~~s~~. In that manner, you will have cheap embroidery.

frame with **sand**. And after having imprinted the work, one sprinkles it with **flour** in order to make the *e-metal*^[151] **copper** or **latten** run better. When the **sand** has been used for a month, it is necessary to take some new, because the one that was used, being reheated *in fire* +,^[134] dries out & loses its bond. However, it is used to mix among the new, for it makes the work not so porous. One casts large works such as **artillery**, bells & similar things in **earth**, & **copper** cast in **earth** makes less of a crust, and is whiter than the one cast in **sand**. The **earth** is **sandy clay** mixed with **horse dung** & **cloth waste**. That which *is* has been used for founding, which is black, cooked & as if burnt, is *east* mixed with **artificial sand**, & is very good. / To soften^[152] & make the **copper** run, throw in, once it is melted, a little **lead**, which does not form an alloy but is found on the surface of the cast.

Margin Notes:

[LEFT-MIDDLE] +^[135]
by the heat of molten metal

gold and silver

sand be from something very dry & arid & reheated well in the frame, because, if it were humid, like **FOUNDERS'** sand, the **gold** and **silver** would spatter, & cause damage. It is also necessary for the **earth** to drink the **metal**, for cast **gold** or **silver** *is* becomes very spongy. That is why it must be beaten again, otherwise it is frangible, as one sees in spoon handles.

boxwood inlaid with **ebony**, **sandalwood**, **ivory**, or **gold** and **silver** like **damascening**. Then one writes on it with silverpoint, and next erases it with a **cuttlefish bone** by rubbing them.

beryl or **crystal** round on one side & flat on the other, then one sets it with a little handle and one sets down the flat side on the letter.

bronze medal & you want to make it very light, make of it a hollow form of **lead**, then spread upon it some **thin plate of gold**, or **plates of lead** or ~~annealed~~ **annealed silver**, & set your **bronze medal** on top & strike with a **wooden mallet**.

horn

acou mount Agnus Dei^[153] & make circles from **horn** for certain little boxes soften *ladiete* the said circles by soaking them in **hot water** and next fashion them on a round or oval-shaped triblet.

Ears

defluxion^[154] occurs there, one needs to be very careful not to put anything inside, and according to the proverb,^[155] one ought only to touch the ear & the eye with the elbow. However, it is good to put on an affected ear musked cotton, that is to say, kept in **musk**, for it comforts quite well.

Toothache

clove of *garlic* in the *ear* which is on the side where the *tooth* is hurting, & within two or three *hours* they feel well because of it. Others put in the *nostril* which is on the side of the ailing *tooth* green skin scraped from the *e*^[156] small branch of *visaube*,^[157] namely the kind which is under the grey one which resembles a small branch.

soft iron

people consider that *iron*, once melted, cannot be melted again because they only heat it in small forges, in which it only becomes red-hot. *ALCHEMISTS* undertake to melt it mixed with *realgar* or *lead* or *orpiment*. But without all that, some have found a manner of *the* melting not only *brittle iron*, such as the kind used for *iron* pots, but also *soft iron* such as *d* that of pigs & ingots, which is the most difficult kind. And to this effect they make a furnace in this manner which has a width of one pan & a half & one pan & a half of a depth of two pans. And the *blast-pipe*, which is the barrel *through* marked A through which the *bellows'* pipes enter, has to^[158] be placed in the middle of the height of the furnace such that there is one pan of the mouth of the furnace above the *blast-pipe* & one pan underneath.

Margin Notes:

[LEFT-MIDDLE] Each pan of the mouth of the square furnace contains one & a half quintal, & the pan of the round furnace holds two quintals.

Margin Notes:

[LEFT-MIDDLE]

[Figure: fig_po16r_1]

[RIGHT-MIDDLE] The **MINERS**, to make the **iron** run, put at the mouth of the melt, two or three **handfuls** of **wallwort** when they want to make the melt run, and this renders the **iron** wonderfully ductile and flowing.

blast-pipe enters through to the middle of the mouth of the **furnace**, which is a principal part of the secret because the wind will hit the edge & the wall which makes up the belly of the **furnace** & by such means, it spreads equally everywhere & above, like the flame in a **reverberatory furnace**, & by such means heats much more; for if the wind were to hit directly from above, the substance which is melted or ready to be melted, it would cool it down & prevent it from running & melting. It is also necessary for the **bellows** to be driven by the leaping & running of **water** as in **forges**, because in this manner, the **bellows** run with measure & compass & with great speed, which the strength of **WORKERS** could *f* not do. Therefore one raises the wall as you see & the **furnace** on the surface of the ground at the edge of which you make a channel as with other founding, to put the **molds** of that which you want to cast & to do this, you unstop the opening that you had made at the bottom of the **furnace** to make the melted substance run. You will be able to melt two **quintals** of **iron** each time and to do this, you will choose the **biggest charcoal** you can find & put a load of it at the bottom, on the plane and surface of the **furnace** & with the bottom piling up **as if** to a point, up to the top of the wall

Margin Notes:

[LEFT-MIDDLE] Some make a **mold** of the caliber of the piece, & temper it, then beat a **soft iron** piece cut to size, & when this piece is very red, they beat it into the **mold** & round it off with a large file, considering these balls to be stronger than the melted ones which, being brittle, are more subject to breaking.

d three **pans** & ~~will reheat well the~~. But first, it is necessary that you have reheated your **furnace** ~~with~~ with a little of the big charcoal, such that the bottom is red hot and then you will put there the aforesaid load of **charcoals** in the middle of which you will put your **iron**, not all at once but ten or fifteen **lb** each time. And when this will be swallowed & at the bottom of the **furnace**, always put in as much again. And add three or four **shovels** of new charcoal which should be of the biggest kind and remoistened, in order that it may have more heat & not be consumed too soon. And when you see that your **furnace** is full of substance, around two

quintals, or less if you do not ~~of it~~ have that much, you will leave the charcoal to be consumed by itself. And when the charcoal is as it were reduced down to the level of the furnace, you will be able to pour into molds & iron or metal^[159] shells, which is even better because one iron attaches to the other. And it is necessary that the inside of the mold be well ashed with tempered ashes, in order that it does not adhere to it.

Against Go. [160]

quince seeds in clear water & of this mucilaginous water make an injection.

For removing fine hair from the forehead

needle's worth of fine silk & pass it tightly across the places with the hair & it will attach to the silk like fine cotton^[161] wisps.

Silk

Crimson is more abundant than all other silks because its color does not charge^[162] as do blue & green, which are also more profitable for the WORKER. Black is less abundant because it charges much.

oranges

well closed and tin vessel with them & they will keep six months.

Candles

bran which makes them white & long-lasting, so say some. I believe, however, that it is enough to keep them in a cool & dry place, in such manner that they are not pressed together. It is better if there is a hemp thread throughout the wick, which gives it more light & makes the wick hold up straighter. Otherwise, if it is all of cotton, as those of Montauban make, it is necessary to snuff it out often, for after it has burnt *il* a little, the cotton droops & makes the candle drip.

gunner

cannon fires at point-blank from five to six hundred paces. But not for battering, in which it can only perform well from two hundred paces, or three hundred *paces* at the most, and it should not be any farther. Its ball commonly weighs 40 lb of the KING's caliber. There is a **cannon-perrier**, which weighs xxv quintals, which are **small, short cannons**. It is for fighting the **ditch casemates** & for battering at close range. It bears a large ball of the KING's caliber like the others, namely of 40 lb. It bears in the breech only the width of two balls & a quarter of a ball. The front only bears the width of one ball & a third of a ball. Its charge is similar to those of bigger ones, namely xx 1b. And for this reason, when one wants to try them *Filleable*, one ought not to over-charge it, for this damages the **piece**. And for the first time & until it has fired five or six *pieees* shots, it is better not to give its complete charge, for the **piece** is still proving itself. And the test that one can do is to give it a charge of xx 1b of **fine arquebus powder** instead of **ordinary cannon powder**. And four good **horses** are sufficient to drag them. They are easy, & close up they have as much force as the big ones, especially for **private houses** & **small towns** & **fortresses of little importance**. They are no more subject to bursting than the others because they are short. For that which gives great strength to the **powder** & puts the **piece** in danger of bursting is the length of the **piece**, because the **powder** is burned entirely before exiting, & **the** its impetuosity is held constrained for *longer* in a **small long piece** than a *gr* short one. The **cannon-perrier** is commonly seven to eight pans long. It is true that this is a pan of **Montpellier** & not a KING's pan, which is not used in the founding of **cannons** for making them good. For the pan of **Montpellier** being *of* shorter, the **cannons** *more* proportioned there are shorter also, & compensate in thickness *ee* the length that they would have by the KING's pan, by which measure they will be found longer. But also they would be thinner. The e^[163] great *eano* strength of the **cannon-perrier** for making a battery is 4^{xx}^[164] paces.

Margin Notes:

[LEFT-TOP] The **double canon**

[LEFT-MIDDLE] The **great cannon**, because of the weight of its ball, carries a range of only a thousand or xii hundred paces without landing, & bouncing, it commonly bounces iii times.

[LEFT-MIDDLE] The **cannon-perrier** does not have a large effect if not close.

[LEFT-MIDDLE] One recognizes the good alloy of a **piece** by seeing it. For if, with the greenness which they expel on the surface, they redden, that is to say that they are composed of a sufficient quantity of **rosette**. If not, they are only of **metal**,^[159] which shows up whitish. If they themselves do not make this demonstration, scratch & you will see.

[LEFT-MIDDLE] The good alloy for **pieces** is of three parts of **rosette** & one of the fine metal of ~~la~~ large bells, where there is more **rosette** than in the **metal** of small bells. The **metal** commonly costs xv 1b & **fine rosette** xv or xvi.

[LEFT-MIDDLE] The pan of **Montpellier** is equivalent to six of the KING's inches, which contains in it two common ones.

[LEFT-BOTTOM] It is necessary, for a mounting a **piece** well, that it be as high at the side of the mouth as at the breech. Otherwise, one does not mount well.

cannon, which is for great batteries,^[165] commonly weighs fifty-five or lx quintals. At the breech it carries the thickness of ~~b~~ two balls & one ~~of~~^[166] the three parts of one ball. At the front, it carries ~~ba~~ the thickness of one ball & ~~two~~ two of the three parts. It is thirteen or fourteen pans long. But they are very troublesome to drive. The head-on battery, to accomplish its task quickly ~~is~~ & batter with great force, is at ~~a~~ one-hundred fifty paces & at two hundred. And It is true that one batters well from three or 4 hundred paces, but it is necessary to give it more **powder**. Its common load is ~~p~~ of xx 1b of **powder**, its ball of 40 1b. One needs xxv **horses** to draw it. When one fires it farther than its usual range, one puts in a half **ladle** of **cannon powder** more. A **cannon** can fire 4^{xx}^[164] or a hundred shots per **day**, but one needs to refresh it every time after one has fired ~~di~~ nine or ten shots, if the battery is steadily continued. For if there is a break, it is not necessary to refresh it as often. For two quintals of **copper**, or two quintals & a half if it is for large **cannons**, one puts one quintal of **metal**.^[159] #^[134] The **metal** is composed at the beginning of eight 1b of **tin** for one quintal of **rosette**, while for large bells one only puts six 1b of **fine tin** for one quintal of **rosette**, to give it a *bigger voice*. For the more **tin** there is, the clearer the **sound** is. Its For **gun** founding, if one provides the material & **charcoal**, as one commonly does, for **MASTERS** do not have the means, one gives x to xii 1b per quintal. And for the mat when the **MASTER** provides everything, one gives him 40 1b, according to the KING's ordinance, per quintal for **large pieces** & such as **cannons**, and for **small pieces**, L 1b. For the more material there is, the more profit the **MASTER** has of it. One finds another kind of **cannon-perriers** of xxx quintals which are longer than the others, and easily eight pans

long, & they are for battering defenses & **casemates**, ~~s~~ placing them via trenches on the edge of the ditch *by night*.

Margin Notes:

[LEFT-MIDDLE] ○

On each side of the opening of the breech they give the thickness of half a ball. And then they also add on each side the third part of a ball.

[LEFT-MIDDLE] *Atm*

One gives it two **ladles** of **cannon powder** for its charge, & one & a half of **arquebus powder**, & the same for the others.

[LEFT-MIDDLE] #^[135]

The composition of **cannons** of **France** is of one quintal of **metal** for two of **rosette**. But those^[167] of **Toulouse** & **Poncet**^[168] puts iii of **rosette** & one of **metal**.

[LEFT-MIDDLE] The **rosette** for re-melting is more profitable than cauldrons, which turn entirely into **filth**.

[LEFT-MIDDLE] **Old pieces** are composed of almost *de dem* as much of one as of the other, namely one part of **rosette** & one of **metal**. One recognizes this composition with a burin. For its substance is found to be brittle & the particle taken from the burin is found to be mixed with yellow & white.

Large culverins ~~are~~ for battery & piercing are forty quintals & eighteen pans long. Their ball, of the **KING**'s caliber & for battery, is 30 lb and thus lighter than that of the **cannon**. And thus, it does not carry so much ammunition for fifteen lb suffices for its charge. The **cannon** makes a bigger opening due to the size of its ball, but the **culverin** hits more fiercely & propels faster, having greater force due to its length. At the breech it carries the thickness of two of its balls & ~~esthe~~^[169] ~~the~~ ~~three~~ ~~third parts~~ of a ball, at the front the thickness of one ball & two thirds. **Culverins** serve to batter defenses from afar when one cannot easily make an approach, and **cannons** approach more closely. They also serve to support the battery. One needs fifteen or sixteen **horses** for moving it. They are *tout* of the same alloy as the **cannon**, as are all **pieces** ~~that exceed~~ ~~smaller~~ than average, for to these, one adds a little more **metal**^[159] in order that the melt runs better. And for two

quintals of **rosette**, one adds six twenties 1b of **metal** for the smaller pieces. They shoot 8 or 9 hundred paces at point-blank, & up to a thousand paces if the **powder** is strong, & half a league at range.

Margin Notes:

[LEFT-MIDDLE] Some invented the loading of **cannons** with cartouches.

[LEFT-MIDDLE] Some *pe* do not put the **powder** in the **cannon** all in one go but in two & ramming each time, saying that each ramming raises & gives a further **thumb**'s breadth. But this is not certain for **large pieces** which are loaded with a lot of **powder**.

bastarde, which is a **culverin** middle-sized^[170] piece, weighs thirty quintals and its ball weighs ~~xx lb~~ xv 1b and carries as its charge x or xii 1b of **powder**. Its proportion is at the breech the thickness of two of its balls & the^{es}^[169] ~~three~~ird parts of a ball. At the front, the thickness of a ball & two of three parts. ~~or~~ They serve to batter defences of little importance such as **gabions** and **garrets topped with a tower** & similar things. It is thirteen or xiii pans long like the **large cannon**. Ten horses can move it. It accompanies well the **large culverin** for point-blank because it carries small ammunition.

bastard culverin weighs 35 quintals & is xxv pans long. It carries three balls at the breech & two in front. Its ball is like that of the **bastarde** piece, weighing xv 1b. These are **pleasure pieces** which *s* cannot be moved by carriage, but are for **city** defences. Some make these xxvii or xxviii pans long, like the Cow of **La Rochelle**. But to such **pieces** one gives reinforcement at the breech as of three balls. At range, they can shoot around one league, & a half league at point-blank. Its charge is like the **bastarde**. And if one wants to fire at some **CAVALRY** quite far off, one increases the **powder** a little. A tail of **smoke** follows the ball which *de* guides your sight *e* to where the ball is going. This goes for the **cannon** and for the **culverin**, and not for **small pieces**.

Margin Notes:

[LEFT-MIDDLE] Some give it the thickness of three balls at the breech & at the front of two balls.

quintals & measures xii pans long. Its ball weighs eight or 9 lb & its charge is six pounds of powder. And for At the breech it carries a thickness of three balls, & in front, two. It is more appropriate for the defense of a city than for battery. However, one takes it sometimes either to break a barricade or to support the battery after the cannons have fired, in order to prevent the assailed from re-fortifying after the cannons have played or fired. Four horses can draw it. It shoots eight or nine hundred paces at point-blank & almost as much as the *bastarde*.

field piece weighs ten or twelve quintals & is ten pans long or 12. Its ball weighs vi or vii lb & its charge is 4 lb of powder. At the breech it has three balls & two in front, as do all pieces that are smaller than the average. One gives them more of a breech because one makes them longer in proportion, and also because in a house or elsewhere one fires them more frequently than the large pieces. Their caliber is also small, which makes the breech 3 balls thick. They are used for following a camp promptly & for the defense of cities & houses, putting them on the walls or on a tower. One needs three good horses for drawing it.

passe-volant weighs vi quintals, is eight or nine pans long. Its ball weighs two lb, &, for its charge, a lb & a half of powder. At the breech it has three balls & two in the front. Two horses can move it, for a single horse does not begin to move a piece. It is used for the defense of houses, or for taking among the INFANTRY to break a rank of CAVALRY.

quintals, is x pans long. Its ball weighs one lb & a quarter, its charge is half a lb of powder. At the breech three balls, at the front, two. To move it, two horses, although such pieces are hardly moved insofar as they only serve to defend houses. The ones which are carted around either for battery or for siege combat, are cannons, culverins, medium-sized *bastardes* & field

Margin Notes:

[LEFT-MIDDLE] To cannons & large pieces one gives ~~n~~ as much powder as is the diameter of a ball & a half, at which point the escutcheon^[171] sits. To medium pieces, such as field pieces, & smaller ones, one gives them powder the thickness of two balls. To the passe-volant & other smaller ones, one gives them powder the thickness of three balls. In general, one charges all pieces up to the escutcheon. One charges with the ladle all pieces from the cannon to the piece of four quintals *de char*, and one gives them two ladles of cannon powder or one & a half of arquebus powder. To smaller ones, one only gives one ladle, & those of one quintal are charged with a small charge.

pieces. The falconet is loaded with a ladle, and one commonly gives it only one ladle. There are also other falconets weighing three quintals, and which are nine pans long. Their ball weighs half a lb. Their charge is a quarter of powder. It is loaded either with a ladle, but more commonly with a charge. At the breech, 3 balls, & 2 in front. To the small pieces which are under 3 quintals one gives them at least 3 balls & a twelfth part of a ball at the breech, & sometimes takes away from the front to make this addition to the breech, according to the length one gives them.

double musket weighs 2 quintals, is seven pans long, carries a ball of a quarter of a lb or a little less. At the breech 3 balls, two in front. One loads it with as much powder as ball, up to the top of the escutcheon,^[171] which in these small pieces can amount to 3 or 4 balls of arquebus powder. For if one uses cannon powder, one can load it to a thickness of ~~ε~~ five balls.

simple musket weighs one quintal, is six pans long. ~~carries a ball weighing [illegible] qu~~ One has no consideration for those which are under two quintals, which readily carry lead balls ~~un~~ of the weight of the ball, but of the caliber. However, those which can receive balls of metal^[159] or iron do better because they will penetrate more than six lead ones. Its charge is up to the escutcheon, namely the thickness of 4 balls.

Arquebus à croc weighs lx 1b, that is to say the large one is five pans long, its charge is up to the escutcheon, namely the length of 4 balls, it carries lead balls, and is for the defence of houses. Of these *arquebus à croc*, both the large & the small ones, one makes orgues which are ~~or~~ appropriate for an assault, both outside & inside the place. They are founded separately as if to serve for uses other than orgues. See the 4th leaf following, marked

[Figure: fig_po19r_1]

[173]

Margin Notes:

[LEFT-MIDDLE] The strength of the **piece** is at the level of the trunnion, which is the point of departure of the lit **powder**.

[LEFT-MIDDLE] The strength of the *berche*,^[172] & at the back of the breech.

[LEFT-MIDDLE] One needs to understand all of this as **iron** balls. When one shoots a **metal** ball, one over-charges by a quarter **ladle** because if a **cannon** ball weighs 40 lb, the **metal** one weighs 1x lb. One also takes the gun-sight higher when shooting a **metal** ball. For if one shoots an **iron** iron ball point-blank, one takes six lines higher when shooting **metal** balls. A **metal** ball **makes** alloyed with **copper**, in order that it is not frangible, is more effective hitting at close range than that of **iron**. But the **iron** one hits more fiercely from afar.

ruler and compass

quill & or else with the **nail of your right thumb** & the bent **big finger**. If you do not have a ruler, fold **paper** in two five or six times to use it. And if you want to draw a column, arch, oval, escutcheon correctly without a compass, fold your **paper** such that the fold **e** gives you a straight line, at the **required distance** from which, trace a point &a or a line & saturate it well with **ink**. Then fold again the **paper** & rub it on the back &

[Figure: fig_po19v_1]

it will print however much you have made. In that way **the l**, A is the line without **ink** which the **paper** fold gives you, B is the line you have traced, C is the one which is printed.

[Figure: fig_po19v_2]

[Figure: fig_po19v_3]

[Figure: fig_po19v_4]

[174]

well-gummed ink on as many little **cards** as you want *{illegible}* to write words. & once each letter is well saturated with **ink**, put it down on your **paper** & rub with a tooth the back of the **card**.

Clysters^[175]

leather sleeves or bags, which for the best result *is* must be of cat skin which is more mitten-like than any other. And then one would start to fold back the sleeve on one side & one would continue to fold it back & twist it around itself & in that way the clyster would run gently. But this manner takes longer & is less convenient than the syringe which has been discovered since, with which a man alone easily gives a clyster. It is true that it always causes wind at the end.

[176]For making **millas**

[Figure: fig_po20r_1]

millet pilled to remove the **husks** and then you will clean it well. Next one needs to grind it again quite finely and pass it through a *hair sieve* quite finely. This done, it is necessary to mix the **flour** with **melted fresh butter** and **milk**, and that there be as much of one as the other, in such a manner that it is very light in color, like the **dough to make fritters**. And you

will put in **egg yolks** according to the quantity of **flour**, so that it amounts to two **egg yolks** for each **millas**. Then you will put in some **saffron**, if you like, to give them a little color.

molds, and it is necessary that they be **earthenware**, in the fashion of the crown of a catholic hat, but it is necessary that they be open at both ends. And then, having made a good fire, you will clean the place in the **hearth** where you want to put your **millas**, and then you will take your **molds** and grease them quite heavily in order that the **dough** does not stick when it is cooked. Having done that, you will put your said **molds** on the well-cleaned place in the **hearth** and will put a little **flour** at the bottom and fill them with the aforementioned **dough**. Next you will cover the said **molds** with **lids** which will be made like the **molds**, but it is necessary that they be larger and not be open at the top. Then having done that, you will put a little **hay** on the said **lids** and plenty of **embers**, and make a good charcoal fire all around. That done, you will uncover one of them soon thereafter and see when it is cooked. It should be hard.

Glassworker

Glass from **Lorraine** is smoother & more even than **plate glass** and it is sturdier & more durable. But commonly it is stained by veins, in straight lines as if tanned, which happens because the **GLASSMAKERS**, having made it, put it when totally hot on **straw**, which stains it in this way. However, this is removed with **varnish** & **salt** & other **drugs** that the **GLASSWORKERS** put on. **Glass from Lorraine** is sold by the bundle^[177] & each bundle is composed of three tablets. The bundle costs usually x **sous**. **Plate glass** is ~~sold in~~ made in **France**, it is whiter & clearer, but alternately it is not so durable as that from **Lorraine**. It is also commonly blown & in that case, it is better to make little diamonds rather than large square pieces in the shape of a frame, because they cannot be set quite evenly.

Margin Notes:

[LEFT-MIDDLE] **Plate glass** is sold by **paniers**. Every **panier** contains 24 **plates** that are commonly sold at x or twelve **lb**.

For whitening the face

puffball in cistern water, & no other, & wash with this whitened water. This is considered quite singular. And I believe that making it from wheat starch & to use it would be even better.

Against winds, colic, &c

Sap squeezed or water *fillegible* distilled from orange peel is excellent against the windy colic. Candied peel, too, is excellent for the winds of the belly. And to make a trial of it, having poured foaming wine in a glass, squeeze orange juice on the wine foam, which proceeds only from vapor & wind, and you will see that the foam will immediately disappear. Also, if you squeeze juice against a candle it will burn all the brighter.

Skirret root

in a very humid place where with such a rodier well or fountain one can water it often, for by this means they are tender. Otherwise a hard heart forms inside, which takes from it all its goodness.

Against burn

onion with verjuice & leave it to soak like this, then apply it. Or else, apply black soap on the burn. Experimented.

Rodez, church of Albi, bells of Mende. However, one holds the bell of Toulouse named Cardaillac^[178] as one of the most beautiful in France, all the more since it weighs two hundred and fifty quintals.

A form of regimen

Every morning, take two or three eggs laid one or two days ago. Heat them until & do not cook them. Take the centers well dusted with sugar. And next drink one finger of wine. And apart from being nourishing, it makes a good stomach.

Gunner

cannons which are not loaded with a ladle, one charges them with powder up to the escutcheon,^[171] which is placed on the piece with due proportion.

cannon, that is to say to take its aim, one needs to take the sight, that is to say aim, from the sides before the top, that is to say above the cannon. For by aiming along the top, you will be better able to find the line tending to your target, but you would not find out if the cannon tends more to one side than the other. Therefore take your sight on one side, then on the other & adjust your piece to the point at which you aim. Then take your sight from the top of the breech, which will be done quickly. Next, lower your piece a little at your discretion if you are within true range, because the force of the powder usually makes it rise. But if you were farther away than your piece shoots at point-blank, you would need to consider that the weight of the ball would make it lower.

cannon at night

pieces loaded and from the day. Then, in order that the GUNNER can fire into the breach where the assailed are perhaps making repairs, the besiegers raise a false alarm in order that the besieged throw torches & artificial fire into the moats or around the breach, at which the GUNNER aims. Sometimes, by using the reflection of mirrors or flasks full of water, the assailants light up the breach. The method you know, with a quadrant & plumb line, is very

good. Others nail two or three rows of boards with **strong iron pegs** on the **wooden** platform made for mounting the **cannon**, and leave empty notches into which the wheels of the **cannon** can just fit. And by such means you will always *te* place it at a similar *q* point, that it will not incline more to the right than to the left. And in order that it be neither too high nor too low, when you fire during the day, you place a **ruler** fixed well in the ground, which comes just to touch the the bottom of the edge of the **cannon** after it has been pointed & adjusted for firing.

Margin Notes:

[LEFT-MIDDLE] If the platform, the wheels, or the wedges break or are disturbed, this invention is of no profit.

equally as far from the edge *and of*^[179] the muzzle of the **cannon** as the other. And underneath they place the above-mentioned **ruler**. Then when they want to fire at night, they push their **cannon** straight toward the above-mentioned **ruler** & make it so that the edge of the mouth rests on the end of the aforesaid **ruler**. Next, they measure with a **ruler** or similar thing cut to measure, from one pole to the side of the **cannon** & if it is too close or too far from it, they adjust it & do thus from the side of the other pole.

cannon

cannon is loaded & give fire through the mouth of the **cannon**. But it is to be believed that the fire would sooner exit that way than going to seek its exit through its usual touch-hole which is spiked & constrained. The most reliable way is that the **GUNNER**, who is often a **FOUNDER**, wedges & thoroughly rivets the **nail** that the enemies placed, and with a **trepan** makes *at the* **side** another touch-hole next to the one which has been spiked, which will be done in an hour. And if with time the violence of the **powder** loosens the **nail** with which the **piece** is spiked, you will make a **thread** in the second touch-hole & place a **screw** in it quite perfectly which will never come undone. *M*

petards^[121] placed at the entryway at the time of the assault. They carry a lot of ammunition. *be* One fills them with **cart nails, large steel dice, bits of chain & similar things.** And when one senses that the enemies are close, one sets fire to all. **Grenades**, too, well-made and aptly thrown, cause great damage. And to make them worse, one puts **coarsely pestling pestled glass** either in the molds or in the *crucible*, when one wants to cast them; this worsens the **wounds**. The **grenades** ought not to be too brittle. But it is good that they be somewhat alloyed with the **substance of the pieces** in order that, holding the blast a little rather than breaking, they have more violence.

Cannon ball, weighing

40 lb, having 12 lines,
king's foot

[Figure: fig_p022r_1]

Margin Notes:

[TOP] A little too big, see the one *of* that follows.

Orgues

g^[181] another & one makes notches on the board this way

[Figure: fig_p022v_2]

& through these notches one passes the hook of the **arquebus** which has a hole through which one passes **iron** pegs from under the board. Then, when one wants to aim it, one mounts the middle one & that on both sides. If you want to make a double row, or triple or quadruple or more, you need only place a similar row of boards like the first, one on the other. **For the other** This kind of **orgues** penetrates & is quite stable. For the other ones which are made of one piece like a solid square have **cannons** only **three four** one pan & a half long. Also, they only serve for making a salvo at an entry or for defending a door.

arquebus à croc weighs 40 lb, is four pans long, is loaded up to the escutcheon,^[171] has three balls at the breech & two in front.

double cannon is no different from the **large ordinary cannon**, except that it carries *fillegible* its ball *fillegible* which has one line^[182] of thickness, or of diameter, more. The line is a twelfth part of the ball of the **cannon**. At the breech, it has one line of thickness more than the **cannon**, & half at the front. Its charge is six or seven lb of **powder**, more than a **cannon**, namely by two big **ladles**. Its ball weighs 56 lb. One needs thirty **horses** to draw it. It makes much more of a fracas at the wall than the **cannon**. But it is very troublesome to draw. It is for this reason that one hardly uses it today, and it is more for moving to some nearby place & battering at close range or for an entry, than for ordinary business. One calls^[183] them **basilics**, and they are **pieces** made for pleasure.

Margin Notes:

[LEFT-MIDDLE]

[Figure: fig_po22v_1]

[180]

On petards

[184]

petard^[121] is made which weighs three quintals, carries a cannonball flat on the side on which it must exit & round on the inside of the **cannon**, as if it were a cannonball cut in half. It is two pans long. It is charged with xxv lb of **powder** for **at** it needs to be full up to the mouth

& it needs to burst. It does not have a different thickness at the breech than at the mouth & is all of one piece. Its substance needs to be better than that of **pieces**, & for 4 **quintals** of **fine copper** there ought to be only one quintal of **metal** in order that it holds the blast, &, bursting with more force, has a greater effect. It is for putting against a door with a large **iron cross** in front of the ball, and **sonce** loaded, it needs to be covered with a well-sewn **thick canvas** which should be anointed **e** all over with **turpentine**. It needs to have four handles, made while it is founded, for it **is** thus easier to place. The **iron cross** is joined to the mouth with the **canvas** with which it is covered. **To place it, it** The handles must be kept at the edge of its muzzle, as you see. To place it, one needs three or four **iron pegs** one pan long & as thick as a **finger** which should have their point like a **wimble**^[185] gimlet, & the entire leg as a **screw**, like an **auger**, & a ring on the other end to turn them with a short stick which has play within the ring. And the **pegs** are placed in the door **but** not straight **but** for they would not have any strength, but at an angle as if you wanted to fix them toward the middle of the **petard**, and to do this, the hole of the handles needs to be quite large. In this way, the firing **petard** pushes the **pegs** along & across into the door & makes more of a breach. Once it is placed, you need to have a **buckram** sausage^[186] made in this manner: take eight or nine canes of **buckram strip** or more if the ditch is larger, and let the strip be four or five **fingers** wide. Have it well sewn in such a way that it is like a gut through **which**^[187] a stick as thick as a **finger** can pass. Fill it completely with good

[Figure: fig_po23r_1]

Margin Notes:

[LEFT-MIDDLE] This one is for putting below an undermined tower with the muzzle pointing up. One makes two large **iron rings** & with a **bar** or two, four men carry it. They are also used for putting in breaches but here one needs only half a charge, namely x 1b, & to fill it with **flint stones** & **cart flint stones**

[LEFT-MIDDLE] One needs to cover it entirely with **waxed canvas** & rubbed with **turpentine** & **combustible things**. This cover is made in order to secure the ball, such that it does not fall and in order that when the fire takes to the cover, the **primer powder** does not fail. Precisely at the fuse, you will need to put in a good quantity of **primer powder**. Some put a cross of **iron** on the ball which exptends beyond the mouth of the **petard** by two pans. Others only put the ball.

powder. When the sausage is full, dip it **well in** lightly, to wet the **canvas** & not the **powder**, in two parts of **vinegar** & **of** one of **eau-de-vie**. Next, let the said **canvas** dry well, and then one needs to join to the said sausage a long **string** or **cord** which should be two times longer than the sausage, & one ought not to tighten it to the sausage but only to bind it to it at both ends & to sew it on the sausage in a few places in the middle. Next one needs to anoint the entire sausage with **very good turpentine**.

petard^[121] for giving fire, you can sew **a** or tightly attach a **large strip of canvas** one empan wide which should also be well soaked in **turpentine**; & this strip must be split in the middle in order to wrap & tie it around the **petard**, and one needs to attach it in such a way that ~~the touch-hole should be close to the me the~~ the tip of the sausage, which should be open, should be joined to the touch-hole of the **petard**. Then one needs to put a lot of tightly-pressed **powder** onto the touch-hole of the **petard**. And next, the one outside the ditch needs to pull the **thread** & **cord** that is joined to the sausage until it is moderately extended, but not so much that it is detached~~sen~~. And if there was **water** in the ditch, one would need to support the sausage with **forks**. Then, the one who holds the end of the sausage will be able to give fire, having gotten himself to safety, & the others also.

Margin Notes:

[LEFT-MIDDLE]

[Figure: fig_po23v_1]

On petards

Petards that one wants to place on doors or iron grates are sufficient if they weigh 40 or 50 lb. Moreover, as for its charge, ball, & fashion of proceeding, one needs to do all as is already said above, concerning the one of 3 quintals. One man can carry it.

a half ball a half of a cut ball. It is also necessary that the cross is held to the ball and that it, when the ball is founded if you make it from metal, is bound up with the middle of the cross.

Grenades

Grenades must be made from the finest metal^[159] one can find, for there is fine metal and crude metal. Fine metal is that of a large bell, because one puts in more copper to give it a bigger voice, & for small bells one puts more tin to give it a bigger clearer sound. The metal of a large bell is made one^[188] with 3 quintals of rosette & twenty or xxv lb of tin. *Tan* Each grenade must weigh four to six lb. And in order to throw them, it is necessary that they be full of powder mixed with coarsely pestled glass. And for a quarter lb of powder, one needs half an ounce of glass which is put with it, in order that on the face or places where the powder will have its effect, the wounds will be all the worse for it. The best arquebus powder is required here. The hole needs to be as large as the thickness of a swan's quill, & you need not bother to make it threaded, but it is enough to make it even. Next, you make a well-soldered pipe of fer blanc,^[189] which can enter into the hole & enter into the middle of the grenade & which comes out of it by the width of one finger. You will fill it with good powder, pestled in a mortar & lightly mixed with good eau-de-vie or strong vinegar which seems. *And when* This is done to temper the powder. And to know if it will be slow enough to allow leisure to throw the grenade without danger, try this powder thus bathed in another pipe. You can keep *et* your loaded grenades in a very dry place, & on the contrary you shall keep your pipes filled with that bathed and well-compressed powder in a humid place. And nonetheless, you shall have some already inserted into the some grenades, to be always provisioned. And every three days you shall change them if you recognize that they have become too dry. To throw your grenade, take it bravely & in one hand & with the other give fire to your pipe with the a match,^[190] & throw it promptly amidst the powder troops. The thickness of the grenade^[191] should be twice the back edge of a knife.

cannon over land

If you have To bring a **cannon**, one needs a hundred **PIONEERS** or more to flatten the tracks by levelling ditches & others obstacles, such as **trees**, **stone** mounds & similar things to make gabions on the way. Once one is close to the place one wants to batter, the **GUNNER** goes *at night* to reconnoiter the most convenient place to mount the battery

Margin Notes:

[LEFT-MIDDLE] Know the magazines of **France** for the **artillery**.^[192]

[LEFT-MIDDLE] It is good if the platform is slightly inclined toward the front because the **piece** is more quickly mounted for battery & holds the blast better & batters more fiercely.

torches. Very often, one batters where it is strongest because the assailed, disdaining the battery, do not make repairs there. Commonly, there are not many garrets & other defenses in that place. And when one has made a breach at the strongest part & the **cannon** removed, it will surprise the assailed. One approaches **fortified towns** *at night*, but to **poorly fortified towns**, **PIONEERS** bring gabions and **earry** once these are placed, one puts some boards or planks behind the gabions to keep the **PIONEERS** safe, while behind, they fill the gabions with some **earth** by means of their shovels. And while one does this, one raises some false alarm on another side. And before, one has

Fowlers

Margin Notes:

[LEFT-TOP] are those which have a reinforcement inside, in the entire space which contains the **powder**, and the ball can only *a* roll up to the opening of the said chamber. These do not penetrate so much & are irritating to load but they do not heat up as quickly.

~~The gabions~~ The PIONEERS carry the boards to make a level ground or a platform of four fingers or half a foot thick, and one sets them into the earth. The platform is five or six ~~canoe~~ feet larger than the wheels of the cannon on each side ~~m~~ if there is only one cannon. But if there are more, the platforms touch. The distance which is between the pieces is the width of two gabions. As long as the battery lasts, the GUNNERS sleep & eat close to a cannon. In small spaces, one does not bother to dig trenches to reach the pieces but one puts plenty of gabions that are high & goes running to them. In large

A steel touch-hole

Margin Notes:

[LEFT-TOP] is put in the cannons in the manner of a screw so it will not be damaged during firing like the others very quickly will be. But these screws are prone to blow off & cause damage to the GUNNER. There is nothing for it but to use a proper touch-hole.

some some companions-in-arms on guard duty to defend the pieces. One keeps the small powder magazine, of three or four kegs, separately,

Margin Notes:

[LEFT-TOP] of the breach is the best because in ~~in~~ this way the cannon hardly pushes back.

paces away from the battery & one surrounds them with barricades or trenches. And there one goes to get powder in bags or frails. And each piece has its own frail for loading three or four times. Then, when the cannon is set on the platform, one puts a board that is proof of an arquebus between two gabions. Then a GUNNER loads it with a ladle, & with the rammer which is at ~~len~~ the other end of the ladle, two men ram the powder as much as they can, in nine or ten pushes, until they find the powder to be hard & well-compacted. Next, another puts hay or straw and the ~~r~~ others ram a little. Another puts the ball and the hay-bearer puts in as much

of it as before & one rams a little. Some put wooden bungs but this runs the risk of making the piece burst. And where one has to fire many eannon shots, one would need many bungs, which would cost much to carry. Once the cannon is loaded, xx or xxv PIONEERS push it forward with bars, keeping to one side behind the gabions without taking off the board until the cannon reaches it. Once the cannon is in front, the GUNNER mounts it with the wedges which are at the back, taking the sight on each side and then in the middle. Then another who is nearby gives fire. Each gunner cannon needs 3 GUNNERS: the loader, the one who aims, the one who gives fire. Sometimes, against a camp or into a breach, one shoots cartridges, made as you have elsewhere, or else one uses a basan full of flint stones, cart nails & similar. P A eh cannon must not move unless it has two harnesses, be they of wood or iron. And to furnish the wheels, powder box, and other furniture of the cannon, one needs seven quintals and a half of iron. For the pre The best battery is done at a curtain wall, some say, for that is, as if at an bieve angle, for by doing this you shake loose several stones.

Margin Notes:

[BOTTOM] Some put small wheels of the piece and a thick board to the end of the carriage of the piece in order that it may be drawn more quickly and without making a noise. Others put leather all around the the wheels & also put leather soles or shoes on the horses' hoooves in order that one does not hear them.

Gunner

cannon, one at the breech, one in the middle, one at the mouth. When FOUNDERS want to work on their craft or render the cannon or other piece lighter & easier to cart around, they make it from the ring at the breech to the ring in the middle of the thickness & proportion of the balls, as is said above. But from the ring in the middle to the ring of the mouth & they diminish it one line, or more or less, on each side, always taking their measurements with the compass from the straight line which they make in the middle of the model of paper or otherwise. And this reduction amounts to seven or eight quintals reduction & lightening in weight, and the piece is not less secure for it. This is done for big pieces, but for gr small pieces from lesser than the average, one needs to observe the aforesaid proportion, & draw the piece in a continuous line from one end to the other. The trunnions are commonly situated one foot from the ring of the middle, from toward the edge of the breech. But because some GUNNERS

prefer a **piece** which is weighted at the front because it is easier to plant, to do this, one only needs to move the trunnions closer to the breech & further away from the middle. On the contrary, if you want to render it ~~s~~ more weighted at the back, you will move the trunnions closer to the middle of the **piece** or place them further up toward the mouth. When you bore your **piece** you make a fluted **cast iron** box like a bedpost & there ought to be sixteen channels or notches in which you will slot sixteen **blades** quite evenly, **with** in order that all together they cut & scrape in the same manner. Because if some were to not cut & scrape, chambers & waves would be made in the **cannon** which would make it lopsided and there would be a danger that the **piece** might break in the middle. In order to avoid this, it is necessary that the **borer** should pass evenly from the breech to the mouth, & that the opening of the **piece** should be evenly bored from one end to the other, because thus the **powder** goes off all at once with more force. On the contrary, if restrained, it goes sideways & makes the **piece** break.

Cannonball

[Figure: fig_po26r_1]

Margin Notes:

[TOP] This is the true measure of the caliber, but the **borer** always takes away a little more.

[121]

hollow at the narrower at the bottom & becoming larger toward the muzzle. It is necessary to pestle the **powder** thoroughly & put on top of it either **sand** or **cork** or better still a fitted plate of **wax** thoroughly pestled on top, for it seals precisely & makes for greater force. The ball only makes a hole, the **powder** alone makes more of an effect. One holds that, once loaded & kept in a **dry place** for fifteen **days**, they have more force.

[Figure: fig_po26r_2]

Culverin ball

[Figure: fig_po26v_1]

Bastarde ball

[Figure: fig_po27r_1]

Medium ball

[Figure: fig_po27r_2]

Field piece

[Figure: fig_po27r_3]

Falconet

[Figure: fig_po27v_1]

**Falconet
of 4 quintals,
alternatively passe-
volant, is 8 pans long**

[Figure: fig_po27v_2]

**quintals,
is 9 pans
long**

[Figure: fig_po27v_3]

**quintals,
is one cane
long, which
is 8 Montpellier pans**

[Figure: fig_po27v_4]

**quintal,
is six pans
and a half**

[Figure: fig_po27v_5]

**quintal
and a half is
7 pans and a half**

[Figure: fig_po27v_6]

Musket, [193]

of 60 lb,

is 5 pans

and a half or 6

[Figure: fig_po27v_7]

quintals

is eleven pans

and a half

[Figure: fig_po27v_8]

pieces

[Figure: fig_po28r_1]

Margin Notes:

[RIGHT-MIDDLE] The numbers and dots show how many quintals the **piece** weighs that carries the marked caliber.

Pewterers

tin is the one that comes in *saulmons*, [194] which has not been remelted since it came from the **mine**, because the **MASTERS** remelt it *et* in *grille*, [195] weighing two or three 1b, to easily cut it up and sell it by the piece. And in this they often make a mixture of leftovers from **plates**, **solder** & **common tin**. And to recognize the best one, it is the most lustrous, which looks burnished,

because it is the softest. Sometimes in their *saulmons* they find pieces of **iron**, stones & similar jumble to cheat on the weight. The **tin from England** is so hard that the **MINERS** put in **lead** to soften it. The one that comes by way of **Germany** is softer.

sworn master pewterers from *bonnes villes*^[196] add six 1b of **fine lead** ~~on~~ or eight on a quintal of **fine tin**. The **OTHERS, WHO WORK IN THE COUNTRYSIDE**, put fifteen or 20 or as much as they can, and to cover up the blackness of the **lead** *it* and its softness, they put in **looking-glass tin**, 4 lb per quintal, +^[134] *pe* which whitens & hardens, and ~~a little~~ six or eight 1b of **rosette** ~~on a quintal~~ to render the plate *sonorous*.

pierre porte morte, which is **grais**,^[123] & they turn & polish ~~around~~ them on the wheel. They melt their **tin** in an *dest* **iron** pot on a **charcoal** fire, and with an **iron** spoon that holds **almost** a sufficient quantity for a platter, they cast *leu* in their cold molds, which they keep joined & tight between their **knees**. And soon after, they open the molds so that they do not heat up, & having taken out the cast which is on the female side, & which breaks easily. Then, with a cloth which soaks in **water**, which they always have beside them, they rub the middle of the back of the dish & around the edge, so that it comes out better, and rub the female mold with it.

Go to the fifth leaf.^[197]

Margin Notes:

[LEFT-MIDDLE] +^[135]

When the **tin is fine**, one adds less **glass-looking tin**, namely 4 lb per quintal, but if the **tin is base**, that is to say alloyed with a lot of **lead**, one puts at least five or six 1b of **looking-glass tin** to it.

[LEFT-MIDDLE] If there is hardly any **looking-glass tin**, one puts about two or three 1b per quintal. One puts eight 1b of **rosette**. But if there is a lot of **looking-glass tin**, ~~one~~ like 4 or 5 1b, one only puts six of **rosette**. And commonly, per quintal of **tin**, one adds x 1b of both.

Stucco for molding

tragacanth gum and put it to soak until, having drunk its **water**, it is swollen & rendered like **jelly**. Then grind it quite hard on **marble** & next take **rye flour**, which is better than **wheat**

because it is more humid and does not make the paste as brittle, and sprinkle your **tragacanth gum** with it, & continue to grind and mix in thus, little by little, *it and mix legi* the very finely sieved **flour**. And knead it as if you wanted to make **bread**, until *you* you perceive that it has enough body & is as firm as **bread dough** that one is ready to put in the oven. This is recognized when it can stretch enough without breaking. And if it was not strong enough, it would not *sti* release well. Once the paste is prepared, rub the hollow form *at the u* with **oil**, with a brush, in order that the **oil** penetrates everywhere to make it release better, and press the paste inside quite hard. And if it does not release well, mix in more **flour** until it has enough body. With this you will mold whatever work you like, masks or garlands, which will be dry within one **day**. Next, you will apply them with **strong glue** or **paste glue**, as you like, and you will be able to paint and decorate them with **gold** & all colors. One makes ceiling ornaments with it in **Rome**. One can make bed ornaments with it. *If you want that the work stays white*, it is better to mold with **plaster** instead of **flour**. It is true that it is more brittle and firm as well, but one needs to prepare it like this: temper it, when it is powdered **strong**, in a good amount of **water** so that it is **clear**, & grind it several times a **day** for fifteen **days**. Then pour off the **water** by tilting, and gather the **plaster** & grind it finely on **marble**, & place it in some kind of clean **lead vessel**, so that no dust & dirt falls into it, & leave it **in the open air** & **in the serain** for fifteen **days** with its **water**, and it will become matte, strong, white and light, very suitable for making a seat for burnished **gold**. And this, in powder form, you can mix, instead of **flour**, with **tragacanth gum**, and your work will be very beautiful. Lacking **plaster**, you can mix in well ground **chalk** or **ceruse**, & try **bole** & similar things. This **stucco** with the **tragacanth gum** has the quality that, yielding when it is not yet dry, it can be accommodated on either round or flat things, as you like. It is to make an ornament at little expense.

Margin Notes:

[LEFT-MIDDLE] **Flour** is not good in this, but **chalk** or **ceruse** is.

gold on silver

silver leaf with **terre emerita**, and once dry, give a coat of **spike lavender oil varnish** and of **sandarac**. And it will be more beautiful than **tinsel**.

burnished gold on paper

starch soaked in **water** & your **gold** will burnish very well. Clear starch water layered on the **paper**, then dried, & repeated in this manner 3 times, is a good layer for **burnished gold** on simple **paper** & has no body.

Good eau-de-vie removes them if you rub the garment with it.

gold

terra emerita with some **saffron**, all of it tempered with very clear strong **glue** & passed through a **linen** cloth.

oils

Apothecaries say that anything which does not adhere to the **mortar** while **pestling** is oleaginous.

Dragon's blood

Margin Notes:

[LEFT-BOTTOM] The **darker dragon's blood**

is the best & has more of a tint; it is the tear that is found in **gr** pieces like **peas** and large **hazelnuts** which look like

[Figure: fig_po29v_1]

glass bottle put the best **eau-de-vie** you can find, in sufficient quantity. **For it** And stop it well and so diligently that it does not vent, otherwise it would be worth nothing. And leave it

thus for a long time, because the longer it stays there, the more beautiful & better it will be & it will dissolve if it is good, otherwise it will become like wine lees. When you want to use it, make a small hole in the stopper of the bottle & pour a little & stop it again each time, then apply it on gold.

good kind of dragon's blood can be found in large pieces like pieces of cake this one has no value and is adulterated, & once broken it shows on its edges scales, transparent as *re rouge clair enamel*, it is also lumpy in some parts like small rubies. The eau-de-vie needs to be very ardent & passed^[198] several times.

Margin Notes:

[LEFT-MIDDLE] I put it in common eau-de-vie, mixing in some aquafortis to give it strength. At the beginning the water took on a slight tint, but at the end there was only an appearance of tragacanth gum with which I think they adulterate the dragon's blood.

[LEFT-MIDDLE] When it is applied on burnished gold, it is prone to break. For this reason, some coat it with turpentine varnish. Cold delays the action of the water and the extraction of the color. And for this reason, one can keep it close to the fire.

Lead

Germany and is not in saulmon,^[194] but in lattes^[199] of around an arm's length & three fingers' width. It is transported to Lyon, and from this, the leaf is made for small mirrors in Nuremberg.

[200] PEWTERER

molds from metal which lasts longer & molds more cleanly than *grais*,^[123] because the plate comes out without flashing & smooth. But this is for the RICH because a mold costs fifteen or sixteen frans. They are mainly made of metal, for basins & ewers & salt cellars & similar things which are fashioned.

[201] molds are made with white clay earth mixed with horse dung & cloth waste & well beaten, because the pints, being sunk in a half round, would not be able to release as well

from the *grais* mold as from the *earth*, which is soft. One makes the *noyau* of the mold of the said pints in *grais*.

metal molds, one makes vents and casts all at once, which is the reason that in the middle of the dish, no smoky black line which comes from the vapor & fumes of the *metal* that is cast, which is the cause that in that spot, the work is lumpy & very often pierced. However they repair it with *solder* of the *n*, as is said. These fumes are made right in the middle of the cast, & in *grais* molds.

hammered *mar* to make it more vendable. But it will not last as long.

iron wheels. And when they want to apply

hammer the *iron* wedges that slide along the spokes of the *wheel*. And, when they are at the notch and points that they need, they tighten the said wedges, wedging them with the hammer.

soldering iron & then with a large *file*, they adapt it on the *wheel*; & first of all they wrap their *desgrusoue desgrusouer* with a rope, as thick *rope* as the *little finger*, & lean it firmly on the crossbar to secure it well. And while someone else promptly turns the *wheel*, they guide the sharp edge of the *esgrusouer* by *hand* s toward the edge of the round hollow, & gently guide it to the center of the circle. And this *desgrusouer* is for removing the first rough & lumpy skins of the work. And next they even it out with ae cutting *iron* called a *plane*, the sharp edge of which they rub with a little *putty* on *leather* nailed onto a piece of *wood* *having*, and this in such a way that the flesh or grain is on the outside, for if the sharp edge of this *plane* was not thus rubbed & burnished, it would not polish & *not* burnish the *tin*, *au* which would stay white, & not black & burnished like a mirror. Moreover, they repair the work for the second time with this *plane* as they did with the *esgrusouer*. Then, with a *knife* or another sharp *iron*, they scrape the edges of the platters or plates to smooth them so that they are not found sharp when handled

hammers must be quite even & polished, and if by chance the rust, *the* or some other use, has damaged them, they first polish them with *emery stone powder*, then they finish burnishing & smoothing with the *putty*. Otherwise they would not strike neatly. It is also necessary that the surface of the anvils be the same.

vine

handfuls of pigeon dung.

Colored waters

Distilled urine, distilled vinegar and eau-de-vie take on a cerulean and green tint from pulverized and finely ground *aes ustum*. And this tincture is red copper in its residue if you distil the aforesaid things through a filter.

Varnish resistant to water

Flanders varnish, made with turpentine & oil of turpentine or mastic, can come off and does not hold up *in the rain*. But that made with white walnut oil,^[202] as you have done, holds *in the rain and* is very clear & beautiful & dries soon. This is why one uses this one for painted banners & signs that one carries *in the rain*.

sugar

paintbrush like other *s* things with moistened color, because the sugar would melt. But one rubs them with color with the finger.

Painter

Scribes achieve darkening of lake & other colors for garments with egg yolk, but this is trumpery and does not last.

reds from minium & others which are not beautiful in oil *M* using glair of egg, and it appears to be done in oil. But humidity corrupts all this.

Brushes

white-limers, for the harshness of the lime & use make them more handleable.

overcast weather because you would make your flesh colors browner than one ought to.

[203]

azur d'esmail & grind it on *shale*, & mix in two or three rosary beads' worth of *rocaille*^[204] or more, according to the quantity of the work. And having done their drawing with *noir d'escaille* (which is painted toward the light with the piece of *glass* upright), they lay all their pieces on *white paper* *when* for knowing by the whiteness of the *paper* the lighting of their histories and *as* set down all colors which are of one kind all in one go. Then they heat it up.

brassard are like a masterpiece of the **MASTERS**, for it is necessary that these pieces be very precisely hollowed^[205] & adjusted in order that the movement may be free. Cuirass bodies must be very evenly beaten & driven^[206] with the hammer.

Milan are all in one piece & thus better than those that are of two.^[207]

Painter

Flemish varnish them so they do not die any more than they already have & remain in that state.

distemper will work well in *oil*. But, on the contrary, the one who knows how to work well in *oil* will not work in *distemper*.

gold in distemper

painters & SCRIBES make *batture*, that is JOINER's glue tempered with water on the fire, moderately clear, mixed with very little honey, that is to say a few drops to make it stick. And with it they form letters, or that which they want to gild, with a paintbrush, and immediately after layer the gold, but they never do their work quite neatly, and if there is a lot of honey it dries only with great difficulty. This layer is undone in the rain.

candy sugar in water and mix it with sanguine that they call *cocon*, thoroughly ground, adding in a little soap. This is done neatly, & renders gold beautiful if one uses it as the seat.

Mat maker

Toulouse, one to hang on the partition walls of rooms, which they weave almost as fine as the straw hats worn by VILLAGERS. And they make them in long bands, some the width of ten b straws, others of thirteen. And they work on them mainly in summer. And in winter, when they put it to use, they sew it. But beforehand, they put it in dye and commonly make it in three colors, green, red, and sometimes violet. The green one is made in a single pastel woad dye, because green being made from yellow and blue, the pastel woad discharging itself onto the straw, which shows its dark yellow, one obtains bright green. For the red, they use alum and brazilwood. For the violet, they use pastel woad & a little copperas, which browns the blue with its black tint.

Glassworker

red from Germany, which is *rouge d'escaille*. They make their common red with sanguine, looking-glass tin, rocaille,^[204] litharge & a little iron scales.^[208] The said red is applied on one side & the other of the glass in order that it has more color; if it were applied on one side only, it would be too pale orange.

Founder

rosette at xx lb a quintal, which is harder to melt than latten because it is softer. For, the softer the great^[138] metals #^[134] are, the soft more difficult they are to melt. The tin for bells, which is fine tin is more and which is brittle, is easier to melt than lead, which is soft. Latten

made brittle by the calamine is melted more quickly than red copper. The *metal*,^[159] which is the substance of bells, mixed with tin, and very brittle, is soon melted. The more silver is alloyed, the sooner it melts, that is why solder is made with it. In Germany they make very light candlesticks, it is because they turn them by means of water, but they are breakable. A quintal of *per* fine COPPERSMITH's rosette is sold for xxx or 40 lb. Another, which FOUNDERS use, is sold for xii or xv lb. The quintal of metal, six lb. Put in

Margin Notes:

[LEFT-MIDDLE] #^[135] Gold, silver, copper,
latten, iron.

Knife for cutting the nose or a finger

[Figure: fig_p033r_1]

well-furbished knife, nailed through the middle in such a way that it easily moves to one side & the other & the side *fillegible*] A, as readily as the side B, is hidden inside its handle marked C. The two tenons you see at the tip of the knife are for locking it on one side or the other against a nail which is at the butt of the said handle, in order that, when one wants to press hard on something to cut it, it does not come out from the handle. You may allow the side marked B to cut for demonstration purposes, but not much, but the side that is notched A and marked A must not cut. It is sufficient that it be furbished well. And also the notch needs to be as thick as the back of a knife in order that it cannot cause pain. And you will only show the part of the knife which is not notched, for the side with the notch needs to be *mar* hidden inside the handle. And when you want to cut the nose or a finger, pretend to sharpen your knife on the thigh and, while while doing this, turn the knife deftly. & the part with the notch, which you will cover with one finger, will come into your hand, and you will place the notch, colored with *brazilwood rosette* or *black cherry juice*, upon the nose.

Margin Notes:

[LEFT-MIDDLE] The CONJUROR ought not to amuse himself by watching what he is doing, but look at the SPECTATORS and give them plenty of good hocus-pocus words so that they look at his face & not at his hands.

X^[104] For relighting an extinguished candle between your hands without blowing

[Figure: fig_po33r_2]

X Take a small stick of well dried between wicker and cut from it a small piece like a toothpick, & it m put one end between your index finger & middle finger and clasp both your hands, fingers well joined, and pass them deftly around the lit candle as if you wanted to cover it with them, & your wicker will light, & immediately remove your hands & thus clasped, & immediately put out the candle. And then put your hands around it again as if you wanted to cover it, & your little of light p^[209] wicker light, by means of the smoke that you are holding with your two palms the candle will light. Then immediately extinguish your wicker & secretly cast it aside.

that to someone that he has a piece of silver on his forehead

token or piece of silver and wet it and make it hold against your forehead. Then say to the BYSTANDER that if you put it thus on his forehead, he will not be able to make it fall without lifting his hands to it, no matter how he shakes his head. And making it seem as if you are placing it on his forehead, retain it in your hand & wet your thumb with your saliva then press it quite strongly on his forehead. And thinking he has the piece on his forehead due to the coolness of the saliva, he will shake his ears & will get nowhere.

blood or wine issue from someone's forehead or from a wall

[Figure: fig_po33v_1]

funnel or funnel of *fer blanc* which is double-walled in the body *et* but not in the spout. Make a small hole at the top edge & *et* another, slightly bigger, on the inner wall that will be a little above the spout, just as you can see in the adjacent example. Then when you want to use it, put in *wine* or *liquid rosette of Brazilwood* or *black cherry juice*, and blocking the hole of the spout *the* with your *little finger*, make sure that the *funnel* is well filled in order that the *wine* can enter *there* between the double walls through the hole at the side, & if it does not enter well, making it seem as if you are *tasting* the *wine*, suck & draw in a little *air*, drinking where the little hole is. Next, make one of the close *BYSTANDERS* drink the rest of the *wine* or cast it aside or let it flow through the tip, but before, you must have pressed your *thumb* well over the hole on the top edge, because in this way, by the compression of *air*, the *wine* will be retained between the double walls. Then with a bodkin rounded at the tip & that goes into its handle, you make it seem as if you pierce the *forehead* of someone who holds a *glass* in his *hand*, and while you pierce, you cover what you are doing with the *funnel* that you hold close to #^[134]

Margin Notes:

[LEFT-MIDDLE] #^[135]

his *forehead*. Then removing your *thumb* from over the hole on the top edge, the *air*, being free, will make the *wine* issue from between the double walls through the hole marked B, & fall through the tip marked C into the *glass*. But you must make the *FELLOW* bend his *head* enough in order to do it well.

putting holding a *finger* to his *forehead*, you will prevent him from exiting a *chamber*

X^[104] Make him put his *arm* around a *bedpost* or something similar, & with the same *arm*, let him hold a *finger* to his *forehead*.

X Wager someone e^[210] that walking to a certain place and back, he cannot say boot without spur four times in a row

X If he tries to say^[211] it, but be sure that he speaks *loudly*, once he has been there & back, you will tell him that he has lost, because he needed to say boot four times without saying spur, for that is your wager.

candlestick hold to the wall without making a hole in it

X Make a SERVANT hold it to the wall.^[212]

X How not to break a glass with a log or a large stick

X You will cut from it a small piece as thick as a toothpick, & thus you will give him something from^[213] a log or a large stick with which he will not be able to break the glass.

fine parchment & mark them according to their order with A B C & cetera, then have them sewn inside the hem of a shirt of rough cloth, like that of a MESSENGER, who, if you want to tear up his shirt, will know nothing of it.^[214]

jewel put inside a box

[Figure: fig_po34v_1]

box of boxwood banded with rings, as you see, into which will easily fit another small box, like that which you see marked B, and make it so that it does not touch the bottom of the large one marked A, but that there is some distance. Also, that which enters the large box must be smooth, but the rim must be made with rings so that, being joined, it appears as if they are one and the same box. You must also have a round leather cover of the same length as the box, as you see marked C, which fits let easily & surrounds the said boxes thus placed one

within the other. But before you do your trick, you must put at the bottom of the larger box powdered gold or silver, or mercury amalgamated with silver, and then place the little box marked B on top. Next, holding the box with your index finger on top, you present it, and seeing only the bottom of the smaller box marked B, one places a jewel or something similar in it. This being done, placing the box on the table, you cover it with the leather box, and making the requisite gestures, you will remove the leather box, & without showing the inside, will put it on the table & let it be recognized that the jewel is in the placed in the bottom of the small box marked B. Then you will gently place the leather box back, & after saying *inhonorificabilitidinitatudinibus*,^[215] you will take the top of the leather box with two fingers, and with the clasping it more firmly than usual, at the same time you will lift the smaller box that is inside & which contains the jewel, & you will gently put both on the table, then you will pour the powder or amalgam that is at the bottom of the large box, then replace the leather box with the box inside it, as it was at the start. Then, removing the leather box without removing the smaller one, you will show the jewel at the bottom which has returned to its previous state, holding your index finger on the rim of the box so that it does not slip.

show teach him something he does not know, and neither do you^[216]

string or a small stick and take the measurement from the tip of his ear to the tip of his nose and show it to him. Thus you will teach him something you did not know, and neither did he.

bucket of water on the tips of three knives laid down without touching the ground

[Figure: fig_po35r_1]

knives, either kitchen or table, you will make them support a large weight on their tips laid down & arranged in a triangle, edge to edge, as you can see, & they would not touch the ground. And if, after arranging them this way, you turn them the other way without unjoining them, the tips of the handles can also support a large weight without touching the ground. You can easily adapt this to another use with pikes, with joists, or to promptly make a tripod in a camp with three halberd points. If the edge of the knife marked A faces from right to left,

the butts of the handles will rise, but if the edge of the same knife faces from left to right, the tips will rise.

egg in cold water without fire

egg from both ends so that nothing remains inside, then fill it with **quicklime** & **natural sulfur**, then stop the holes with **wax** & put it in **water** so that it floats by two or three **fingers**.

rabbits come out of a burrow

embers in a pot, & having put **sulfur** on top, put it in the **burrows** & block it with something light.

foodstuff

calf's foot root, otherwise **arum**, & sprinkle the **foodstuff**s with it. There is no danger in this. See **Mathiol.**^[217]

grain from one vessel to another

[Figure: fig_po35v_1]

small **wooden** bushels of the same size, which should be hollow on the bottom exterior by about the width of the back of a **knife** or more. One of these will remain empty, & on the bottom of the other you will glue **kernels of grain** with **starch** such that it will be covered entirely with **grain**, & it will seem to be filled with it. Take also a **wooden** bell into which you will place as much **grain** as can be held within the capacity of one of the bushels, and over the top put a simple piece of **leather** that fits tightly inside the bell. Put all into a **bag** or a **napkin** or a folded handkerchief, if you do not want to use a **CONJUROR**'s pouch. First show the empty **bushel**, then in front of the audience fill it with **grain**, then put it back in the **napkin**. Next, leave that one there & take the other where the **grain** is glued with **starch** & it will seem to be the first one, filled with **grain**. Put it under a hat & place the bell gently on the table for the first time. And if you like, promptly & without stopping, show the bottom which will be covered with **white leather** of the color of the **wood**. Then pretending to show

the bushel that is under the hat, you will turn it deftly to the side that is empty & leave it covered. Then you will command that by *invisibilium*^[218] the grain pass into the bell, which you will have tapped shortly before on the table a little strongly, & the grain will fall to the bottom & cover the piece of leather. Then lift the hat; the bushel *semb* will be found empty and the bell full of grain, which you will scrape deftly along with the piece of leather

bag or pouch.

ball into a thimble, cunning

small sheath of plain leather, such as cow or morocco, somewhat thick, as tall as three fingers, sewn like the finger of a glove & large enough that two fingertips can fit inside & which, at the tip, which is a little puckered, has a round hole as large as a double liard. Take one two similar boxwood balls, & let one be hollow & open with a round hole on one side only so that the thimble can fit inside. Thus, when you want to perform, you will place your leather sheath on the table with the ball that is not hollow. Pass a stick inside the leather sheath to show that there is nothing there, also show the full ball, and hold the one which is hollow & has the thimble inside it by your little finger & ring finger, and do this with your right hand with which you are holding the stick. Next, you take your leather sheath & place it over the hollow ball which is in your fingers, & making it seem as if you are putting some *oribus* powder^[219] over it, you put back the leather mold^[220] that contains the ball with the thimble on the table, then you take the round & solid ball remaining on the table, and command it to enter from under the table into the leather sheath. Then, when lifting the leather, it seems to be the same, although it is the hollow one. Then you cover it again & command it to become invisible. And then, lifting the sheath while pressing it, you will remove it & the ball along with it; & *t* putting it aside with the sheath, & *a* [illegible] in its place will be found a thimble for the ladies whose bottom hurts, that is to say, the bottom of the needle.

Margin Notes:

[LEFT-MIDDLE] of leather

[Figure: fig_po36r_1]

Founder

bad taste to the food, with the same *metal*^[159] the bells are made of. It is true that ~~FOUNABLESDERS~~ mix in more *latten* to make them yellower, to make them more vendable. But the *latten* by itself, & at a mere touch, is *stinking* & of *bad odor*.

Latten does not lose, or only slightly, its *calamine* in an *four à vent* when it is melted in a crucible, nor in a *wood* furnace, but it does in a bellows furnace because bellows give violent fire.

Four à vent

crucible be able to enter in it, & that there be space to remove & take it with pincers.

GLASSWORKERS' glass

Lorraine & in Flanders well-made glass is made of *fern ashes* & *pebbles*, and first they blow a long bubble, which another *WORKER*, with long shears, cleaves & cuts lengthwise. Then, having set this long, cleft bubble on a *stone* or large *plate* that is in the *furnace*, a little less hot than for the melt, it is left to stretch out. And again in addition to this, they flatten it with a long & thick round *iron rod*, then they remove it to the annealing furnace. It is made in the same way in England more beautifully. Near Rouen in France, *plate glass* is made with some *salt-of-saltwort* & *pebbles*, that is whiter & more delicate than that of Lorraine. For *plate glass* can be melted with a *candle* & not that from Lorraine. That of plate is blown in a long bubble, of which another cuts the end, then the blower flattens it while turning it & while touching it to a surface that is on the ground, *A* then puts it to anneal.^[221] Thus the middle, whence it is begun, still remains.

Margin Notes:

[LEFT-MIDDLE] The **glass** can be cleft again with the light of a **candle** by wetting, but not as precisely as with the hot **iron**.

Founder

metal^[159] whitens the more it is melted, because the **tin** does not go away but rather mixes in more. And, by holding it a *long time* in the fire, the **filth** is eaten away, which is what makes it brittle. If you want to chase the **tin** from the **copper**, after it is quite hot, throw in **saltpeter** often. This only & not the fire separates it, & purifies it, & eats the **filth**. The **metal** is cast very neatly. The **copper** is prone to swell, but because it is soft, it can be fixed with a hammer.

Medicine for the **stomach** which heats it and unstops the **liver**

Take

Take **wormwood powder**, dissolve it in *capilli veneris*^[222] **syrup or preserves**, & make with it an opiate of which you will take **once a week** on a **host** soaked in wine. Then you will be able to drink a **finger** of **sufficiently tempered wine**. This **dissipates the phlegm & the winds which arise from it**. You can take six **pepper grains** & grate their rinds such that they are smooth, & swallow them without chewing. This **benefits the stomach without heating the liver**.

Foil backings for the **{illegible}** gemstones

case of **iron** or **metal**, for this stains them, but in some box of^[223]

candles from dripping and making them white

mold **fresh water** well beaten with **bran**, which should not at all be purged of its **flour**, so that the **water** becomes white. And dip your **candles** in that, then leave them to dry. And do thus two or three times.

Gardener

melons well, it needs to be at the *end of a moon cycle*, for otherwise they would bud too many leaves & not bear enough fruit. Make small *e* holes, two *fingers* by two *fingers*, with a stake & put in each two or three *seeds*. Next, take *very fine earth* & fill the holes lightly with it. Next, spread over all the thickness of a *thumb* of *havets*, that is to say *wheat* *fl* chaff, in order that the coming rain does not beat the earth & prevent their birth. *Havets* attract *field mice* who eat the seeds. And for avoiding this, one must moisten them with a *s* *decoction of wormwood*.

Glassworker

gris d'escaille to the *glass* for painting on glass, but trace on the *clean glass* with *noir à huile*. But it is very necessary that the *wood*^[224] be rid of *grease*, for if it has *grease*, however little, the color will not take on it at all. And likewise, if the *GLASSWORKER* who is working has a *stench* from his *nose* or his *mouth*, *the* & he *breathes* on the *glass*, the color will not take on it. Those who discovered the invention of working in small works of soft *enamels* use only *esmail d'azur*, which is blue, & *esmail colombe*, which is the color of purple, which they soften with *rocaille*^[204] or *leaded glass*. As for the yellow, they make it from *silver*, the red from *sanguine*, as is said elsewhere, the black & gray & shadows with *noir d'escaille*, either strong or weak, the flesh color with *clear sanguine*. The green is made first from yellow, then on top they coat *esmail d'azur*, either strong or weak, according to whether they want to make it bright or dark.

Yellow Amber

file, then one passes a certain *pulverized salt* over it, which an *Englishman* called *desramonet*. But I suppose that this was *pulverized pumice stone*, for it had the harshness of *arène*. And with a taut *cord*, he polished his *amber*, then passed *tripoli* from *Bretagne* on it with the *finger*, others with a piece of *leather* or a *cane*. *Amber* loses its color if an unhealthy person wears it, & becomes whitish. But to restore it, it needs to be soaked for one *night* in *urine*, then boiled a little in it.

Sapphire

sapphires that one calls of the trellis, because they are pierced and it is said that a certain KING had made from these a certain ornament in the shape of a trellis, as would perhaps be the Screen of Charlemagne,^[225] as it is called, in the treasure of Saint Denis, in which the gemstones are mounted without leaf, so as to have the enjoyment of the light on one side & the other, & to show their vividness. I have a white one one that seems to be rough & pierced, and is spotted all over with blue blemishes. I am of the opinion that these are artificial & that they are of taffer or very clear *esmail azuré* melted entirely on the sapphire. The file bites on it as on the beryl.

Saffron

[98] & augmented with marigold leaves half-dried, & twisted like a thread, & put in the hottest sun to dry, & is mixed, & the said marigold even gives some color.

Sapphire

Stone cutters sometimes choose old pieces of antique glass in church windows, which are much thicker than those of today & are of more lively colors. If it is for *souf sapphire*, they choose beautiful blue & from such a place that there are no pieees grains, if it is possible. And having cut it in squares with emery, they cut it in bevel & polish it. And in this manner, they counterfeit very beautiful sapphires. The old *esmail d'azur* for silver verging on aquamarine was very appropriate for counterfeiting sapphires, but it is scarcely found. One counterfeits aquamarines with white glass, but they take it from the bottom of the glass.

Amber

transparent amber and in the other one that has body is not internal, for on the inside it is whitish. But through age it or wearing it, it acquires this reddish crust. This is why those who cut it with the file or on the wheel do not remove, if it is possible, this crust. But they only polish it, rubbing it with a willow stick or other soft wood dipped into water & dusted with tripoli of Brittany, and it takes a beautiful polish. If it is too straw yellow & you want to intensify its color, hang it inside a chimney where there is much soot & smoke, and it will take on a reddish-orange color. Try to take the most whitish transparent one, and put it under

dung to turn it green, like bones. Or smoke it in a closed space, with the smoke of *safre* or manganese & other drugs that you know. Or in urine & distilled vinegar mixed with colors, or in the vapor of aquafortis boiling in copper, or aquafortis boiling with silver & sal ammoniac. & some cut amber in facets on a wheel of soft wood with putty instead of emery, & jet also. The salt called by the English *de armonic* is a mineral salt that resembles marble stone and is a very hard mineral with large pieces, like that of Cardona & Monserrat.

Margin Notes:

[LEFT-MIDDLE] I have experimented by making it boil in lye or corrosive water, it turns reddish on the surface. And if it is rubbed against fir & soft wood before it is cooled, it is easily cut.

dyeing

lye of quicklime & litharge, mix & soak, & you will make a tawny dye, & by reiterating it you will make black. Try other colors with lye of lime.

nosebleed and for dyeing

Pestle some sorrel or *lapathum acutum*^[226] of the sort that is red-veined, which is called dragon's blood, and apply it of the to the forehead of the one who bleeds. This herb is a strong dye & makes beautiful violet.

artichokes

every year so that only one stalk is left, & water them thoroughly. L Also replant some every year, for the second year they will bear very beautiful fruit.

St. Paul's day^[227] fails to take, & for covering the bark, **cow dung** is very appropriate, for it is not undone in the rain like earth.

Merchant^[228]

velvet & *es* other stuffs by retail do not make double-entry books because selling by retail & in detail it would be too much effort for them. They have only their sales book^[229] & their account book. But those who sell in bulk & those who traffic in **pastel woad** have double-entry books.

aulne costs seven or eight **lb** to **dye**, they use **cloths** worth seven or eight **francs** an aulne. But whoever wants something beautiful ~~se-la~~ should buy **white cloth** worth fifteen **francs** an aulne & have it **dyed** with **pure scarlet pastel woad** & a little **cochineal**. **Black cloth** is thin so that the **dyeing** is inexpensive.

Goldsmith

silver filings with **saltpeter** which refines it & does not make it brittle. But **gold filings** are assembled with **borax** or, to save the **borax**, with **lead**, which refines the **gold** & softens it, for the **saltpeter** would make it brittle, which **silver** does not do. This is why, to save money, **GOLDSMITHS** use it to assemble, in order to save **borax**, which costs viii **sous** per ounce, & **saltpeter** x **sous** per lb.

goldsmiths have thus assembled their **silver filings** with **saltpeter**, a red enamel vitrifies at the bottom of the **crucible**. I do not know if the **copper** mixed in with the **silver** is the cause. *Try for enamel.*

Pastel woad

Lauragais where the depth of the earth is so fertile that if one were to grow wheat there every year, it would lie flat for being too vigorous. This is why one alternately does pastel woad and wheat there. For the cultivation of pastel woad, one ploughs the soil with shovels of iron, as GARDENERS do. Next, one harrows it with rakes, & breaks it up finely as for sowing cooking herbs. One commonly sows it on St. Anthony's day in January.^[230] One makes eight harvests of it. The first ones are better. The best pastel woad of Lauragais is the one from Carmail & the one from Auragne. And sometimes the pastel woad is good in one field & in the one close by it will hardly have worth. The goodness of the pastel woad is known when, put in the mouth, it gives a taste as of vinegar, or when crumbling & breaking it, it has some mold-like veins which are as if golden or silver. One assays it in the DYERS' vat, and to fill a vat with it, one needs six balls of it. In this, one dyes several locks of wool, and if it dyes fifteen times, it is said to be fifteen florins, if it gives xx dyings, xx florins. The good kind dyes up to 30 times & commonly up to xxv or 26.

Enamel

Enamel takes more readily on copper than on silver. It is true that the cut needs to be well hollowed out & rough. Azure in body & the red called gules, white enamel & dense green take to it very well. Having enamelled, one gilds the foillages of the engraving^[illegible]. Copper has a similar hardness for engraving as fine silver or pistolet^[231] gold.

glass

turpentine colors do not spread, & hold together, mix in a little of tear of mastic together with the turpentine.

glass

glass, you can do it in different ways. Lay your glass pane on, the thinnest you can find, on the printed history, & having cleaned the glass well with lye & ash so that it is not greasy, trace over the lines visible to you with noir à huile or noir d'escaille with the paintbrush; if you want to paint with colors in the fashion of GLASSWORKERS, who wash their glass pane with noir d'escaille & then scrape & clear the parts which they want to coat with color, leaving that

which is necessary for shading. But if you want to make **gilt** histories on **glass** with a background of colors, which imitates the basse-taille of **GOLDSMITHS**, **gild** your entire **glass pane** with **gum water** or **garlic juice** or **milk of the fig tree**. Then moisten your printed history between two wet **linen cloths**, and lay it down on the **gilt glass**. Then with a pin mounted on the end of a small stick, follow the lines of your history as if you wanted to pounce it, & thus you will exactly trace it on the **gilding of the glass**. & next you will clear the background & that which needs to be blank with a quite pointy **steel awl**, & neatly follow once more the lines & accomplish your work & make your faces & flesh colors in **argent moulu**; then you shall fill the background with **azur d'esmail** or **verdigris** or **fine laque platte**^[99] **platte** tempered with **clear turpentine**, mixed with a little of **tear of mastic** if you want that the colors are more even & do not spread. Next, layer on the back of the **glass** & over the colors a **white tin leaf**. And once this is dry, you can cover the **tin leaf** **of** with color to hide your secret. The **tin leaf** gives light to the colors. Thus you will be able to paint without being

glass pane is bulging as if taken from the belly of some jar, it will show all the better for it.^[208] When you apply your **turpentine** colors to your **glass** panes, first place them on a hot tile &, once they are hot, spread your colors & leave it a while on the tile, then lay down your **tin sheet**.

Dye

root of *lapathium acutum maius*,^[226] which resembles **MONK's rhubarb** or **sorrel**, & with the root, which is yellow in the *summer*, they **dye thread** & similar things.

Aquafortis

on for four pounds of substance of **aquafortis** **four** which are in the retort four ounces of **common water** in the **receptacle**, which is better than putting it into the **retort**. One de-phlegms & calcines **alum** in order that the **water** does not have as much dregs. Several make it without de-phlegming the **alum**.

Vinegar

mineral salt, which resembles **marble** & which one calls **Cardona salt** in **Catalonia** & at the border of **Spain**, *jee* & throwing it **in the** all red or quite hot into **wine**, that it turns it into **very**

good vinegar. Some make it with water poured on pomace soured after being pressed by VINTAGERS, but it does not keep, & spoils in heat & thunder storms.

vermeilles

vermeilles do not fear fire, one cuts them into lozenges flat [*illegible*] on one side, then one joins them together in a star shape in a paste of ground enamel, next one melts it & one gilds the enamel with gold leaf which one reheat.

Grottos

thick parchment close to the fire, which shrinks & crumples. Then one paints it with distemper, then in oil. Next one affixes it.

commanders of Malta

rouge clair which makes the field of the white enamel cross is blood of fine tear of dragon's blood tempered with eau-de-vie or else Indian laque platte,^[99] which in my opinion is made in Flanders, tempered with clear turpentine & tear of mastic & laid down on a silver leaf, not the kind which the PAINTERS use, but a thicker kind, which is burnished by THOSE WHO MAKE GEMSTONE FOILS *Av* or by GOLDSMITHS, & that gives it this beautiful brilliance.

Latten and calamine

Founders do not melt latten in a bellows furnace à vent but in crucibles, for in a bellows furnace à vent^[232] & amid the charcoals, the calamine would go away. *A*

Metal^[159]

Tin should be pure for if there is any lead, it will go up in smoke while melting. Mixed tin holds in the fire for a long time but the cendrée^[233] separates it.

Aquafortis

retort is well luted, you ought not to surround it with **ashes**, which would only get in the way of chasing the **spirits** properly. But when, at the end, you give it violent fire, surround it with chacoals which should be lit elsewhere beforehand, as those in the **furnace** should be, in order that they do not crackle & do not make **smoke**. Put the said lit charcoals around the body of the **retort**, & not close to the neck, which does not need to be heated as vigorously. The **top grate**, where you set your **retort**, is sufficiently far, one dour or half a **foot**, from the bottom grate where the charcoal is placed, for by doing this not as much of it is wasted.

Earth for casting, for **FOUNDERS**

horse dung. **POTTER's earth** would be too fatty and would crack & would not hold in the fire, but one needs to mix it with **half as much sand** and a quarter or a fifth of **horse dung**. And leave it to dry, then turn it to powder, then sift it to render it fine & purged of gravel, which would prevent it from casting neatly. The **dung** renders the **earth** more amiable & tractable, but it is necessary that it be well free of **straw** & other things. And when the **earth** is very fatty, one needs to give it more **sand** & more **dung**.^[208] But one does find **fatty earths**, in and of themselves mixed with **sand**. If they are not, do it by artifice. One always needs to reheat the **earths** before casting.

Garden lily

in the following year, & I believe bulbous herbs do this.

Sand

sand east for casting should be chosen neither so lean that it has no hold, nor too fatty. And although it is found **in nature**, it is nonetheless not everywhere. And if you are in a place where it is not found, you can make it, but not with **fatty earth**, for the **sand** does not want it at all, for it makes it very porous. But you can give it bond with **brick thoroughly ground** on **marble**, or **plaster** or **calcined alabaster** or something similar, or the **burned marrow of ox horn** or **burned aspalte** throughout. If you grind it quite finely on **porphyry**, it **s** acquires hold & then you can burn it with **aspalte** or mix it with a quarter part of **tripoli**. Guard against **bread** falling into your **sand** because it makes it very porous.

Margin Notes:

[LEFT-MIDDLE] Try mixing in soot black.

Ducks

month after they are hatched, but remain in this state. But after that they grow quickly, especially if they go into the *water*. One feeds them with *boiled millet grains*, crumbling in *bread* for them and scattering in *well chopped lettuces*.

Glassworkers' black

Iron scale taken from bars that have been in the fire for a *long time*, & which is thick, is much better than that *common delicate kind that falls under the anvil* in the forge, because it imitates *niello*. To the said *black*, described elsewhere, some add *a* little *minium* to it.

ewes

shearer sometimes wounds them, he puts *{illegible}* the very *dung of the ewe* on top. When they are fat, they are easier to shear & do not get wounded so easily.

Margin Notes:

[LEFT-MIDDLE] [234] If the *SHEARER* wants to *viscorter* [235] them, that is to say castrate, when they are one or two *years* old, he must not have been with his wife for this would make the *sheep* die.

gilding on glass

gum water on *glass* for *the gold* as for the *silver* layer as for the *gold* because a *silver* leaf is twice as strong as a *gold* leaf. Also, *silver* is harder and therefore does not scratch as easily. Q And if the *gum* was not a little strong for the *silver*, the latter would not split so neatly. When

you work, ~~the humid~~ the exhalation of your **breath** moistens the leaf laid on the **glass**, & therefore it would be good, while working, to heat it up a few times. You need to be very careful to wash that which you want to be blank & serve as a background for painting with colors, for if it were not quite clean of the **gum**'s greasiness & viscosity, ~~the~~ & of other things, the colors would not be so neat on it. To advance your works, you can pounce, or, better still, layer the **gum** & leaf on a cut **paper**. In this way, you will only need to repair very little. If you want to make **gold** color there without **gold**, mix soaked dried **saffron** with a little **massicot**.

Founder

mold of **earth** is reheated until, sometimes, it is as if red, for otherwise the **metal** would spatter & would not do anything good. And similarly, the *noyau* on the inside should be very reheated, & mixed with **charcoal powder**.

Wax for seal and imprint

wax seals, you need to have **tepid water** always ready & *apre* keep your **wax** in it. But before, it should have been kneaded between your **hands** to render it very uniform, for otherwise the **water** that would get in between would prevent it from becoming uniform. Next, you will press it into whatever you want and put three or four pieces of **paper** on, & with a stick *you* even & round like a pestle, you will roll it as if you wanted to polish it, and it will attach itself to the **paper**, which will help you lift it off the mold. Thus you will imprint better than if you were to cast it molten. You can carve the figures & **gild** them, **silver** them, & paint them with **colors in varnish**, & transfer them onto a base of **glass** painted with **colors in turpentine & mastic**. And if you want to apply these plates by incrustation, do it with **gum ammoniac** tempered with **vinegar**, and you will have good **glue**.

plaster

wax, & with a large brush coat the relief of which you want to have the hollow form, as if you wanted to paint it. And a light crust ~~upon which~~ *qu* will form, upon which you will cast *you* **plaster**, to give it body and strength. Next, in the hollow form of **wax**, you will also cast your **plaster** in order to have your relief, & it will release very easily because of the **wax**. This is done more for large pieces in high relief than for others.

satin

flour or **ground chalk**, in order that the dots of the pounced design be not erased, follow the trace with **glair** beaten with the **milk or bark of the fig tree**, which will immediately make it clear up like **water**, & without becoming thick, it will keep the trace, which you will follow again & scratch with *a* piece of **glass** or a penknife.

oil without breaking

oil does not break & spoil in the folding of it, make your layer with **honey**, **oil** a bit of **oil**, & **water** & **flour**.

oil on taffeta which

oil does not run, make your first layer with **honey**, **alum water** & **starch water**.

Sand for casting

marble, & that it be impalpable & mixed with a little **calcined alabaster**.

lake ground with **olive oil**, which will not dry.

White varnish on plaster

coats of **quite white glue** for painting. Next, varnish with **varnish of sandarac**, **spike lavender oil**, and a little **mastic**. And *in the evening* put it into a vessel, all pestled well together, without fire, which would turn it yellow. Then with a paintbrush, it is dry immediately. Pour the **oil**, which will have taken the substance.

Mericotons and **pavis**

en during *Advent of Christmas* provided that it does not freeze too much.

plaster

PAINTERS' distemper glue on the **plaster** portrait, always leaving each layer to dry. Next, with **minium from England** ground on **marble**, or burnt **lead**, grind *av* & temper with a bit of **gum** or *go* **glue**, & coat lightly. Once dry, rub lightly with a little **cotton** and the **plaster** portrait will seem to be of **lead**. Others grind **minium** with **quicksilver**.

Purple

R **stagno** dolce, meza onça, farlo fondere in un cochiaro.
Depoi fonduto, gectarly dentro una ȝ de ♀, mesedar insieme.
Essendo freddo, macinar supra il **porfidio**. Dapoi piglia
una ȝ de **sal armoniaco**, una ȝ de **solfo** del più giallo
que se possa troval, macinar tutti duoi. Et poi mesedar
molto bene tutti gli matteriali sopradetti. Dapoi metter tutto
insieme dentro un *a pignatta* sublimatorio di **vetro**, tenerlo
sopra picciol fuoco una **hora** & una **hora** un poco piu forte
& una **hora** bonissimo fuoco, et sarà fatto. Dapoi, per
adoperarla, datte il **negro di resina** con **colla** di **PINTORI** da
pintar & per doi o tre volte, fin a tanto che sia ben negro.
Dapoi datte un poco di **vernice**. Essendo secco, datte a secco con
ditto la purpurina dove vorrette. Tanto più ne darette, sarà
piu bello. Dapoi, si volete, datte **vernice** sopra. [236]

glue, as was said, on the medal, then varnish. Once dry, grate minium from England on top with a paintbrush or a finger. The said grated minium embellishes lead medals.

Varied and transmuted wine

brazilwood very finely, put it to soak one or two **hours** in **clear water**, then take this **tinted water** & add to it some **clear water** & you will make *e*[237] **wine** as claret colored as you like. If

you please, put a drop of **lemon or orange juice** in it & it will immediately turn white. It can be drunk without danger.

Pearls

pulverized talc blown into with a **lamp** renders them thus.^[238]

Arquebusier

arquebus precisely, it is necessary that the end of the breech be & come precisely to the edge of the touch-hole, because in this manner the **powder**, without blowing, catches & burns all at once & has more force & does not push back. On the contrary, if the breech is made hollow, as they commonly are, the **powder** catches sooner in this place, makes it push back, & blows, which a **chambered arquebus**^[239] clearly shows, which pushes back more than another. And since the barrel is thicker at the breech than at the muzzle the sights are also uneven, for that at the breech is higher than that at the muzzle. And then, the thickness of the barrel gains about one line over the caliber, and the sight another. It would therefore be necessary to either make the barrel all of one thickness or to raise the stock **on** at the end & toward the muzzle, & sink it in & lower it toward the breech.^[240] The weight of the **powder** must be the third part of the ball.

arquebus

^[241] of **felt** or **leather** or **paper** on top, according to the distance, & let thee^[163] piece be made with a cutting-punch precisely cut **a**^[242] according to the caliber of the **arquebus**.

arquebus

is of the **fowling piece** is 4 king's feet long & the ball xviii **deniers**, the charge vi **deniers** of **powder**, its range iiiii^{xx}^[164] pans & 3 feet **lxii** & a half, two inches & a few lines, which is the **Paris aulne**. The medium **hackbut**,^[243] which is the usual one & the easiest, carries a ball of xv **deniers**, v **deniers** of **powder** & a range of lx paces.

Pewterer

lb or ten of lead, per quintal of tin in cities where they are SWORN MASTERS. But elsewhere, they add as much as they can. One also uses ii 1b of looking-glass tin to bind it & three 1b of debris, that is to say the copper shards that COPPERSMITHS make. This makes the plate more sonorous and it is not as breakable.

Margin Notes:

[LEFT-MIDDLE] This tin is called common tin.

Arquebus

arquebus every eight days, & rub it with oil, & when you fire, wet some linen cloth in oil & put it in instead of paper.^[244]

Lake

paper, & if one or two hours later it does not die there, it is fine and good.

Dyes from flowers

red poppy, which grows amongst grains, makes a very beautiful columbine on white leather. The cornflower makes a very beautiful blue. A plant which grows in hedges, which has a stem similar to flax, a long & broad leaf like small bugloss, which has a violet flower verging on blue & is shaped like the lily flower, makes a very beautiful turquin, surpassing azure. Another flower, the columbine, of the shape & size of the bugloss flower, which has a petal resembling that of the pansy, also makes a very beautiful turquin. It grows amongst grains, in light soils.

Horsehair sieves

Coustance in Normandy with horse tail hair which they clean with lye because they sort them with the mouth & separate out short & broken ones. They do not make the reed longer than

the sieve, & the reed is round. They attach to both edges of the reed the hair, either black or white, according to the work they want to make. And the weft is ~~is~~ done over & under as for making any other fabric. And passing a small flat stick of ii or three fingers wide between, next they pass two hairs at each step of the pedal and weave with three pedals. There are xvii^c[245] hairs in the entire sieve. They sell them by the dozen & each dozen xxx sous. They bring them to Toulouse to transport them afterward to Spain, and take silk tammy in exchange for it.

water against the plague of Monsieur de Montorsin^[246]

theriac, rue & dittany, & good vinegar, put the whole in a glass bottle, leave it half-open & well strapped, and put it in a very long bath for three or 4 days. Then separate your decoction from the residue, of which^[247] in time of need you will pour some on a flaming red tile & receive the vapor of it & also fumigate your clothes with it. This is a very rare & tested secret.

White soporific oil

mandrake apples, put them in quarters in olive oil, the whole in a vial glass bottle which you will place in a bain marie for two days and your oil will turn white. If you rub the soles of your feet with the same, you will soon feel like sleeping.

Stucco

glueing stone, some do not use poi resin & black pitch resin because it is too fatty, but take rosin & sulfur, as much as of one as the other, & as much of wax as the two together, and mix it with pestled brick for greater strength. Others, white chalk or white stone pestled & pulverized & sieved.

arquebus with hail shot

[Figure: fig_po45r_1]

wooden pipe as long as the width of 4 or 5 fingers, which should be hollowed precisely according to the mouth of your barrel, of the form represented in D A. Then, having

cut strong paper, of the as of large printed books, in the form of D, as wide as you want to make your cartridge^[248] long, wrap the paper around the baton B & at the end, where the point F will be, fold all around the said paper, & your cartridge will be formed. But in order to make the bottom more uniform, put it into pipe A, then put in the baton B and, through the other end of the pipe, which is marked G, put the baton C & beat so as to tamp & press the folded tip of your cartridge, then take it out, & load it. Put three or 4 pieces of shot or tears^[249] into it. Then, with a cutting-punch, marked E, which should be of the same caliber as your arquebus or pistol, punch round pieces on cardboard or felt or waxed cloth, and put this round piece into your cartridge, and push it onto the pieces of shot with the baton B. Next, more pieces of shot, 3 or 4, then a round piece. And do thus until the cartridge is full, then put it into your arquebus. If you want your hail shot to scatter sooner, make the round pieces out of paper. If you want it to reach farther without scattering, make the piece out of cardboard. If you want even farther, make the round piece out of waxed cloth, or else of leather or felt, & a piece of waxed cloth on the top. And if you make the cartridge itself of waxed cloth or waxed paper, it will reach one hundred paces & will make for great piercing, & the hail shot, barely scattering, will make an opening.

waxed cloth or a material stronger than paper, you ought not to make so long the part coming from the square to the point as in D, because it is enough that it wraps around twice, #^[250]. In this manner, the hail shot barely scatters & makes for great piercing against a door, cuirass body,^[251] and others.

Margin Notes:

[LEFT-MIDDLE] as D H

arquebus

arquebus, all of which should have a screw on the end that fits in the nut of the ramrod of the said arquebus. Thus, when you have put the powder in the charge, which is in the nut, hold the ramrod upright. And raising your arquebus up, insert the said ramrod until the charge is at the bottom of the arquebus, then right the arquebus, the mouth of the barrel up, and remove the little ramrod. Thus your powder will be entirely in the breech without any of its

grain or dust attaching to the sides of the arquebus, which always has some **filth** in the chamber. Thus it will not push back, and you will shoot more true.

[Figure: fig_po45v_1]

cannon

smooth & well-leveled table and pass through the inside a very smooth string without knots, on each end of which there should be a **plumb** hanging from each side. Then look into the **barrel** along the **string**, and if it does not touch equally all over, note the place where it does not touch & hit with a **hammer** on the outside on that side & in the same place, & thus it will be righted, & do thus all the way round.

For the teeth, oil of sulfur

whiten them with confections of **aquafortis**; however, one says that **this corrupts them afterward & causes a blackness on them**. One says that **oil of sulfur** is excellent, but one needs to mix it in this way: take as much **clove oil** as can be held in a **walnut shell**, and as much **rose honey**, & seven or eight drops of **oil of sulfur**, & mix it well all together. And after having cleaned the **teeth** with a small burin, touch them lightly with a **end** little **cotton** dipped in the aforesaid **oils** and leave it there for a little while, then spit or rinse your **mouth** with **tepid water**, and reiterate two or three times. **Oil of sulfur penetrates & is corrosive, and l** but the **clove oil** & the **rose honey** correct it. Therefore use it with discretion.

Wheat oil

Applied to hair, it makes it fall out & keeps it from being born.

[Figure: fig_po46r_1]

Against the falling sickness

or four or five **fresh crow eggs**, & **the** over the space of 4 or five mornings **cook one of them**, and, having mixed in it a bit of **powdered gentian** & one drop of **oil of sulfur**, give it to the patient. It is held that **the pain will not return**.

Against cold gouts^[252]

Oil of **guaiac** & of sulfur mixed together, applied.

Go Flowers of trees

with **everyes**^[253] new & scarcely come to profit. One ought to leave only two buds on the graft.

Scribe, oil of sulfur

scribe wants to clean his **quill** promptly of the thickness of the **ink** which has dried on it, one only needs to soak in **oil of sulfur**. And it will immediately be white & clean. *Urb.*^[254]

Shoemaker

black leather shoes, he can dip a writing quill in **oil of sulfur** and paint with it what he would like on shoes, boots, and **colets**.^[255] And he will obtain a reddish color which will not disappear by any effort. *Urb.*

writing quill in fresh & good oil of sulfur & thus retrace all the letters with the dipped quill & they will disappear on parchment. Urb.

ink

oil of sulfur & heat & the letter will turn as black as this one. *Urb.*

[Figure: fig_po46v_1]

à jour on paper and other work

d or trace something on the paper & heat it quite soon, & immediately it will turn black; then by rubbing with a sponge, the letter will be cut because it will be burned. *Urb.* Or retrace the letter with a dry quill of.

oil,^[256] & as it becomes warm, they will burn without a flame.
Urb.

stone, black letters

oil^[256] on letters engraved in stone & heated turns black & penetrates.

For teeth

Sal ammoniac i ȝ, rock salt 1 ȝ, alum half an ȝ. Make water with the retort, and as soon as you touch the tooth, the tartar & blackness will go away. It is true that it has a bad odor, but you can mix it with rose honey & a little^[257] cinnamon or clove oil.

Antimony oil

silver, if you put it on it being heated.

Against falling sickness or vertigo

neck, wear root of peony which should be picked *at the waning of the moon.*

Bayonne, which seem to be made of *grès*^[123] are better, for they last, without comparison, longer than others. And because they are not very thick, one wastes less charcoal melting gold & silver, for they heat quickly. They do not drink as much silver as the others, & for this reason, there is hardly any residue^[258] to be found in them. They are less prone to tipping as others that have a flat foot.

Against diarrhea and dysentery

Against diarrhea, it is very good to use preserve of *sympytyum*, also called *consolida maior*. And if it is against dysentery, you can rub with it the temples, the hollow of the hands, & the soles of the feet with wax oil & take one drop or two of it with a spoonful of broth. The root of *consolida maior*, pestled & put between pieees cuts in a piece of beef, then boiled, rejoins them, as they say.

taste of wine

tartar from large vessels & soak it in water & it will have the taste of wine.

half **metal**^[159] & half **copper**. Others take one part of **potin** & one part of **copper latten**. Others take one part of **candlestick latten** & one part of **basin latten**. And among basins, the **latten** of larger ones is brittler than that of skillets, because for making the curve of the round so small it is necessary that the substance be softer. For big ones, to which they give a more ample curve of the round, a brittler substance can be taken. In any event, the brittlest **latten** runs better & casts more neatly, but let it be cast very **neat hot**. One When one wants to cast, one casts **lead** into the substance, which makes it flow & run & goes up in **smoke**, & keeps the mold from corrupting. And if you want to cast fire pieces, mix in more **rosette** than **latten**, in order that it be less breakable. The **crucibles** for melting **metal** should be better than those for **GLASSMAKERS**, as **glass** is not as heavy as **metal**. And in this instance, one needs to lute the **crucibles** with **earth** and pestled **glass**.

Crucibles

in winter & *humid weather* are not good. Those of the **FOUNDERS** must be thick and must be luted.

calcined pumice stone casts 22 carat gold without repair, but it needs to be ablaze and red like the metal. And it withstands several casts.

Founder

[Figure: fig_po48r_1]

furnace for melting a large quantity of metal.

Curing dogs of mange

pill of precipitate, [259] that is to say iii or 4, or up to 5 grains, mixed with their food. Having given it to them for one ~~one week~~, give them another seven or eight days after.

Excellent mustard

bread in an oven, then lard it with cloves & cinnamon & thus put it to soak in good wine. Then, pass everything through a tammy cloth, being well pestled, & incorporate it with your mustard seed.

birds and animals

Skin them

Take a measurement of their body, which is fleshy & more subject to decay, with some canvas that you will cut to their size & width. And having ~~eon~~ filled it with cotton & sewn it, skin them, birds leaving, however, the head, the neck, the wings & the feet on the birds, & the head, the legs & the feet & tail on the animals, because those dry easily. Then fit that skin on the ~~a~~^[211] to mold made of canvas. Small ones are dried in an oven or prepared with sal ammoniac & [illegible].

Extraction of regulus

lb of antimony, half a lb black soap, and half a lb of tartar from Montpellier. Once the whole is pulverized, one needs to boil in a varnished earthenware pot on a big fire while stirring the whole often with a pick of wood or iron, & the said soap will be consumed and burn off and the rest will stay as if red, and it will be necessary that it is reduced by a third. Then one needs to cast it on a tile and it will turn blackish. One will need to melt this four or five times and pour it on the flat tile and then you will have the regulus drawn from antimony.

antimony & mix it with **salt peter** & **pulverized tartar**, as much of one as of the other, &, having heated a pot or **crucible** red hot, they put a little of it at a time, & **se** turn their **back** for fear of the **fumes**, and continue thus until everything is put in, and strengthen the fire until everything is thoroughly melted & melt it again several times.

Lead, **tin**

long time, and they thicken and burn, in such a way that even when one melts a **saulmon**,^[194] the **tin** thickens at the bottom if, while casting, one does not stir it often. It is best for casting to melt little **lead** & **the** or **tin** & **stir** to renew it at each melt. The **antimony** renders them breakable. The **looking-glass tin** whitens them. **One PEWTERERS** put in ~~on the~~ **fine tin** one lb of **looking-glass tin** per one quintal of **fine tin** & two 1b & a half or three 1b of **red & soft cauldron copper**, which is better than **latten**. There is **fine & soft tin & brittle tin**. The brittle one is cast in **grille**^[195] by the **PEWTERERS** to sell it better. **They** come out better & more neatly in **stone** molds than in a **copper** mold, because **copper** is fatty & sticks unless one heats the mold well or one casts large works. Three quarters of **lead** per one lb of **soft tin**, makes a very liquid line & proper for casting, which has a shine like a mirror. **Sandiver** lightens them. And all things that thoroughly lighten **metals** & remove their thickness & dense nature & render them **like** liquid like **water**, render them proper for casting, for it is the thickness that prevents them from running. **Soft tin** is more even **com** than the **brittle one**, which is whiter and seems to be burnished like a mirror.

Margin Notes:

[LEFT-MIDDLE] ^[260] To alloy well **tin** & **lead**, one needs to melt one by itself, and then mix in the other, small pieces at a time, and throw it often on the **marble** or the **square tile**. And when you will see it become quite even **like** & shiny as if it were burnished, it is good. For sometimes it becomes spotted due to too much **lead** & sometimes due to too much **tin**. There is some **tin** which takes more **lead** than another. **Common tin** is the one that is mixed with **lead**.

Casting of lead

churches, **in-it** melt **one** for one lb of **tin** a half of **lead**, & cast in **stone**, & if they want their work whiter, they put **p** half **tin** and half **lead**, but the first mixture is the best, & does not

become porous. One needs to cast it rather hot, for otherwise, it would not flow. Others **smoke** their **molds** with a **resin candle** to cast neatly. The **antimony** makes the substance brittle & breakable. The **looking-glass tin** makes the work whiter, but not more runny; as for **tin**, it works well ~~to—the~~ with **pure lead**. Those who make very neat **lead** casts, use **puncheon**. **PEWTERERS** cast in a **copper** mold.^[208] One says that one makes **lead** take hold on **glass** with **resin**. Some put into the **lead** a quarter of **tin**. **Looking-glass tin** renders the work stronger.

Margin Notes:

[LEFT-MIDDLE] **Poncet**^[168]

They cast with **solder** that **PEWTERERS GLASSWORKERS** use.

[LEFT-MIDDLE] Lump of **iron**

Calcined iron oyster shell

Sand for **lead** casting

Rye straw ashes well boiled then dried & then well sieved. Bind it with **glaire of egg**.^[261] One can cast **copper**, **latten**, and others in it.

Burnt & calcined pumice stone. **Burnt & calcined cuttlefish bones**, as much of one as of the other; & **ashes of walnut tree or vine**, well boiled, dried & finely sieved, bound with **glaire of egg**.

Pewterers

quintal of **fine tin** one 1b of **looking-glass tin**, which renders the **tin** thicker. There are two kinds of **tin**, one of them nearly like **lead**, which runs better, the other brittle, which becomes thicker. They cast in solid & thick **tin** molds or, to do it more neatly, in **copper** molds engraved with a burin, or in **stone**, or in **earth**. Since **latten** scraps, mixed in, only render the **tin** more

breakable & harder & difficult to work with, they cast in their very hot molds & almost *roug* & with very hot **tin**. They fumigate their **tin** molds with **resin candles**.

Brittle *deut* tin is found mixed into *saulmons*, [194] easy to cut, but difficult to put to use & melt if it is not mixed with the other soft one. And without this, it would become waste.

Birds

Calandra larks & all **birds** taken from the nest & which have not had freedom are better, for these which are taken by net never sing so well. However, the wild ones give *illegible* much pleasure with their chanting, but they ought be taken *before St. Michael*, [262] otherwise they scarcely live. A small impostume occurs on all on the fork of their tail, occasionally, which some call *gaillardise*, [263] which makes them sick & sometimes makes them die, especially **calandra larks**. One knows this when they are sad & do not sing. One must pierce it *aw*, not with a pin, [261] but very gently by turning with the tip of quite pointy feather. The **calandra lark** does not want to be without *grey river sand*, & the grey is the best, a little coarse. It rubs itself in it & purges itself with it.

lead

pierced playing card, pierced with a pin or needle, folded on all four sides. Hold it with the end of a small cleft stick and, holding the said stick by *one end* the other end, put your card three or 4 **fingers** away from the **water** that you will have put in a **dish** or similar vessel. Then pour your **lead**, which should not be too hot, into the **card** & continually tap on the stick that holds it. And thus your **lead** will granulate itself roundly. And pass it through a coarse sieve to separate the largest grain from the smallest. The largeish one will reach 25 to 30 paces. [264]

Birds

can are taken *at St. Michael* are good for keeping, but those that are taken in *March* die, because they are starting to fall into love. *Ortolans* are fed on *oats* *all summer* in order that they are nourished without becoming fat, to be more appropriate for hunting & catching others. Then, when one wants to fatten them for selling, one gives them **millet**. They sing *at night*. One needs to *e* take them *after mid-July until St. Michael*, for after that time when they have their young in this country, they go *t* away like **turtledoves** do. **Siskins** should also

be taken from All Saints' Day until Christmas, for after that they go to the mountains to brood.

Margin Notes:

[LEFT-MIDDLE] *Ortolans* are ventriloquists, such that singing without opening the beak, one would say that they are. [265]

for the entire year

glass ampul with an opening capable of receiving cherries and plums or whatever fruit that you want. Put in some hot water for the space of two hours. And when your water is cooled, throw it out & turn the opening upside down on a quite even & table, & in a room where there is not a drop of air & of wind. Then en prepare a stopper of new wax, wrapped in waxed canvas, and adjust it to the ampul quite precisely in order that it will be all ready to stop it when you will have put in the fruit. And when you will have delicately picked with your hand the fruit without it being corrupted & on a warm & dry day, return to the well-closed room, where neither wind nor air may enter, & put it gently & with dexterity in the bottle. Then stop the bottle well with the stopper & lute it & making the lute if it seems good with some quicklime & oil, & such that no water may enter in. Then put your bottles in a vat full of water during the summer And in the winter because the cellars in a cellar, and in the winter put your bottles into a basket furnished with some weights & lower it to the bottom of a deep well. For in the winter the water of the vat would be too cold if the cellar is not quite warm, for one needs the water to be like river water.

paper in five or six doubles, & place it on the medal & make sure the **paper** is folded on the back of the medal so that it is well secured. Next, take a stick, broad at one end & pointed at the other, well smoothed, and rub well on the **paper**, & with the point of the stick retrace the lines & proceed until you recognize that your imprint is well done. Then, at your convenience, slightly rub **oil** with a paintbrush *temp* on the **paper** imprint and cast in **tallow** or **wax** or **sulfur**, & the **paper**, without burning, will render your portrait neat, which you will afterward be able to mold in **plaster** or **tripoli**, and then in **lead** & other **metal**.

Margin Notes:

[LEFT-MIDDLE] Polished **carton** of little thickness & a little moistened is proper. Then if you want, strengthen it with **paper** glued on the back.

Small birds

Ortolans sing *at night* if they are left *in the serain*, but they are better for fattening for fine tables than for singing. **Chaffinches** are prone to becoming blind, & their eyes become swollen at the *beginning of August*. **Goldfinches** like **lettuce** seeds very much, & often one catches them in **gardens** on seeded **lettuces** with two lime twigs. But because such regular fare would be too expensive for them, they are ordinarily fed with **hemp** seed. The **passe solitaire**^[266] is purged with a **spider**, which one needs to give to it *once a week* in order that no **gaillardisse**^[263] comes to it. The **calandra** is purged with **dry mortar**, composed of **lime** & **sand** to keep it from *gaillardise* & fattening too much. **Young small birds** are purged with the same **dry mortar**, by putting some pieces in their cages. The **cuckoo** lays in the nest of **ortolans** otherwise called **verdaule**. This **bird** is very simple. In the past, I have given leave to two of them, which *after several days* returned to their cage. For feeding young **goldfinches**,

one needs to pestle almonds with pith a very little amount of bread pith and lettuce seed or hemp seed. If it is for linnet, some rapeseed.

steel and files

steel that FARRIERS & IRON WORKERS commonly use is not refined like that from Germany or Biscay, which is reduced in hardness *p* in the bath of molten iron, but only in the iron bars which are transported in flat ingots from the forges of Foix & elsewhere, there is a harder & whiter & finer kind than the other, as it comes from the mine. And the WORKERS choose it & use it like the other steel. And because that it comes from common iron, they call it strong iron. But it is not as excellent as purified steel like that from Germany & Biscaye, which is sold in small beads. Some curry steel, giving it a heating, then temper it & water in a large quantity of water, then forge it. & fine steel, which is brittle, breaks and crumbles, & iron allows itself to be stretched. Thus they separate the finest steel, & which with another heating they reduce to a mass. The Germans make their files from strong iron.

Margin Notes:

[LEFT-MIDDLE] One applies steel to tools *desse* not on both sides, but underneath the part where one sharpens & whets them. & in this part, they must be of very soft iron.

[LEFT-MIDDLE] Levantines refine our steel because their country does not provide them with any. And they reheat it in a pot with bitumen, &c.

soap water & with this, rub & moisten the intaglio piece that you want to counterproof, then lay white paper on it & rub very vigorously across the top with a tooth or the bottom of a glass & you will transfer your printed piece. It is true that it will be in reverse, but if you oil your paper with spike lavender & or turpentine oil, it will represent from the left right on the other side. Then follow these lines with a paintbrush or a quill, then heat the paper & the oil will go away & leave your paper white. And if you want this not to be known, if by chance, you borrowed the piece, moisten the paper, and the polishing that the burnisher has made on the back, which shows what has been done, will not be known. The soap water will turn the piece yellow, but well-gummed water, which has the same effect, does not do this. If you want to, for the same effect, make gummed water, then mix some soap in it & do as is said.

Cutters of printing plates

copper plates, or to make worn ones print better, boil them for four or five good hours in a good lye quite spent in the wash water. Then make your ink with some linseed oil & not with walnut oil & press with the rollers. The copper plates are sooner made than wood blocks, but they are not so appropriate for printing promptly. The wood ones are laborious but also will sooner have printed twenty sheets than the other two. To carve in wood, the secret is first to poach, that is to say to lay the counterproof or drawn piece onto the wood block & to make sure that the side with the traced line is stuck to the wood. Once dry, you then gently rub with a moist handkerchief the back of the paper which, by rubbing, will become so delicate that almost only the line will remain, which, next, one follows in cutting the surface. You could do this with historiated glass & coat with noir d'escaille, to then scrape & layer your colors on the uncovered area. To make ink for copper plates

Margin Notes:

[LEFT-MIDDLE] These rollers are good for promptly printing with cut *cartons* different kinds of pastes.

[LEFT-MIDDLE] One can place the plates among the linen when the *lye* is quite pure, or in a pot.

printers, one needs to boil *walnut oil* or, even better, *linseed oil* for a *long time*. & having boiled for a *long time*, you will put in *garlic* & *bread crusts* to rid it of grease & leave again to boil thoroughly, then finally you put in one part of *lampblack* that you have previously ground on *marble* with *oil*. And finally you will mix everything as long as & until you see that the plate prints well. *Which* And when you have spread the *ink* on it, wipe the plates well with the surface of a piece of *white paper*. & do this until the *paper* looks clean and then print. If you were to wipe the plates with a *linen cloth*, it would remove the *ink*. *Linseed oil* thickens while boiling & becomes like a *varnish* & is in danger of catching fire. Therefore, when you boil it, make sure it is in an *open space* or in a *place where the flame cannot cause damage*. Some burn *tartar* until it is black & grind it with *non-boiled linseed oil*, or *walnut oil* which others find to be better. This *black* is beautiful, but the one of *lamp smoke* is blacker. When you want to print *fr*, take with your *fingertip* of the said *black moderately thick*, the whole plate having first been cleaned in *lye* as said, then, rub it with the surface of a piece of *white paper* until the *paper* remains white & do not touch it with the *bare hand* *poureeq* but with a piece of *paper* applied on top. & having cleaned the plate perfectly, *mi* rub again with a piece of *paper*, fold the edges & sides. Next, take a small even table & on this a piece of *felt*, then a few sheets of *paper* & finally the one you want to print on, which should be moistened between two wet napkins. And on this *sheet* put your *plate* then another piece of *paper*, & finally another *felt*. Then pass between the *rollers*. And you can print a dozen pieces consecutively by always charging the *plate* with *ink* & cleaning it as you have done. But if you desist from printing, the rest of the *ink* will dry in the grooves of the *plate*. Thus you will have to boil it in *lye* or *urine*, as already said, to clean it. The *rollers* must not be too loose.

Algiers

colt of three or 4 years & feed it on *rye barley* & *straw pig* cut in the manner one feeds *horses* in *Spain*, and water it with *good fountain or river water*. I do not know if it would be good to water it occasionally with *water of sulfurous baths*, & to sometimes give it *fenugreek* or other

hot foods, for the intention of the **WORKER** is to it to use the heat of its **dung**, & the climate here is cooler than that of **Algiers**. Keep it in a **warm & close place** & so that none of its **dung** & **urine** should be lost, of which you will make a heap or two in order that while one cools, the other will be at the appropriate heat to continue. Also take a large **glass** mattras, as thick as you can, & one **finger** thick if it can be done, & of the capacity of one pitcher or **earthen** jug. *Around the feast of St. John*^[267] put into it a dozen & a half **chicken eggs**, that is to say, the **yolk** without the **glair** & the (**germ**) see).^[268] Others say lx **yolks**. And it will be with this dozen & a half **egg yolks** put in half an ounce (others say for lx **eggs** half a 1b) of **female silkworm seeds**. And after having luted the mattras well (I do not know if it is at all necessary for the generation that there be air), put it & bury it in the heat of the **dung** up to the neck, and leave it there until several ~~fillegible~~ worms are engendered. And then remove the mattras & do not bury it in the **dung** any longer, but only keep it placed on the hot χ ^[269] layer of the **dung** until all the **worms** will have eaten & consumed one ℓ ^[270] another, bustling & stirring, and only one remains. When this is the case you need to feed it *at regular intervals, day & night*, with the aid of two men, who by intervals will take care of it, and you will feed it with an **egg yolk** covered with a **gold leaf**, or with a liquid **egg yolk** with the **gold leaf** incorporated; & take good care that it does not want for such food (some say one **egg yolk** per **hour**, others three, but the thing itself will demonstrate the practice). Nourished in this way it will achieve its growth in two **months** or seven **weeks** & will become like a **snake**, one empan & 4 **fingers** long, & one 1b in weight, and as its wings begin to grow, one will need to put it to death by making a ring of **charcoal** fire around the **bottle** one empan distant from it, and then stopper & lute the **bottle** well in order that it does not exhale.

Ap for its exhalation would be dangerous. And for the occasion when you feed it with pincers, b^[271] wash your **mouth** with **good vinegar** & take some preservative & plug yourself up well. Once it is dead, put it in a **linen** cloth or a canvas of **silk** & fold it & hang it **from the ceiling**, **where the air or & sun dry it**. Once it is quite dry, pulverize it in a mortar. And keep this powder carefully, because one ζ of this thrown on iii 1b of **molten** \oplus reduces it to **finer** \circ **than the other one**. But it does not have as much weight. For this work you also need to choose the **oldest** \oplus that you can, which has often been melted & finely hammered into sheets or other works, & purify it before by melting & throwing it into **honey** & **vinegar**. The term of the work is nine **months from the feast of St. John**^[267] until the 25th of April.

Linseed

p very delicate needs to pick it before the *fillegible* seed is perfectly ripe. For if one waits for the seed to be perfectly ripe, the foot is so dried by the sun that it is brittle & breakable. It is true that in this way the seed is reduced by a third.

gum and such that they do not lose any of their true color, put white wine, the whitest and clearest you can, in a bottle with a little tragacanth gum. And having stoppered the bottle, scramble & shake it very strongly together, & let it rest until the tragacanth is dissolved. Also put in a little fine-grained white salt to brighten the whole. Some mix clear water with white wine, and with this mixture they temper the colors without grinding. And these show very beautifully in ILLUMINATION work.

Soldering a vise

vise should be high to make a long piece in it, and that the jaws join well to clamp a delicate object. To solder the nut, after you have forged the bolt, you will make will forge a long iron strip *quar* of such thickness that it can fit into the notch of the bolt when red hot, & you will bend it *pe* all around, striking it with a hammer. Once it is well *je* wrapped around, you will insert *it* the bolt *e* around which *is* it is wrapped.

Copper

iron, this iron will be so brittle afterward that it cannot be forged.

lead

half tin & half lead, and to *lesch* *afier*^[272] it, one mixes in a little sublimate. It casts well in small works in a cuttlefish bone, provided it is good.

paper

over hot **ashes** some **cotton** in **aquafortis** mixed with **sal ammoniac**, like **aqua regia**, and the **cotton** will become very fine, like powder. Temper it next it with **gummed water** & you will mold very delicately.

Almond trees, apricots

pavis, mericotons, alberges, vie apricots &c, come in best shield grafted on an **almond tree**.

lead and copper

Lead & **tin** come out well in **white chalk** but the softer it is the better. The one from **Champagne** fetches the price that is set in **Lyon**. **Burnt & calcined horse bones** mold very neatly.

Margin Notes:

[LEFT-BOTTOM] I believe that the marrow from the horns of oxen or sheep, that is to say, the **spongy bone** from the inside, molds very neatly and is better than **bone**.

[RIGHT-BOTTOM] Note that any **brittle metal** comes out better than the **fatty**. Also, **lean sand** receives & drinks it better than the **dense one**.

Silkworms

ounce, which is commonly sold in **Languedoc** iii 1b v s. The one from **Spain** that **MERCHANTS** bring there is considered the best because the **worms** which come from there are not so subject to illnesses & make more **silk**. In **Spain**, from one ounce of **silk** seed, **worms** are produced from it which commonly yield **ord xv** 1b of **silk**. But **the ounce** from one ounce of seed produced in **France**, only x or xii come out of it. Three ounces of seed are for producing

such a quantity of **worms**, that with them you will be able to furnish a **room accomodated with three or 4 levels of large shelves**. Willingly they begin to molt *around Holy Week*. And to do this, one puts them in a **fir** box, like those where one puts sweetmeats, warmly among feather cushions. And at the beginning, they molt like **little black ants**, & as soon as there are two or three molted, one needs to give them **white mulberry leaves**.

Margin Notes:

[LEFT-MIDDLE] See **Hieronymus**

Vida Albensis episcopus

deb Cremonensis

scripsit carmine

de bombycum natura. [273]

shelves. And three times per day, one needs to exchange **fresh leaves**. And if *during the day* there is some **thunder or rainy weather, cloud-covered & cool**, one needs to keep in the **room** three or 4 chafing dishes & with glowing charcoal, & put in **incense** until all the **room** would be filled with **smoke**. And when the **weather is warm & serain**, the **silk** abounds more & is all the better for it. Some **worms** make it whiter, others more yellowish. And even if it may be white, it yellows when one draws it with **hot water**. From The **worms**, *from their birth until u the their time when they make their cocoons & their prisons*, sleep & rest 4 times, & each time remain 4 or five **days** resting without eating, as if they were dying to be reborn again, for each time they change skin & begin by molting from the head then consequently, on different **days**, the **s** rest of the body, & from white turn grayish, & from grayish to white. Finally And if one of them has some illness who does not have the strength to molt, one needs to help it & be careful not to break it, for at that time rendering a yellow liquor, it is no longer worth anything. And further they scarcely profit after one has handled it with the **hand**. Around **Pentecost**, they begin to want to climb on the dry branches of **heath** or **heather** that one prepares for them **en** & attaches

Margin Notes:

[LEFT-MIDDLE] How one moves them

high shelves, & at that time, one knows when they want to climb up when, on the leaf, they *heat* lengthen & raise the head & a part of the body. At that time one carries them to the *heath* branches where they stop & begin to spin their prison, which one calls cocoon, commonly the size of a *pigeon* egg, although one finds much larger ones because it sometimes happens that two or three & up to xi *worms* are put in a cocoon, which is hairy & downy all around, & the hair of which is *ferret-silk* or *foret*; & from the cocoon, which is a white, solid, continuous & firm skin, *silk* is made. The cocoon is so hard that one only cuts it with difficulty with a *fingernail*. And nevertheless, to leave its prison, *it* the *worm* gnaws it at one end, & after having stayed inside living on its own sap *it* for three *weeks*, it comes out, diminished by half. For when it begins to spin, it is as long as a *ring finger* & has eight feet, & coming out it is shorter by half & only has 4 feet. On the other hand, it has become a *butterfly* & has wings, without, however, flying. And there are male & female. As soon as they come out of the cocoon, the male charges the female & one puts them on a *white linen*, where they make their eggs, which the female would not make well & profitably if the male was not given to her. And when the male has detached himself from a female, one needs to throw it out, for it would not be good to give it to another. They have completed spinning & making their eggs in three *weeks* & *around St. John's Day*.^[267] And at that time one keeps their eggs & seed *until Holy Week*, as *or* is said. Some spin among the leaves & make their cocoon there without climbing high.

Margin Notes:

[LEFT-MIDDLE] The *silk* of the cocoons where there are^[223]

On dry preserves

[184]

[Figure: fig_p054v_1]

take a which are not liquid, take an open tub pierced on both sides with a small, square window, & pass sticks through these on one side and the other, & place on these a sieve made of strings in the form of a net. And on this, you will properly arrange the vessels with your

preserves. And having put at the bottom of the tub a chafing-dish or two, cover the tub with a bedsheet folded double.

horse follow

+One needs to give it **sweet bread** & it will know the one who will do him such good.

put it make it take a good gait from the start of the way & continue it.

Dogs

resin balls prepared like those of **SHOEMAKERS** & to throw to them as they yap at you, & they will bite on the **balls** so much that their teeth will be stuck together & they will not be able to hurt you.

horse

lit hay, singe the hair on its head & elsewhere.

hay

hay & wrap your **legs** in it, & the **rain** will never pass through.

schioppo senza rumore^[274]

[275] well & plug the touch-hole below, & take a piece of **porkfat**, the freshest that you can, as long as the **joint of the little finger** & of the caliber, & put it in the pipe & move it up and down until it is completely melted. Next, load the pipe at the top with a **socket**^[276] that is held on the ramrod, as you know, & it will only make a *little whistle*.

will make healing difficult

fat & **strong vinegar** & throw your ball very hot into this mixture.

Against wounds

chicken or a dog to test & in the wound put sap & pestled herb which is called *semperferviva*, [277] that is the small one which has leaves like small grains, which some call *vermicularis*. And one holds for certain that it will not die.

Onenev elbirro^[278] hcihw sllik fi eno spets no a draob ro a ueirse purrits^[279]

in the month of June & July, a number of the largest snails you can, with their shell, put them in a glass bottle with a sufficient quantity of very hard & thoroughly boiled egg yolks with good vinegar. Stopper the whole well & put it under horsedung for the space of fifteen days. The snails will first live on the egg yolks, then with the heat they will come out of their shells & eat & live on those. Finally, a white ointment is made with it, which, without cutting open the bottle ~~you mee~~, which above all for your safety you *b*^[280] will always keep well stoppered, you will put in the very strong sun & in the serain for the space

days. Next you will break it from quite far away & with a long stick without looking at it & having plugged yourself up well, you will put some of it where you want, or rub some of it on a stake in a running river or a tree or a plant that is on the bank.

waters

Daot ni a top^[281] with quicklime, which will consume all this powder afterward, &c.

Damascus steel^[282]

earthworms separately & horseradish leaf separately, & mix these two waters, as much of one as of the other, & temper in this.

open sea

ferlin^[283] in oil, then attach it to the stern of the ship such that it dips in the water, & it will make a trail that will show for ten leagues because the water is parted wherever the oil has passed.

Chalk most recently taken from the quarry is good for lead. One ought neither to wet nor grind it, but render it subtle by pestling or scraping & passing through a sieve. Thus for pumice, which one ought not to grind with water, nor corrupt its nature. Lead should be but little mixed with tin, only for giving it strength, and two parts of tin for lead for of one of tin or more.

cuirass bodies

river water, as clear & running as possible, & heat it to a little more than tepid. Then take a bunch of weld, & take the grain of it & put it into the said water & boil it thoroughly, stirring it with a stick, then pour it into a muid or other vessel, then throw into it two pecks of salt.

big cauldron of the said river water & heat it to a little more than tepid. & take three or four double handfuls of fatty red earth, soak it & throw it into the cauldron with the said water. Take as much pigeon dung as the said earth, & as much horse dung, & as much iron filings, & mix the whole separately, & throw it into the cauldron & leave it for two or three days. Then throw it afterward into the said muid and stir the whole thoroughly together. And the older this temper is, the better it will be.

Varnish for distemper

marble with distemper of lake or rose of Ghent & chalk. Once dry, glaze with lake tempered in wine, for the glue makes it die & blacken. And all will appear red, but the varnish you will put here, which will penetrate, will make appear dark & light that which ought to be thus. The varnish is made thus, mix with clear Venice turpentine some spike lavender oil & until all is

clear & liquid enough, & it is done without fire. This one *es* is for things in **distemper**, and the turpentine varnish that you know, for panels. Pure spike lavender oil varnish is not good for panels, for spike lavender oil is too penetrating & makes colors sparkle, unless it was made *long ago.*

lake & florey rosette of Ghent & others lose their color & die in the air.

marble on which a knife can *prick* is worth nothing for grinding fine colors.

Chalk has no body in oil. Ceruse is appropriate. But lead white more excellent. Ceruse is the whitest, when ground first in water, the lead white grayish. But ~~the~~ white it takes on its perfect whiteness in oil.

workshop well, for when walking, if you stir up dust, this will damage your colors, which will never be beautiful if they are not very *be* clean.

Florey must not be mixed with azur d'esmail or another, for it makes it green.

palettes to paint, ivory is excellent, knots of the fir tree, the pear tree, & if it is a walnut tree, make sure the grain of the wood runs lengthwise.

L One always needs to apply imprimatura *don*^[284] wood to paint there in oil in order to fill the holes & unevenness, and make imprimatura with some stil de grain yellow & ceruse tempered in oil, then soften with a feather, which flattens better than a paintbrush. Or when the imprimatura is dry, scrape strongly with a knife.

azur d'esmail in oil, one needs to choose the most delicate. And to render it subtle, one ought not to grind it, for this makes it

whiten. But one needs to wash it, & the coarsest going to the bottom, choose the one that is above in the water or, by inclination, pour out the cloudy water, then gather the azure.

Margin Notes:

[LEFT-MIDDLE] [285] THE ONE WHO MAKES A PROFESSION OF WORKING IN OIL will hardly work well in distemper if he has not been trained well from adolescence. For the way of working is different, because when washing the paintbrush for distemper, one always leaves it humid. And on the contrary, when one cleans the paintbrush in oil to soften, one wipes the paintbrush well. Otherwise, the work would run & would soon be all disfigured.

[LEFT-MIDDLE] The Italians soften by hatching with a large flattened paintbrush which makes serrations.

[LEFT-MIDDLE] And they do not lay their shadow all at once like the Flemish, but make them hatching lightest toward the light then a little darker next & finally a little blacker to better make project & come out.

[LEFT-MIDDLE] In distemper do not mix your different colors together But, for this makes them die, but use each separately. And in order that they do not dry & that you have time to soften, moisten the back of the canvas.

Lake takes long to dry in oil and for that reason one must grind some glass with it. But one needs to choose cristallin because it is cleaner. And because it would be too difficult to grind by itself, one must redden it on the fire, then when entirely red throw it into cold water, & it will crumble & pulverize easily for grinding it afterward. Being well ground it with a lot of water, it resembles ground lead white, but for all this it has no body. I think it would be good for casting.

[286] Lead white is made with plate lead, beaten thin & put under the dung heap.

White varnish of turpentine or of spike lavender oil and turpentine is colored with pulverized terra emerita, making it boil together. It gives a gold color on silver and more beautiful if it is

burnished. It is dry in a *quarter of an hour*. **Aloe** would make brighter color still, but it takes long to dry & the other is dry in *a quarter of an hour, in winter* as well as *summer*.

lake moistened with **saliva** is promptly rendered dark. That from **Florence** is too gummed.

PRINTERS' ink on **velvet** and there apply **gold leaf** and then stretch the **velvet**, it will appear grainy as if there were **gold powder** disseminated on it.

[287] **Vermilion** ground by itself is wan and pale, but ground after **lake**, it is more beautiful.

marbles of grease, one grinds **common ashes** on it, which is good afterward to make the first imprimatura of a panel that is prepared in **oil** in order to seal the cracks & chinks of the **wood**. It has more body than **chalk** & it has **ehalk** a certain fattiness. One mixes it with the said **chalk** or **ra** with the colors collected from the **vessel** where one cleans the **paintbrush**. It is desiccative and spares the color. **On** Once this first imprimatura is made on the **wood**, one scrapes with a **knife** to even it. Next, one makes there a second imprimatura of **ceruse** or of the meanest colors mixed together. In a painting in **oil** on **canvas**, one applies only one imprimatura, and the same **ashes** can be used there. Also, after one has ground a color, one grinds some **pith of coarse bread** on it to rid the **marble** of grease.

[288] **SHEATH MAKER**

Sheath makers use small, very delicate skins of lambs and young goats, almost like **parchment** and keep them constantly re-moistened in **humid places**. When they want to imprint some history, they layer them in the hollows of their figure, then put over the top **fine fatty earth** with which cloths are rid of grease, having pressed & beaten it well & rendered it moderately humid and soft. Then they put on the **earth** a small even board and put the whole in a press and let it dry there. After the **earth**, only the **leather** remains neatly imprinted [**gap**] of the size of a **pea**. And then you give the **leather** two or three layers of **copperas black** and **iron scale**, one after the other, as even as the **TANNERS** do. And this **dye**, being astringent, makes the **leather** shrink & strengthens it and makes it imprint better. Once dry, one **glues canvas** on the back with **strong glue**. In this manner one can promptly imitate big statues & very subtle medals and paint & decorate^[289] them & are light and portable & last a *long time*. That which is imprinted on a relief is done differently and can be retraced with a **hot iron**.

PAINTER [290]

crayons are not made with good glue but with women's milk.

carton, once dry, have to be soaked in thoroughly thinned and clear melted resin. This strengthens it, otherwise they turn limp in humid weather.

Venice masks are made with the hollow & the male face of copper.

Flemish do not use any whites for flesh colors in oil other than lead white because the ceruse turns yellow.

year-old walnut oil which is clear is the best color, it keeps off dust. [291] The kind which has recently been drawn with the press in the manner of almond oil is white, especially if the walnuts' skin is removed.

[292] One needs to make at least three layers of flesh color to accomplish faces in oil. And at the beginning, one puts the black and umber where it is appropriate. Next, the *e* heightening with lead white must not be put on the black. Flesh colors, and [gap] where the ceruse enters will yellow in five or six months, but lead white does not change.

[293] Florence lake is better than that from Flanders for in Florence the best dyes are made. To make a beautiful flesh color, the reddest & liveliest lake is the best, for the kind that contains purple & violet, by admixture of too much alum, makes flesh color like that of one who is very cold. That is why ladies, wanting to color their cheeks, grind Florence lake very finely, then fill a little cotton with it, which they next wrap in a little fabric of Cambray which is clear. And thus they pounce the lake on their cheeks & then, with another clean cotton, they soften it.

Cristallin having been ground with water appears to be have body, but with oil it does not have any. It is ground with lake & with asphaltum, which would not dry for a very long time without this.

Spike lavender oil is commonly put with lead white, *et* [294] not entirely pure but mixed with a little walnut oil. The said spike lavender oil would not be good for lake & colors that do not have body, for it would make them glitter, but with those that have body & are somewhat fatty, it is quite appropriate.

Verdigris and **orpiment** must first be ground with **urine** before thinning them with **oil**. Thus they are beautiful & do not die.

Black of charcoal from the mines, of ordinary charcoal, of burnt ivory, of peach pits, of lamp smoke, of burnt bones of the feet of oxen.

Azure is not good here, but wan, & one needs to work with long paintbrushes. Fresco is not used *cont*^[295] on wood.

Azure

Turpentine oil renders it very beautiful. Test *palma christi* seed oil. Walnut oil in Flanders costs at least a hundred **sous** a pint. The **azure** requires a little **fatty oil** because it has no body.

Margin Notes:

[LEFT-MIDDLE] *Azur d'esmail* hates more than any other to be ground, especially with **water**, for it dies & loses all its color. However, because it cannot be worked if it is coarse, grind not with **water** but with **oil** & grind it thickly, and in this way it will not die as much.

[LEFT-MIDDLE] Always choose the most delicate one.

Paintbrushes

spike lavender oil and they immediately will turn soft again as before, then you will finish to clean them in **walnut oil**. **Walnut oil** is not **as not** as appropriate to soften them as that of **spike lavender**, which is clear like **water** & penetrates & does not have body like **walnut oil**. The

handle of paintbrushes is made by those who work with care from porcupine quills, by others from wood of arrows from Turkey with whom with which they also make small rods to rest their hand when they are painting.

Margin Notes:

[LEFT-MIDDLE] To work well on a small scale very thin paintbrushes which have a firm point *z* are *on*^[296] needed. And because a squirrel's tail hair is soft, the most careful take the bristles of the oldest rats, especially of dormice if they can find them, & put two or three of them in the middle of the paintbrush. These make a straight line like a quill & all the other hairs

[BOTTOM] of the paintbrush stick to them as to the point. The bristles of beech martens & weasels & small animals that make musk are even better, for a single hair in a paintbrush suffices.

Lake & lead white & ceruse are easy to work in oil, but every kind of azure is difficult. And to make beautiful azure, one needs to layer it not with large strokes of the paintbrush but with small strokes of the point. Not only ash & azur d'Acre^[297] but mainly azur d'esmail which one needs to choose to be very delicate. For it Otherwise you will not *v* be able to work with it except with much work, and even then you need to allay it with turpentine to give it body, and mix it with a little lead white. Any azure wants neither to be ground nor washed for it loses color & becomes pale. But putting it powdered on your palette, you will thin it little by little either with walnut oil or turpentine oil, dipping a knife point in the oil, then tempering it little by little on the said palette.

[298]The Italians commonly make three shadows, the first one, of light, very clear, the second one darker & the third ones quite strong, then blend these three shadows together by hatching them from the darkest to the clearest.

[Figure: fig_po59r_1]

Margin Notes:

[LEFT-MIDDLE] The varnish is more beautiful on the panel when the color has imbibed well.

Azure

Azure is more beautiful when imbibed on the panel ~~without~~ with **walnut oil** with which it has been first thinned, without putting in **spike lavender oil**. And if you want to know if it is dry, breathe on it and it will not shine, thus appearing to be well-imbibed. If not, it will shine.

Azur d'esmail imbibed in **oil** tempered in **oil**, leaves it & returns to its primary nature if you mix it in **water**.

paintbrush if you want your work to be well-softened.

Black Painting of armor

Charcoal black mixed with a little **lead white** is very appropriate to make armor, mixing in a little ~~of [illegible]~~ **azure** if you wish. Charcoal **black** by itself is as if bluish.

crêpe

charcoal black mixed with **lead white** & a little **azure**, then **resu** after it is dry, heighten with strokes & lines in **lead white**.

thick cloth hardly makes any folds, **taffetas** & **silk cloth** make more, & **crêpe** more still. Make Heed which ones should go lengthwise & others across.

Lead white & **massicot** are the most desiccative, nevertheless they need a good two days. If you want to prove whether an **oil** is desiccative, temper **lead white** with it, & if it produces a crust in a day soon it means that it will dessicate.

Azures, flesh colors, & reds are layered twice. The others not.

glue it well on the reverse, but to fill in the cracks well in order to paint on it & repair it, it ought not to be with **glue**, which rots in humid weather & would swell when touched with the **oil** of the painting. But take **white wax**, which is harder than the other. The **oil** mixed in among the **wax** prevents it from melting in the sun. The **wax** ought not to be hard, but soft as if recently cooled. Apply it on cracks & crevices with the tip of a knife, then scrape;

oil & melt them together & fill the cracks & make them even and paint on them. And the **oil** mixed with **wax** will *q* better receive color, which is also tempered with **oil**.

chalk tempered with distemper^[138] glue on the panel, not with a paintbrush but with a brush in such a way as if you wanted to pounce, & leave to dry. And reiterate up to two or three times, then even out the last ground well with a knife, then give a coat of glue on top, upon which you will next be able to make your imprimatura and then paint. But make sure that your first white is not too thick for it would break easily. Flemish PAINTERS have such panels made by the dozen.

Margin Notes:

[LEFT-MIDDLE] Also do not layer color on color if they are not similar, such as white on black, but rather flesh color on flesh color, & thus with the others. And leave blank the space for shadow or a different color. *Ains* In this way, layering each manner of color on the imprimatura itself, they will not die & you will work neatly.

[299]Oil

Walnut oil extracted like peeled almonds is very white. The one of *palmachristi*. And when the oil has a little body, the colors soften in it. For if the oil is too clear, the colors run & do not have bond, even those that hardly have any body. Fatty oil that is not easily imbibed is appropriate for varnish. The oil is desiccative enough when it dries out as quickly as common varnish. Oils do not dry as quickly in cold countries as in hot countries. Oil exposed to the sun is clarified well. But it fattens, if you put in ceruse or lead filings or lead white or calcined pulverized p glass. To avoid this, put the vial in clear water.

oil, once dry, sometimes do not easily receive the second colors; to prevent this, breathe on them & the color will take there.

Varnish dry in an hour

white turpentine oil & turpentine & mastic, pulverized & passed delicately through a sieve, & boil together, stirring continuously with a stick until it is dry. And put in two liards' worth of good eau-de-vie. And if you extract the tear of mastic, it will be whiter & clearer. There is no need to put in turpentine, but only its white turpentine oil & mastic pulverized at your discretion, until it has enough body. +^[134]

Margin Notes:

[LEFT-MIDDLE] +^[135]

Which one knows when, being placed on a knife in the wind, it does not run. This one is excellent for panels and is dry within an hour and does not stick like the turpentine one.

soapy water, others with urine, others with white wine, for dust spoils the colors.

Spike lavender oil

Margin Notes:

[LEFT-TOP] One ought not to put any into colors for it is so brisk and penetrating that it makes the colors flake, which next come off. And for this reason, PAINTERS use it to clean their oil paintbrush when they have become hard, for it renders them soft & clean immediately, penetrating the dry color which encrusts them. Also, PAINTERS, sometimes envious of the work undertaken by another, *in the evening* secretly pour a few drops of spike lavender on the oil on the top edge of the panel such that, running down, it makes a stain that penetrates as far as the wood & makes the colors come off such that, to make the work even & of an equal composition, they are forced to do everything again and thus lose their work.

Wood color

bistre, then a coat of varnish.

Flemish

oil with the tip of the paintbrushes, in *f* the fashion of good ILLUMINATORS, and grind their colors very finely, protect against dust, and often clean from their paintbrush the bits of hair which they sometimes leave there, for if these should remain on the work ~~it this~~, it would prevent neat working, which they are very careful about. In this way their work appears very soft, especially in small work, in which one needs to apply more diligence because one looks at them more closely. They usually finish the forehead, then the eyes, next the nose, finally the mouth and the rest. But they do not proceed like some others who *fo* layer two or three different flesh colors, one yellowish & the other darker, because the colors always mix & finally die. They simply *fillegible*] make their imprimatura properly,

then and once quite dry, they draw their portrait & layer their natural flesh color, leaving the space for shadow, like the side of the forehead & the cheek, & the area around the eyes blank & dry until they have filled in the rest. Next they put their shadows separately, which they do not make so dark, but rather that which the natural can make. In sum, they do not put shadow on flesh color nor flesh color on shadow, but white on white & black on black, *Thus* & each on their own. In this way their work is neat & the colors do not die.

lead white. But avoid putting too much of it for this will make it look like a face of death. The beautiful Florence lake makes a beautiful *re*^[300] vivid flesh color approaching *Fillegible* the tint of *rose alexandrine* & *incarnadine*.

Margin Notes:

[LEFT-MIDDLE] Certain colors do not want to be ground, like *minium* and *massicot*. The *ashes* do not want to be ground at all.

arr soften round things by rounding them with the point of the paintbrush & the rest with the flat part if it is flat, & thus for the others according to their nature, & lightly with the point of the dry & flattened paintbrush &^[301] with patience.

Lead white

ceruse because it does not have enough body.

paintbrush shows it to you by casting a shadow which must always follow the **back of your hand, not in a straight line like this**

[Figure:fig_po61r_1]

, for the light would be too crude & too harsh, but obliquely & as if at an incline, thus

[Figure:fig_po61r_2]

. It is necessary that the panel not be facing the **light head-on, but half turned against it. And above all look for soft light, for it makes soft both the shadow & the work, as a harsh light a harsh work.**

Water to give light for the PAINTER

vine water^[302] & put it into a big bottle. And behind this, put your candle, & it will not hinder your vision.

Frames^[303] of the Germans

Germans who work in miniature make frames not of **glass**, but of **canvas** anointed with **clear turpentine varnish**, namely half **turpentine oil** & almost half **turpentine**, because this light, which is not as bright as from **glass**, makes features appear larger to them. And when they want to make something subtle like veins *de* & similar things, they use paintbrushes composed of two or three **rat whiskers**.

Azur d'esmail in oil

beautiful delicate that will be possible, for if it is coarse one cannot work with it in **oil**. And if you do not find any that is subtle enough, you can grind it well, not with **water** but with **oil**, & grind it thickly. Next lay it on your **palette** & mix in a little **turpentine**, but hardly any, to give it bond, and make it so that it is thick like **butter** or **mortar**, & then, with a fairly large paintbrush, work it by always moving the paintbrush back and forth. Then, to soften it, hatch across it in a tooth-like jagging with **the** the tip of the paintbrush. The highlights will be made with **d** the same thinned with **ceruse**, which, giving it bond, makes it easier to work. I have seen it used thus. It must be very thick, & almost such that you are at pains to spread it with the **paintbrush**. And it is all the better if you lay down your panel. All these difficulties do not arise when it is very subtle & thin without being ground, and does not run.

Margin Notes:

[LEFT-MIDDLE] **Azure** wants to be layered neatly, which is why **gutan** it always dies somewhat when, to mend an old panel, one layers it on old, already tarnished **azure**. In such matters, it is better to scrape off the old layer & apply imprimatura again, then put down the **azure**. It is almost thus for other colors. Also, **azure** ground with **oil** always remains shiny, which is not a good sign for **azure**, for this makes it die.

marble & p glass a **glass** thumb thick is more appropriate than anything else for grinding colors neatly, especially for **lake** & for whites.

oil *take a long time* because of several lines that need to be done with a ruler, and for this reason one usually does them in **distemper**. One takes the points at one's discretion. The main thing in this lies in having the knowledge of the point. One commonly makes two or three of them, sometimes five.

1304 Ocher

azure

ash & lake. Once dry, one heightens & finishes with flesh color
& other
colors & with white. And it
looks better & is sooner
done than with white & with black.

Armies
are painted
thus. [305]

knife to render it quite even, you will start drawing with the longest piece of charcoal you can find, for with a short one you would not see your line so well & would do it roughly. Let the tip of the charcoal be thin, & in order not to render it dull & blunt soon, drag the tip flat, thus you will constantly sharpen it. Also, hold your charcoal as far at the end as you can, & ~~do it~~ & accustom yourself ~~at~~ to make a light line. For if you accustom yourself to drawing delicately with charcoal, you will do likewise with colors. And he who is rough with charcoal is never exquisite with colors. And by a line of charcoal, MASTERS pass judgment on their APPRENTICES. First make the outline of your drawing, that is the contour, lightly & without any too careful work, but boldly. In so doing, you will teach yourself to be an ARTIST, and if you need to undo anything, you will not waste as much time as if you had elaborated it. Next, re-work all the distinctive lines, & do not keep too close to your panel, but occasionally step away from it to better judge the proportions. Once the first drawing seems good to you, retrace all the lines with the paintbrush in rose color or another color in gum or distemper. Thus you will work more confidently with colors, and with less effort.

artist, one needs to draw by eye, without compass or ruler. MASTERS do not allow APPRENTICES to do this.

long done, it becomes greasy. One needs to rub it with ash & water.

ruler over the lines, & at the intersection^[306] of these, the point will be. Some make a hole at the end of their rulers to fix the point by that hole & move the ruler about. Others lay down a ruler across the panel, then on this laid-down ruler they set the tip of another ruler, which, attached to the former by means of a screw, moves about & reaches as far as necessary without losing the point.

ruler and compass without the judgment of the **eye** cause errors.

Perspective is very difficult.

[Figure: fig_po62v_1]

Margin Notes:

[LEFT-MIDDLE] To paint perspective in **oil**, you ought not to use a **ruler**, for you would smudge everything. But when layering your colors you need to keep to **the** & follow the lines of your first drawing.

plumb lines also, which go from the top **to make vif** to the bottom of the panel, you need to have a **thread** with some piece of **lead** attached to one end & a little **hook** to the other for hanging the said **thread** from the top of the panel.

Margin Notes:

[LEFT-MIDDLE]

[Figure: fig_po62v_2]

oil, it is necessary that you hold your panel as upright as you can on the easel, for if it is slanted there is a danger that some dust & **dirt** might stick on it. Keep clean & without dust the place where you paint.

Amaranth color

white wine removes its tint & turns claret-colored, ~~on~~ & the dry flower ends up white afterward. Note that in this way the wine,^[307] & I have *p* tested it. **Eau-de-vie** does as much.

oil

oil does not dry out, put in **massicot** & **minium**. There is no better oil than that of **walnut**, for it dries out neither too soon nor too late.

Germans use **lead from Flanders** because it is very soft. And to cast better they take **lead ore** & melt it, & separate what is melted from the **filth & ore**, & pour it into a separate vessel, then ~~the bottom~~ they make their cast with it. For the **lead** must not have been put to work before, but rather completely new. Some cast into molds of **iron & copper**.

Margin Notes:

[LEFT-MIDDLE] or new lead coming from the **mine**. They melt it twice in a **crucible**. In the first one, they purge it of **filth**. In the second, they *en* make the cast.

German PAINTERS make their shadows on flesh color of men with ground **jet, stil de grain yellow & ocher**.

Bistre

distemper, & with this **wood** color is made.

Verdigris and another very beautiful bright green

water alone, for that makes it die. To render it beautiful in **distemper**, some grind it with **vinegar**, but that makes it turn pale & become whitish. To render it beautiful, grind it with **urine** & leave to dry. Then, whenever you like, grind it with **oil**. And after you have collected it with the **spatula**, before finishing to clean the **marble**, grind **stil de grain yellow** on it. And you will have a very beautiful green.

needs to make thee^[308] middle main layer very *d*^[309] dark, & its folds & highlights very bright with white, & on the edges of *u*^[310] its light, you make a white line. For blue & green velvets, you highlight touch the shading with peach pit black, which is very black. For lake, black of pit coal which makes a reddish black on lake for velvets. The common charcoal makes a whitish black. *P*

Soft wood charcoal makes a bluish color. It is good for making armor.

Stil de grain yellow

broom flower boiled well in water, putting in enough alum, then ceruse.

Rosette

chalk, but the best has its body with ceruse & brazilwood dye.

Flanders blue

month of May, one puts the cow dung to putrefy under horse dung. Then one mixes with florey.

bistre.

minium & similar, finish softening while the work is fresh, for if you were to wait until *the next day*, it would be dry & you would not be able to finish it neatly.

[311]Yellow ocher

Margin Notes:

[LEFT-TOP] One needs a little of it in every flesh color.

Fatty oil

s makes them thick, & as difficult to work as *azur d'esmail*. Therefore use the **clearest walnut oil** that you can, & the freshest.

Margin Notes:

[LEFT-TOP] One softens in the same way on **oiled paper** as on **wood**. But it is easier to soften on **canvas**, because the softening must be rougher on it.

Vermilion

water when tempered ground with oil for it loses its color. It is better to choose whitish vermilion than dark & blackish. For vermilion is commonly mixed with a little lake, without which it would hardly be different from minium. But the pale casts more vivacity than the dark. It is not desiccative, & for this reason one mixes in calcined *cristallin*.

Margin Notes:

[LEFT-TOP] Every eye must follow the circle of the compass & not be flat & square.

Oil colors in water

e fo piece of tin leaf on top, & one puts them in water to prevent them from drying out. But this is more appropriate for ceruse, lead white, minium, & massicot than for the others, for lake dies there & loses its color, also azure, vermilion.

Verdigris does not die, & thus does not need to be layered twice. But lake & others, & principally flesh colors, the require two layers. Colors hardly change when they are dry.

painter

egg to do in which one has him make half a face, then a whole one with the ears, next the neck, then the parts of the body separately, next joined, then one figure, then two & three, finally a history, teaching him how to hold the charcoal by the end, & also the paintbrush. Once he knows how to draw, one teaches him how to *p* layer colors.

CThe^[312] figure of the egg is the main pattern for faces and for bent bodies, & the cross as the cross is the model for a straight & whole figure.^[313] Without these strokes you will never do well.

[Figure: fig_po64v_1]

azur d'esmail.

Margin Notes:

[LEFT-TOP] All colors that have no body
in oil have none in distemper, and
but in distemper they sink to the bottom.
Distemper colors want to be fatty,
which is recognized when they take hold
on the palette
once tempered
in oil.

ruler, but do not lay it flat on the panel, but as if lifted off, & resting on the edges of the panel. Otherwise you would smudge everything, & also you would not see the stroke well.

Distemper

Distemper colors need to be kept darker *pr* while you temper them, because they whiten while drying. But oil colors remain the same color.

oil, for the shadow, especially that of men, is yellowish. And for this effect use very strongly ground **jet**, which you will mix with a little **yellow ocher** & **lead white**. Or else, after you have ground your **lead white** *bro* and *clean p* gathered it with the

[Figure: fig_po65r_1]

, [314] grind the **jet** into it. Thus it will be more desiccative, & making on its own a yellowish black. A little white mixed in renders it perfect for men's shadows. Blacks which make a greenish black are appropriate for women's shadows. Take, then, some black of *[gap]*, a little **sap green** & **bistre**, & you will have a perfect shadow for women in **distemper**.

Margin Notes:

[LEFT-MIDDLE] The powder of *orberé grain* is darker than **umber** & when you lack **umber**, the said powder will do, but it does not have body.

lettre a ga right to left like

[Figure: fig_po65r_2]

, and whatever ought to appear round must be softened in circles.

Margin Notes:

[LEFT-TOP] One cannot layer oil on cut paper & model as in distemper because the color would run. Thus, to gild with or mat, one needs to pounce & then layer the gold color with the paintbrush.

[LEFT-BOTTOM] All fatty colors, such as ceruse and minium, massicot, ocher, lead white, are good for making gold color.

Mirror

cristallin mirror, which represents nature well, and in which it you will see if your shadows are soft enough or too crude. But do not look at it with a candle, for firelight will make the shadows reddish. The PAINTER also teaches himself with the mirror, for he sees in it what nature can do.

soap or breathe on it, because the humidity will make the colors take.

Margin Notes:

[LEFT-MIDDLE] Every color or thing that becomes dense when water is put in during the grinding has body. But those which do not have it, such as pestled glass, lake, &c, become clear.

a^[315] absorb into the **canvas**, it means that it has been given imprimatura only once, & for this reason they become matte rather than being shiny. But this is the best, as long as you re-coat it twice, for in this manner, the colors, having more body, do not die & are all the more beautiful for it, especially **azure**, **lake**, & those do not have body. But those who want to rush their painting apply imprimatura twice on the first go, to be done with it. Thus the colors do not absorb, also they will not last as long. The second layer of these does not absorb & remains shiny.

[316]

Margin Notes:

[LEFT-TOP] There are some who paint from nature on **oiled paper**, & if they do not finish in one go, they put their **paper** & unfinished picture in **water** so that it shall not dry.

charcoal at the tip of a stick such that you make your first drawing from a distance because up close, you would not be able to judge proportions as well as from a certain & sufficient distance. Also, **you** when you paint up close, hold your **charcoal** at the farthest end, & **de** practically with your **fingertips**. For in this way you will acquire an **ARTIST**'s stroke & *t*^[317] will render your **hand** nimble.

Margin Notes:

[LEFT-TOP] ILLUMINATORS painting on paper temper their colors with **gum** & mix in a little **soap** to make them run better.

[LEFT-BOTTOM] PAINTERS must all learn how to depict after nature, for to them it is travel provisions & revenue & sure means of earning their passage when travelling across the lands with only their *cocon*.^[318]

lake & verdigris. However, to use other colors, one mixes in a quantity of calcined & ground **cristallin**, which also has no body & makes lightens the density of the others.

apprentice should work with white & black for two or three years to become an ARTIST.

Margin Notes:

[LEFT-TOP] One needs to be quite careful about this, & not make it, as some will, with gold color which is made with the **washings of oil** paintbrushes, because **verdigris** & other corrosive colors which are in it will in the end make the colors die that are *meu* layered on next. It is good to do it.^[319]

Lead white

Margin Notes:

[BOTTOM] [320] with ceruse, & a bit of yellow ocher, & a little massicot, & make it not very thick in order that it does not crack.

Flemish & those who paint panels by the dozen only make one layer & finish at the first go, but the colors soon die. And when they are layered twice, they do not die. One needs to layer them lightly & not very thick, to soften them well.

*

Or mat

Margin Notes:

[LEFT-TOP] It is made with massicot, minium, *ocre de ru*, & yellow ocher, in order that the composition resembles gold. Gild *the day after one jo* it is laid down if you *in the* make the seat for the color in the *evening*.

asphaltum, umber, & a little lake.

Margin Notes:

[LEFT-MIDDLE] After having gilded,
let it dry
& rest one
day, next rub the gilding
with a feather & cotton in order
that no protrusions remain, then varnish with Flanders
varnish, which you make mixed with a little *eau-de-vie*,
to render it desiccative.

distemper on wood

distemper on wood, and because one is at pains to make a good *a* face on it, some thin their colors with *glair of egg* passed through a sponge, or mixed with the *yolk, water*, & thoroughly beaten with the *peelings of the fig tree*. With this

[321] they paint & soften on the wood, as with oil, and this supports the varnish, but this does not last.

Margin Notes:

[LEFT-TOP] The varnish will be dry in an hour. It will increase the color of gold. And this *or mat* holds in the rain, even if one rubs it. But it must be well dried for eight or ten days.

[LEFT-MIDDLE] Gold color that is made of different colors cleaned from paintbrushes for oil is not so good, & with *time*, tarnishes the gold because of the *verdigris*. One must not touch with a *finger* the layer made for the gold because that will keep it from attaching itself. The *or moulu* is spoiled if water touches it, but the *or mat* holds well in the rain & in water. One must not burnish it, because the tooth would remove it. Gather the protrusions & small flakes that the cotton makes lift off when the gold is dry & you clean it, for an ounce is still gold. In Flanders, women make gild. It is more beautiful when it is a little thick, but in France they beat it too delicately.

oil that are imbibed

oil are imbibed, that is to say they do not remain shiny after they are dry, for they do not die. But if in some places they are shiny, it is that the fattiness of the oil has remained in that part, which would make the colors die. The varnish mends all this & unites & renders it similar in one place as in another. | It is necessary that gold color be laid down thick, for if it were clear, it would be imbibed & would run.

Margin Notes:

[LEFT-MIDDLE] [322] On canvas & in distemper, one gilds with bole & honey & a little garlic juice.

Gilding molding for panels with *or mat*

see the other side of this folio this mark: *[323]

Flemish give a layer of **distemper glue** on the molding, then mix **lamp black** or **soot black** with the same **glue** & let dry. Next they pounce some moresque in the corners & paint it with **minium**, **massicot**, & **ocre de ru**, and a little **yellow ochre**, tempered with **fatty oil** in which they clean their paintbrushes for **oil**, because the three aforesaid colors are gripping & dry immediately. Next they lay down the **gold**, then varnish on top of all. And it seems to some by this means that all this black is painted in **oil**, but it would not be good because the **gold** would attach itself everywhere & not only to the moresque. Go back to the top to *[324]

Margin Notes:

[LEFT-TOP] Breathe on the gold color, and if it fogs up, it is dry enough, but if it does not receive the vapor of the breath, it is not enough.

[LEFT-TOP] One ought not to gild with **or mat** after **with** having **gilded**. But wait **one day or one night**, But take heed **not to** and when it is as if dry, it grips the **gold**. Next, one varnishes.

Margin Notes:

[LEFT-MIDDLE] When gold color starts to grip, it is a sign that in ten or twelve **hours** it will be dry & appropriate for **gilding**.

For preventing **teats** from swelling **d** or to diminish overly large ones [325]

loaves of bread freshly drawn from the oven & split them in half &, as hot as may be done, apply them & **they** & do this 3 times a day, & continue 4 or 5 days. Next, make a plaster with **Venice turpentine** or better, **common turpentine**. Mix in **sumac**, **blackthorn sloes**, **quince seeds**, **pomegranate flowers**, **olive tree leaves**, & the like, decocted, & mix with the **turpentine**. But, I forgot, one needs, after having applied the **hot bread**, which **softens** & **makes one sweat**, to put on linen cloths soaked with **water from a honey bee hive**, that is to say **honey** & **wax** extracted all together from the *honeycomb*.

Margin Notes:

[LEFT-TOP] *[326]

To make *or mat* beautiful, put in a little *varnish* or *fatty oil*, not from that which is made from the cleaning of paintbrushes, but the pure, which is made fatty *in the sun* or mixed with *ceruse*.

[LEFT-TOP] *Or mat* of this sort is scarcely less beautiful than *es*^[327] *burnished gold*, and lasts longer *in the rain* & besides, & is made sooner. *Burnished gold* cracks *over time* & comes off *in the rain*.

pigeons

hemp seed in a pan with *oil* & give it to the *pigeons*.

Against bruising of the eyes

At night, apply *very thin sheets of lead*. Singular remedy.

Paintbrushes

hair from the tail of a *squirrel*'s fur, as much in one go as one can hold in a *card* folded up like a cannule. And putting it thus into the said folded *card*, tap it & shake it such that the *hair* comes together & is rendered the same length. Put one or two *bristles of a rat's whiskers* in the middle, then, grabbing it with the fist & pinching it well with the *thumb* & *index finger*, thoroughly wet the tip of all this *hair* in *water*, then, moving close to the

hairs which make the tip too long with the *ends of your fingernails*, and this until the tip seems good to you, & until you notice in it the *rat hairs* which are entirely black & the *hair of the petit-gris*^[328] is *at the* whitish from the root to the middle. When it pleases you, bind *b* and tighten it very well with a *thread* in two places, then cut the excess & fit it in a *quill* of a convenient thickness for it, of a *duck* or a *crow* for the small ones. Good paintbrushes are those that, once dipped in *water*, do not bulge when you trace on your *hand*.

Oil

oil which is imbibed by paper & once heated by fire evaporates & leaves the paper clean, like turpentine & spike lavender oil, is good for making varnish.

Sand

Bellows furnace

metal, it is necessary that it be red at the bottom, like a charcoal & well inflamed. Next, you [illegible] fill it & cover the charcoal & adjust the bellows, otherwise the metal on top would melt by means of the bellows & its bottom would be curdled & cooled & would not run. But if you proceed in this manner you will melt everything you like.

Varnish on paper

Germans make boxes *p* covered with painted paper & varnish it with glair of egg mixed with gum & a little oil, not of spike lavender, but another *fragrant* one that resembles olive oil. Every work done with glair supports oil. It is with this that PAINTERS trick the POOR PEASANTS, painting their bands of taffeta with this glair, to be done sooner. But the first rain carries away everything.

Files

trempées à pacquet, that is, in the fashion described, with soot, salt, & vinegar, they will not be good. The square large square files used by LOCKSMITHS for their rough work are only made of soft iron, but the soft files must be made of steel. FOUNDERS whose work is to repair latten & copper must have their files *d* coarse otherwise they would fill up with the copper which would make them smooth & soon render them useless. Latten, which is more brittle, welcomes softer files than copper does.

Bones of the foot of oxen for sand

sand & need not be reheated, but simply heated with the flame of straw. But if you mold them *en noyau*, give it its first layer, simple & very thin, with a paintbrush, & leave to dry at ease. Next, fortify the following layers with wadding mixed with the said tempered sand of bone.

Margin Notes:

[LEFT-MIDDLE] It is the neatest sand that can be found for copper.

Essential oils

Walnut oil mixed with as much of turpentine & distilled through an alembic renders an essence whiter than common water. But this has no body & does not give bond to colors that are immediately imbibed, and then leaves the color without hold and fading. These, imbibing in this way, would not give you leisure to work and soften any more than in distemper. But you mend this defect by giving it a little body with turpentine, not at all so thick as for varnish. And thus you can work with azur d'esmail & will make a perfect lead white. Turpentine varnish made with this oil is dry in one hour.

fishes painted from nature & with colors on **simple carton**, & if you please, on **silvered** & burnished **paper** which will represent the scales. And next, cover this with **very clear lantern horn**. You can apply the same to other works.

dry place dry weather, & gather plenty of **earth** at the foot all around, like a mound, in order that the **rains** do not fill the **holes** & drown the trees.

sand for lead & tin: chalk, pestled glass, tripoli & burnt linen, all 4 excellent. But as for the chalk, it needs to be of the softest kind you can find, like the Champagne one that PAINTERS use. It releases very neatly, does not want to be moistened with *magistra* or anything else, but needs to be completely dry, in its natural state, finely pulverized. The first cast is always the neatest; however, it will well withstand two or three. But there is only the first one that you need to take heed of, when you want to remake your frame mold to take new powdered chalk that has not yet been put to use, for the one previously used in the frame has dried out & does not have as much hold & bond like the fresh one. Pestled glass can be made from common glass sand, however, *cristallin* is more excellent, for common glass contains glass salt of saltwort only, but *cristallin* contains both salt of tartar & saltwort all together, which both help fusion, the glass once calcined & reduced as if to its prime substance. In order to calcine it perfectly, throw your pieces of glass, whichever it be, among the largest possible lit charcoals that you can, if you are lacking another amenity *tfor*^[329] violent fire.^[330] And when it is well red, throw it into water

Margin Notes:

[LEFT-MIDDLE] Putty is considered excellent for these two metals.

fingers and easily pestle in a mortar of metal,^[159] or better yet, of iron. Next, it will be easy to grind it, not *only* on common marble that would corrode, but on porphyry, and it is necessary that it be finely ground with water so that when putting it on your fingernail, you find it soft

without any asperity, like the *p*^[331] colors that the PAINTERS grind for oil. This one, once dry, you can use *au lie* instead of sand, in a frame without moistening it with anything nor reheating it, if you do not want to; fumigate the hollow form with sulfur smoke or *of p* with the tip of the flame of a wax candle that barely makes smoke, and it will make a very neat & shiny & polished work, in pure lead & tin. I would say the same for finely pulverized tripoli that does not want to be ~~not~~ reheated or moistened. Burnt linen gives less trouble than any other, because it needs neither to be reheated nor to be moistened, & molds and releases very neatly & ~~very~~, subtly & ~~releases well~~ neatly, like the previous ones do as well, & withstands several fusions. First one ought to burn it with a flame, then leave it to rest & to be consumed with its fire until it wears it out, then finely grind it on marble or on a paper. ~~But because a lot~~ And if you reheat it in a crucible, red hot due to the fire, to render all of it fine & impalpable, I believe it will be even better. But because a lot of linen is reduced to very little when burned, if you want to save some, you can sprinkle only the medal that you want to mold & cover it, and fill the frame with pestled slate, which molds also very neatly. But note that the first cast is always the most beautiful & the neatest. If you cast opportunely, soft tin that seems to be burnished in little wheels that PEWTERERS sell, comes out very neatly & approaching the color of silver, without mixing in anything. It is true that one ought to cast it rather hot, & so that the molded object should be 4 fingers away from the cast. In order to know its heat, first melt it well, ~~with such a degree of heat~~ so hot that it promptly burns in a shiver a paper or straw placed inside. Then remove it from the fire & leave it to rest a little & cast. Tin mixed

half lead comes out almost better than pure tin pure or lead, even though in any case they come out well. Nevertheless take care not to cast lead at all as hot as tin. In big works it is necessary to moisten the sands with magistra or glair of egg.^[332]

Joiner

Sand

the one from the sea or *desei* from sandy paths dried out by the sun. But choose them or in *t* in the first place from quarries or rock caves, because that one is best, provided that it is very fine. You will recognize the vein of it if, among the greyish rocks or quarries *qu* that seem to be made of *arene*, you see, *after rainy weather*, certain small patches like dust attached to the said rocks, or if due to the humidity, a small piece of it flakes off, which easily crushes between your hands. You will also find in lean soils some which comes off in *lop* large lumps

like stones of *tuf* and not, or among *terres bolvenes*, which are much better than those in fatty & strong earths. And one ought not to take it from the surface, for fear that it be mixed with common earth, but three or 4 feet below & the closest to the *tuf* or stone. Since it comes out in large lumps one would say that it starts to take shape as a stone. But when it is wet, it comes apart easily. One needs to make sure that when breaking it up it is quite granular, & that when crushed between the fingers, it renders itself into very great subtlety, like impalpable, keeping nevertheless its sandy asperity, without muddying the fingers like clay. It is dried slightly on the *fillegible* fire,^[333] then it is pestled & passed finely through a double sieve or a linen sleeve, then is moistened with wine or *magistra* &c / *Verte*^[334]

Margin Notes:

[LEFT-MIDDLE] The Toulouse MOLDER reheats it strongly then grinds it finely on marble and passes it through a linen & moistens pass it with wine. He makes the cast very broad & not flat & barely deep. He casts pure latton used for *trebuschets* & similar thin things. He casts very hot.

[LEFT-MIDDLE] Try calcined vitriol.

sand near my area is very excellent. But one ought to, in order to make an excellent work, take it fresh, which has been hardly put to work. For it dries out after having been cast several times & is lean & has no body. If you cast some fine work which has hardly any thickness, it is necessary that your substance of copper be very hot so that it penetrates & runs. Some mix lead in this melt, but it is for large works & not for small ones.

Sand from oxen feet, burned twice & finely ground, melts more neatly with copper than sand that I have seen, & without crust. I have cast a high relief medal with it, and f with a thickness as delicate as a knife blade or a card. And it was hollow on one side, opposite the relief, which was on other side.

lean sands be more moistened than others, namely with *magistra* or good pure wine or boiled wine with elm tree roots & similar things. But very fine sands, like burned linen, which is fatty & soft on its own, want to be applied dry.

moistened sand wants to be strongly beaten & stirred, to be ground finely & to flatten out the clods that it makes in itself when it is bathed.

olive oil that some mix in with beaten egg glair makes it become porous.

Sand of calcined glass withstands several fusions, but there is nothing like the first ones. It also becomes porous.

Latten comes out well on its own, but it runs too quickly. It is good to mix it with a little copper, like a quarter part, with the substance of skillets.

Founders do cast frames up to 30 or 40 lb, but not more.

Margin Notes:

[LEFT-MIDDLE] It is good for big work, but for small ones it is troublesome for releasing H because it crumbles. It is good that it be alloyed with some fatty thing which has bond such as molded tripoli or ab burned felt or sal ammoniac or tripoli & similar things.

eof^[237] the metal, which afterward runs more easily in something that comes from it.

Human bones are the best for casting once calcined.

iron scales, either in powder or otherwise, E for it heats copper a lot & cleanses it of its grease. At the end, when you want to cast, add some saltpeter, by folding your additions in a paper in order that everyone may not know what you mix in.

Sheep foot bones are even better than those of oxen foot.

Oil & tallow make it very porous, & pestled glass, & copper alone.^[335]

Cendrée^[233] earth molds very neatly.

Ash does not have enough body to withstand copper.

sands, but to fill the frame with one only.

Latten is always fatty, & does not mold neatly. One finds that it comes out better alloyed with a quarter of copper, but let it be cast very hot.

Copper comes out well with a bit of metal.^[159] If you mix in metal within latten, it will be more brittle & more troublesome.

Slightly coarser sand has more body.

Sand from *eorp* rock is always better, which seems like *tuf* in lumps, which has a beautiful & very fine grain, & a little fatty. One pestles it, then one dries it in a skillet on the fire, until it is no longer *smokes*, then one passes it through a fine & double sieve, & one molds with it.

Margin Notes:

[LEFT-MIDDLE] Copper or *latten* cannot come out well if the medal does not sufficient thickness, & if it does not have it, give it some with *wax*.

[LEFT-MIDDLE] Some cast through a hole made in the middle of the reverse side of the medal.

[LEFT-MIDDLE] Some, wanting to cast large works in *latten*, in it mix in the *sand* some pestled *glass* to give the *earth* bond. But it makes it porous, and the work needs to be repaired.

[LEFT-MIDDLE] One puts in *lead* for a large work to make it run, but not *not* for in a small one because it would leave *filth* all around the work.

Copper *is-meil* and *latten* are proper to cast & at the right heat when they throw off, while stirring them in the *crucible*, a very white flame & that the bath is very liquid.

well ground ceruse for the, others in *flour* moistened several times with *oil* & g & dried in the sun.

lead, old *PRINTERS'* type or the composition thereof.

tin or lead a substance of *fixed quicksilver* which makes it run.^[336]

Amber

paste when boiled in *melted wax*, and takes color boiled with *ceru* fat of a young goat kid, for that of a *goat buck* would make it break, principally if it is glazed.

Wood with streaked grain

elm, in its knotty root, has beautiful streaks diversified with grey and black, and the root of the maple, but one needs to choose well the grain of the wood. One gives the maple a certain yellow color, then one varnishes it. [332]

wine

English, when they feel a cold coming on, mull wine in this manner. They heat it in a large tin pot until it boils, and when it is boiling up, they remove it from light it with burning paper to know if it is hot enough. Next, to ignite it entirely, they pour it from one vessel into another, as one who wants to beat *eau panée*, and as they are doing this, someone else lights with a burning paper what is falling from one vessel into the other, such that you would think you were pouring fire. When the wine is mulled enough, heat it again a little, adding a few cloves & a sufficient quantity of sugar. And they *bœi* drink it as hot as they can to overcome a cold.

Margin Notes:

[LEFT-MIDDLE] The common English put sugar in wine to affect for themselves the sweet new wine, [337] which they cannot have because, owing to the long sea crossing, the wine has lost its sweetness and is clarified before it reaches their country.

horses

horse, they make it drink some of the aforesaid wine through a horn, and it finds itself disposed for doing an even greater labor.

Eau-de-vie

Irish do not drink any wine because they convert it into eau-de-vie, which they use almost as habitually as we use wine.

Varnish

half lb of spike lavender oil, put in 4 ȝ of sandarac & mastic subtly pulverized. And first, boil your oil in a pot on a chafing dish, and then mix in little by little the aforesaid gums, stirring continually with a small stick split and quartered at the tip, & when you do not collect gum with the tip, that is to say that it is totally melted & that your varnish is done. And to render it clearer, put in a small lump of camphor to decoct. It is true that with this it is not dry so soon. Heed well that the spike lavender oil be good, clear & not fatty, otherwise your varnish would be worth nothing. You can test it, *et* soaking some paper in it & heating it. If the oil, which will evaporate, leaves the paper clean, without being a yellow mark, it is good, if not, it is fatty.

Sheep fat

England, the sheep that graze there have very yellow fat and are nevertheless just as good as others.

Spider

Ireland, there are none, & if one touches them with wood that is there, they die. This is why some RICH people of England make their ceilings from this wood, & by this method, they never have cobwebs & spiderwebs.

Sand

Grindings are very good for casting in copper, but one ought not to take those of CUTLERS, because it is only sludge, but rather those of those who mold grind large shears.

Pierres de filieres, [338] with which THOSE WHO SHARPEN smooth, [339] mold very neatly, once scraped, for lead. It is commonly slate-colored. One frequently brings them to Toulouse from around Carcassonne.

Printer's letters

lead some nails nailheads & old horseshoes, & antimony which makes it all melt. This composition is strong for printing, & holds up. It runs and is good for casting in lead.

copper

frame be quite even & that it fits well also on the board where it is set, so that it holds firm & does not shift when one molds. It is necessary that the sand be clean & well chosen and well reheated, & pulverized very finely on marble, for the one that you want to put first on the medal, and that you press strongly when molding. Guard against oiling your medal, for this would make it porous. Reheat slowly and reheat well, & let cool. Moisten your sand with wine boiled with elm root, and cast latten which comes out well / namely from the substance of the trebuschets and similar thin things. Make your gate broad & even if it is barely thick, it will not be worse off, but it will enter well in the mold. Cast from the foot of the medal, in order that the face, further away from the heat, comes out better & more relieved from the violent heat. And if your frame does not have vents, make some *qu* in the sand, which come from the edges^[340] of the piece, to go into the gate. Cast very hot, which you will recognize when you throw a little reserved substance in that which is already well melted, & if it melts quickly, this is a sign it is *fo* quite hot. At that time, invigorate the heat of your furnace with bellows of the right size, keeping the mouth of the furnace well covered with some large *euvr* tile or other similar thing, which should be very red before you cast. When you want to cast, take your red-hot pincers & the crooked iron as well, to clean the charcoals which are in your substance. Having cast, rub your work with a latten wirebrush. The grindings from sharpening large scissors & large knives is very good for copper.

Margin Notes:

〔LEFT-MIDDLE〕 One believes it to be a great secret to put in *persicaire*, which renders them soft as lead. Try to extract salts from it.

Lead, which is mortified & weighty, wants to be cast hot, more so than **tin**. And when it is not hot enough, it makes lines in the medal. It **Straw** burns in it, however little hot it is. One can make a **solder** so soft & runny that it can be melted in a **tin** dish. It is composed of one part **looking-glass tin**, one part **soft tin**, & another part **lead**. It runs very neatly and is cast in leaves, but the work is very brittle & breakable. The best **solder** is the common one for casting well, but **is** leaves certain points lumpy. Alloy **lead** with **tin** so that the ingot that you will cast comes out even & shiny & polished, & without any eyes or bubbles except for a small point in the middle. And this sign will tell you that there is enough **tin**, otherwise the **lead** dominates too much. **Sand** is good for **lead** & **tin**. The good one is very thin & fine & lean, which nonetheless sticks together between one's **fingers**. The **sand** wants to be reheated before putting it to use. And **onee** to mold with it, it wants to be much moistened & then reheated, not all at once nor with a burst of fire, for this corrupts & makes it shrink & crumble as well. But if you reheat it gently, it renders itself very stiff, once well moistened. One ought to pass it through a shirt sleeve for the finest one, in order to put it first on the piece to mold.

solder with quicksilver, **But** which is white, but it is brittle. Make it so that your frame joins well & that one does not see the light between the joints.

Germans cast their **leads** very thinly, because it seems they come out better than very thick ones, but in order that are not

too pliant, being so thin, they mix a little tin with the said lead, which otherwise would bend like wax.

The blackest lead, so some say, is the best & the softest & which runs the best. *You will know its goodness by rubbing it with your finger, which will render it very black immediately.*

lead & tin is per one lb of **lead**, one lb & a half of **tin**, *Aultr* in order that the **tin** exceeds more than one part. It is **solder** which flows well & is good for casting, but it is brittle.

Margin Notes:

[RIGHT-TOP] To make the **lead** flow well, one puts in a little **quicksilver**.

[LEFT-TOP] Rub **cuttlefish bone** on a well evened table to flatten it & one against the other & pierce through the two **bones** with pegs to mark the place.

[LEFT-MIDDLE] **Cuttlefish bone** molds **lead** better than anything else. But try it to see if it needs reheating. One ought to mold on the back of the **bones** & from this side for the **marrow** is more delicate there.

[LEFT-MIDDLE] The **bone marrow** toward the tail is more delicate & does have not as many stripes & molds more cleanly. The **shell** which holds the **marrow**, once calcined, is good for making **sand**.

[LEFT-MIDDLE] When you cast **lead**, you need to cast it **east** very neatly rather hot, & not at once & shake the frame a little & cast two or three times. However, if it is cast too hot, it will rise up & swell. When it is very hot, it becomes blue, let it then pass this color **deva** & rest a little before casting.

[LEFT-MIDDLE] Some, such as **PRINTERS**, mix **iron** or **pin filings** in the **lead**, **But** in order to render it hard. But this renders it brittle & **not** it breaks under the hammer.

[LEFT-MIDDLE] Take a wirebrush to clean your molds.

[341]For making blue varnish

blue of flowers of florey or of Flanders^[342] & quicklime, and put around four fingers of water over it, and let it soak one day / Take the water where the said lime has soaked, and put your blue with it, and lay it down on the wood.

water in which lime has soaked and put terroy merita, one with the other, and then set on your wood.

bone or horn of grease

quicklime, and let there always be water, and take a very clean pan. And when they are washed, boil them in the ash of vine shoots, and put them into the hottest pot you can, and put into the pot GOLDSMITH's water, verdigris, and leave for the space of some time, and you will see a very beautiful green color.

wood

alum with river water, make them boil together, then take river water with bran, submerge the bran and beat it together. Take iron filings & sulfur & verdigris and grindings^[343] [gap], and make it all boil together, and pound maplewood which will have been soaked in alum water and well water, & put it to boil together. All of this will be done better in a hollow grais.

bronze in gold color

ounce of sal ammoniac and grind it in an iron mortar. Once well ground, take one ounce of sulfur, and

Margin Notes:

[LEFT-MIDDLE] l_____ [344]

[345]grind it separately. When it is well-ground, take the **sal ammoniac** & grind it together again. Then take one ounce of **soft tin** & one ounce of **quicksilver**, then melt your **tin** & put your **quicksilver** drop by drop into your **tin** while melting, & stir strongly until it is powder.

glue of Partenay or parchment and apply it with the white of one egg, then take a little saffron and vinegar and the milk of the fig tree, and do another coat. Then take the bronze and apply it on top.

Varnish

ounces of **spike lavender oil** & one ounce of **sandarac**. Take a clean pot, & warm it, & then take it from the fire, and next put the **drugs** inside, and next put them into a **vial**, & apply it on the **wood**.

varnish

ounce of **verinse Venice turpentine** & one quarter ounce of **oil of perolle petrole** & one ounce of **sandarac** & one of **spike lavender oil**.

ounce of **sal ammoniac** with one ounce of **brouillamini** and half of **copper filings** with one ounce of **sulfur** & a half-septier of **vinegar**. Push it all into a small tile oven and make a small **charcoal** fire around it, and put your pot into the said oven for the whole day.

[345]For bronzing white

looking-glass tin & put it to soak in **gum water** & pestle it in a mortar. And next, you will put it on **marble**.

vermilion

pounds of **sulfur**, & melt it, & put it into two pounds of *mereeuse* **mercury**. And if this substance ignites, cover it quite gently, so the air does not pass into the pot, then put the whole for some time after into a **leaded** pot, onto the fire for the space of twenty-four hours. You will have **good vermilion**.

varnish

pound of **linseed oil**, and then you will put it in a **earthen** pot, mixed with a **crust of bread** and three **onions**, and put it on top of a **charcoal** fire, and you will cook it on a little fire, so that it boils for the space of five hours. You will take half an ounce of **flour glue**, & you will make it boil just as before and stir with a spoon. And then, after, you will put in two ounces of **well-pestled sandarac** & will do as above. And then after, you will take **mastic** & **arabeic**,^[346] two ounces each, which will both be well ground, and you will put everything together, & will make it boil while stirring continuously, for the space of five hours. And then you will put **d'araueq rock alum**, two ounces, & then you will make it boil. And if you add two ounces of **l'arable arabic** to it, if you see that they are not cooked enough, have it cook more on a low

[345]fire until it is cooked enough. And pour it into a **cloth** that should be rather tight. And when you have poured it, let it to cool a little. And if you see that it is too thick so that you cannot pour it, you will put a little of the said **oil** & you will make it better.

red varnish

vermilion and make it soak in quite clear gum water, like the other, and *s* make two or three ground layers as above.

yellow varnish

gum arabic & ^[347] soak it with water, then take some well beaten saffron, & temper the said gum, and make it quite clear, then make your ground layer on that which you want to varnish, & let it dry, & when it is dry give another ground layer of the same, & let it dry as before until it is dry enough. Then take varnish from an APOTHECARY, dash by blows, one quite far from the other. Then wash your hands quite well & with your palm spread your varnish.

gum

white wax & ceruse & a small amount of fine pitch very well pestled together, & put it in a small new pot & make it melt. And when it will be melted you will make a spatula of wood *of*&^[348] burnish what you want.

gum

green wax with a small amount of verdigris and make it melt as above.

[345]Red gum

red wax, vermillion, & a small amount of *resins* resin pitch, as above.

Bronze of copper

da some verdet & clear glue, & grind it together. Then make a layer on your wood, and take pin filings, and grind it on marble with water, then pour it on the wood & polish it with copper.

Bronze like tin

looking-glass tin, two ounces of **quicksilver**, & melt the **looking-glass tin** into a new pot. And **difiant** as soon as it is all melted, put in the **quick**^[349] **aiant** **silver**, & remove it from the fire, & let the said **glue** dry. Then take a piece of **tin** & burnish it on **marble** with **clear water**, and then coat it on the **wood**, and polish it with a piece of **tin**.

aquafortis

half-septier of **vinegar** with one ounce of **verdigris**, & one ounce of **copperas** & one ounce of **solle**, then put them together in a **glass** vial.

Or moulu

fine gold & put it on a quite clean *but* **marble** & put **aquafortis** & start crushing. Then take **saltpeter** & **sal ammoniac**, and put it into a shell which should be large & washed, for safekeeping.

[345]For making gray wood

half-septiers of **iron filings**, xviii *s* deniers'-worth of **glass alum**,^[350] & as much **green copperas**, six deniers'-worth of **verdigris**, *am*^[351] **pitch**, & a quart of **euyr CURRIER'S water**, and if you cannot find it, you will put **more rainwater** *[gap]* of small degree.

gilding on wood

very clear glue, and once dry, you will put down a layer of **yellow gold**. And when it is done, you will take **fig tree wood**, & put it to soak some space of time, & wash the places you want to **gold**, and cut your **gold** with a knife to the price that you will lay. And one must lay the said **gold** with **cotton ie.**^[352] And if you can find a **fig tree**, take the **the white of one egg** & stir it vigorously.

gold does not have beautiful enough color, you will take a **partridge feather**, & make it burn in a chafing-dish, and make the **smoke** go against what you have **gilded**.

gilding with or moleu

shell of gold^[353] and, before you want to work with it, you will put it to soak with gum water and lay it down with a paintbrush, & polish it with a wolf's skin tooth when it is dry.

woods in color

olive oil, and similarly for horn, as the case may be, four or five days, & then boil it where it has soaked for the space of one hour, & take it out of the oil, and take some natural sulfur or another

[345]if you cannot find it, and cover the said wood with this powder, until it is cool, & you will make it boil again, & boiling it, one will see if it is black enough or not. If it is not enough, you take the said powder & put it on the said wood while boiling.

wood green

quart of white vinegar & one ounce of green & one ounce of glass alum, all mixed together, and you will put your substances into a leaded pot over the fire without taking air, & then put the pot in a dung heap for fifteen days, and once it is out, you will boil your substances for the space of three hours.

wood red

quart of old urine and three ounces of madder & one ounce of glass alum, and you will put all in your pot, & do as with green.

quart of urine as above and one ounce of alum & two drams of sal ammoniac & half an ounce of pastel woad flowers, the whole made into powder, and do as with green.

quart of urine & one ounce of alum & two drams of sal ammoniac & one of lake, & do as above.

urine as above and two ounces of guesdre woad & one ounce of fustet and two ~~ounces~~ drams of sal ammoniac, & do as above.

[345]For making very beautiful color of gold & of little expense

orange peel, & clean them well of the white that is inside, & pulverize them very well ~~and~~ in a very clean mortar. And take as much of sulfur, & grind all together, and put everything in a glass vial, & keep them in the cellar or other humid place for the space of eight or ten days. Then when you want to use it, one needs to warm it and use it where you want, & you will see a very beautiful color.

goumiche

glue, & temper it with vinegar, & melt it, and it should be very clear. And take lampblack or another black & mix them together, then put it on wood.

white wax with ceruse, and melt it all together, & lay it on wood^[354] or another thing.

iron or tin

wine lees, and then wash it again with white wine, and take three ounces *terra merita* & a chopin of white wine, and boil the substances the space of half an hour, & put down your colors on your iron or tin, or other, and then let it dry on a piece of paper, & not put the hand in your materials.

[355] Against redness of the face

lead cap & wear it *overnight*. Excellent secret. Try a lead mask.

orientals against all maladies

[Figure: fig_porr_1]

rosemary in the month of May, then fill this bowl with powder of it, and put a lit charcoal on top. And, receive the smoke by a quite tightened mouth, and a part will come out by your nose. But if you want to purge the head also pinch the nose. Against colds, rheums, and other maladies.

Fatty earth

Founders, to make the handles of their bells, use it. And before it is used, they beat it very well, then leave it to dry in the shade, little by little & for a long time, and mold with it very neatly. But it must not be sandy &, but rather well chosen & soft.

[356] Recipe for making bronze and varnish of many sorts

varnish with clear water which you will use with a paintbrush and immediately dry, for putting on paper, a tablet, or another piece.

ounces of eau-de-vie and one ounce of benzoin pestled between two pieces of paper or card or in a mortar,

[357]but it should not be too small, then take *fillegible* a glass vial not too big and put into it a half of these two, namely two & a half ounces. Next take the said benzoin just as coarsely pestled, and put it to use with the said water and let it rest for the space of one & half days, & then take the said water & put it into another glass vial & mix it very well. And on the rest of the said benzoin that remains at the bottom of the said first vial, put the rest of the water over this, and do as before when you see that the case is going well, and mix the first water with the second. By means of this you will be able to use it for something more noble.

varnish

ounces of linseed oil & two ounces of *petrolle* oil and two ounces of mastic, the whitest you can find, and of glass alum,^[350] & grind it, and take a little bit of white copperas, and put all these drugs together into an earthen pot that should be new, and lay it on hot ashes for a bit, and you will see a beautiful varnish.

varnish

petrolle oil & spike lavender oil, as much of one as the other, & mix it together with copperas, & make them melt over hot ashes, according to the quantity that you want to make. To lay down this varnish, put three coats on the work that you want to varnish.

varnish

ounce of spike lavender oil & of sang de raiey^[358] da Rac^[359] & make

[357]these drugs melt in a new earthen pot, & when it will be melted, you will pass it in a clean cloth & you will see a beautiful varnish.

varnish

ounce of spike lavender oil & heat it over charcoals, & then take a half ounce of sang dea^[163] Raiec^{[360][359]} & grind it coarsely, and then put it into the spike lavender oil, & then mix it with a stick until you see that it is melted, and then put it in a glass vial. And when you want to use it, heat it little by little over the charcoals. And before putting it down, put down a coat of very clear glue, & then put it down with a paintbrush.

red varnish

vermilion & temper it with gum water as well as with other water, and make it like the other varnish, & mix this other water like the other varnish, and then lay it down as before for making three green.

trwood^[361] green^[362]

very strong vinegar, salt, & rainwater, and one needs to put it all together with verdigris, and put it in a new earthen vessel with your wood, & put it in some very warm horse dung for the space of eight or nine days.

I357]For making bronze in the color of steel

glass alum^[350] & antimony, but one needs twice as much glass alum as antimony, and pestle the whole together in an iron mortar, & then mix with gum water while grinding it on marble, & then one needs to use it with a paintbrush, & next let it dry, and then polish it with a tooth of a wolf or dog.

bronze in the color of gold

copper filings & ocher & gum & alum, & grind it all together in a stone mortar, and when it is well ground, you will lay it on the work with a paintbrush, then polish it with a tooth of a wolf or dog.

bone or horn green

verdigris & temper it with **strong vinegar**, then soak your **bone or horn** an **hour**, & then put it to use.

bronze

pin filings & other of **latten**, & put it together, & grind it on **marble**, grind it well with **water** little by little, until they are distilled, then put them into some new **vessel**. And

[357]when you want to use some of it, mix it with **very clear glue**, & then you will layer it on what you want two or three times, & then let it dry. But before layering it, lay down on it one layer of **very clear glue**, & let it dry, & rub the said **bronze** with a tooth of a **wolf** or **dog**.

wood gray

grais powder, _____, [363] iron filings, ironware, alum, CURRIER's' black, copperas, & glass alum.[350]

water for disease of the eyes

white copperas, & heat it a little on the fire, then put it as a powder on a white cloth stretched over a very clean **glass**, & the powder on top, then take **fountain water** & pass it through the said cloth, while stirring the said powder with the **finger** until it has all gone through. Then wash your *v* **eyes** at any hour you wish & with the help of **God**,[364] you will find yourself very well from it.

bronze in the color of gold

ounces of calcined **tin** & as much of natural **sulfur** & six ounces of **sal ammoniac**, and put the **tin** to melt in a spoon. When it is melted, put in **quicksilver**, and cast it in a line, then pestle all these **drugs** together in a mortar, &

[365]and put it into an **earthen** pot, & it should have many hot **ashes** underneath, & little by little you will make the fire underneath bigger and bigger, & one ought not to move it, & when it is cooked, & it needs to be for six **hours**, **mind that the fumes do not harm you for they are bad.**

varnish

mastic, **sang daRage darac**^[359], **gum arabic** & **spike lavender oil**, as much of one as the other, & make them melt all together, & before coating it, lay a coat of **glue quite clear**, & let it dry.

[366]Antidote against the fumes of metals

In the morning, take a piece of **toast with butter**, & **neither antimony nor any other vapor will be able to harm you**. Or put **half a pig's bladder** in front of the **face**.

Tin for casting

common tin, which is the one that **PEWTERERS** use to make plate, which is composed of 9 or **ten** ten 1b of **fine lead** for one **quintal** of **tin**.

Margin Notes:

[LEFT-MIDDLE] Some find that there is nothing better than **fine tin**.

printers

pulverized antimony, & a layer of **latten** & **old scrapings** or **thin plates of iron** or **elo iron nail heads**, and continue in this way until the **crucible** is full. And melt inside a **four à vent**, & then mix a little **tin** & fill up the **crucible** with **lead** ~~until it causes it~~. And increase the fire & mix to make the substances alloy well. The mixture for large letters is harder.

fine copper, which is capable of fifty 1b of powder, in the shape of a reinforced firkin, and having made a hole even ~~ef~~ with the ground at the foot of a wall with *gimlets*,^[367] they set the said loaded petard in that hole, with the muzzle pointing up, which makes a large breach.

stucco

White wax, Venice turpentine, eggshell & ceruse.

[Figure:fig_po8or_2]

water rise higher than its source, make a pipe descend as in A to B. in order to give it push to the water, then from B to C make the pipe ascend again, which should not quite attain the height of the source, which is represented to you by this horizontal line, then make the pipe descend again from C to D, then raise it again, higher than the line showing the height of the source. And do this successively until you have reached the desired height, heeding nonetheless that the length of the descending pipe should be twice as long as the ascending pipe. This cornet folded back on itself also shows you a perpetual fountain which you can fit into some rock, pulling the water with which it is filled by the tip marked E, by sucking & breathing in. You can also make a watering pipe in this manner, such that the trussed-up length is as long as its straight pipe, & nevertheless does not descend as far down.

[Figure:fig_po8or_1]

[Figure:fig_po8or_3]

Founders of small works of tin

solder, even the things that should not come out empty, for the latter require **fine & soft tin**, which however would not release, & would not come out empty if it was mixed or had some **looking-glass tin mix** in it, just like they put in a little of it in **soft tin**. They engrave their works on **stones** of which are made the **sharpening stones or files of BARBERS**, which are found in **great flakes near the mountains**, & resemble **slate**. They are of three colors: reddish, which is not as perfect as the others because it does not last as long in the fire & as, one **dard** of the color of dark **slate**, the other whitish. When they have some relief, first they imprint it on **carton** as thick as one **finger**, to serve as a pattern, then with a little compass & little matching **iron fittings**, they engrave their figures, having first flattened their **stones** & worn down one against the other, they make their **p** molds of three or four pieces, to make a circle or a square which joins perfectly, because the **stones** render themselves even. Before casting, they rub the **mold** with **tallow**, which has quickly absorbed it because it is hot. Then, taking **fine powder of quicklime** in a **linen**, they pounce the **mold** while beating with the **linen** on top, then blow a little on top to prevent it from becoming porous. The main thing is to make vents, if the work is largish. They make them in this manner, as you see represented here. They pierce a hole in some place on the medal that is least visible. And then with a **borer** they pierce the **mold** on the side of the medal. And if they want their work to stay pierced in any place, they drive in a bit of **cork** at this place in the **mold**. And the **lead** or **tin**

[Figure: fig_po8ov_1]

will not attach to it.

Margin Notes:

[LEFT-MIDDLE] Make sure the pegs of your frame enter easily so that n
in opening the frame will easily open without shifting anything, and that your frames fit well together, & that the table is quite even.

[LEFT-MIDDLE] Try to engrave^[103] with distilled vinegar.

[LEFT-MIDDLE] Try calcined oyster shells. They are said to be excellent for molding.

Sand

on the little hill of Puy David^[368] near Thoulouse for lead, tin & copper. It does not want to be too much reheated because, drying out all at once, it loses its bond & burns at the first arrival of metal, which makes the work lumpy & not neat. It is better to reheat from a distance, rather than with a straw flame, which generates some some filth. Before filling in the frame, you can put in the finest sand you have in a very fine linen, & dry pounce the medal and then the moistened sand that you put on top, which has more body, will grip it.

Margin Notes:

[LEFT-MIDDLE] Tallow makes it porous.

[LEFT-MIDDLE] Fixed mercury mixed in when one wants to cast, makes metal lead run. But if it is pure, one ought to cast very hot so that it runs. And vents.

Earth for molding

TANNER's earth, or the one with which POTTERS make a whitening on pots to make lead run better on them & to prevent the lead from being absorbed into them, is very good for molding the hollow forms of things you want make in relief. It releases better than plaster or sulfur which become hard once they have set. For the earth being ready, one ought to beat it hard so that it does not crack. If the piece is very large you can mold it in several parts. If you reheat it, it is necessary that it be over a closed fire. One finds this earth at Fosseret^[369] & in another place called Ox.^[370]

Plaster

iron or *metal*^[159] pot, you mix it with an iron rod, & if it attaches to the iron, it is not cooked enough, if not, it is good. The water with which you temper it should be a little warm & the mold made with the aforesaid earth also a little hot. The work of plaster does not last & the faces & delicate things break if one does not give a coat of glue.

Carton

paper from Florence, which is the finest, & pestle it & soak it several times & change the water every day, so that it does not smell bad, & when you have molded it in the hollow form, put a linen over it, & from the back, rub it with a tooth, as if you wanted to burnish it, and it will mold very neatly. Then glue the cloth on the back with strong glue.

Sand

brick, very finely sifted, & worn down one against another, is good for all castings of lead and copper, mixed with urine. This needs to be of that whitish brick.

copper and latten run

sal ammoniac & saltpeter, which removes filth & heats it. Mix some ardides with the latten. Guard against the metal^[159] touching the iron or the latten of the frame, but cover it with sand or lute. Do the casting very evenly.

Sand

Calcined black pebbles from the river are good for lead, but they dullen metal.

[illegible] clay earth with which one makes tiles, reheated & reddened & passed through a sleeve finely mixed with glair.

Willow charcoal is excellent^[371] for sand for b lead.

Latten runs better.

Frame casting

boxwood. Turn it in order to make it even, as this is important for the casting. Lute also, or cover the mouth of the frame with sand in order that the melted metal, or lead, or copper does not touch the frame's iron or latten, because it makes it brittle, & makes it porous. Also make sure that the cast is always higher than the mold. Also guard against the cast being too wide or too deep because the narrower, the better. For when it is big, the weight of the substance that runs breaks & shakes loose the mold & makes it porous. When you have cast, gently tap the frame, in order that the substance spreads better. Black lead of saulmon^[194] from the first melting makes a very neat one.

copper

filth.

Frame

Iron & copper make it porous if the metal^[159] touches it, & the wood warps. Thus, make a mold of wood, & have frames of bricks made inside this mold of whatever thickness that you want.

Glair of eggs

Glair of eggs gives strength to sand to make several casts.

Clockmakers

compass, for there is none so fine that it can compass distances as small as those of the small cogwheels. But they make a platform (as they call it) of latten make divided into several circles, & each circle is divided ~~into~~^[372] equal distances marked by a point, and each circle has a certain number of them, for example one 30, another 36, another 40, &c. Then, on the pierced center of the platform, they set the small cogwheel there, and on the center of the cogwheel a flat line or alidade which is moved to the circle with the number that you want to mark on your cogwheel. Then they mark a line on the cogwheel with a sharp point, then move the alidade to the following point, & continue to mark thus. And to mark the

points on the circles of their platform, they divide the circle into three & then divide this third part into as many distances as is necessary with regard to the total division of the circle, & make in this manner their division & distribution of the teeth as fine as they please.

[Figure: fig_po82r_1]

Clockmakers

In the past, they tempered their springs by dipping them into molten lead. But *today* they temper their springs straight, & bend them once tempered, which is a *pa* beautiful secret.

lead in lead

lead, then cast lead in them.

Lead when not cast hot enough, is white, & blacker when cast well hot.

Margin Notes:

[LEFT-TOP] One can make a lead mold, & to cast in it, smoke it with candle black. But it is never that neat.

[LEFT-MIDDLE] Never does lead come so neat as tin.^[373]

Sand

bronze

Latten of potin *eor*, which is the most brittle, molds more neatly, according to the opinion of many people, than **fine latten of pots**, just like all **fine latten** molds neater than **red copper**. If you want to cast something fine & thin, the entire secret is to cast as hot as possible so that the substance boils. You will recognize that it is hot enough when it **smokes** a lot and while

stirring it throws sparks. To heat well, place your crucible as low as possible & at the very bottom of the forge, so that the bellows *fra* beat on the middle of the *crucible*, for in this way it is better than on the grate on which one usually puts the crucible, under which the bellows beat. It is true that the crucible risks more danger breaking, but you can lute it as you know FOUNDERS do. And also, one ought to maintain the charcoal between the bellows & the crucible. Also take heed to cast all at once & not in increments & drop by drop, which would stop & plug up the conduit of the substance. And if you were to make in the cast a trough to feed the medal, it would be even better. And in order that the substance heats well at the bottom, stir it, once melted, with a stick, for iron only makes it brittle. Turn.

Margin Notes:

[LEFT-MIDDLE] Some put wool stuffing in order to heat it & make it run.

[LEFT-MIDDLE] Put under your crucible a thick iron slab, which will redden & will maintain the heat under your crucible.

[LEFT-MIDDLE] The copper substance is found to be good for casting, when once broken it makes the grain long & not short, for it demonstrates that it is soft. It is half fine latten & half red copper. This long grain is called long stalk.

Sand for lead

R [374] grey soot from the furnace of the SILVERSMITHS, quick lime, and flour ana, [375] moistened according to the art, being the finest possible.

Margin Notes:

[LEFT-MIDDLE] The grey soot of LOCKSMITHS, which is held in the forge, is very fine once ground, molds very neatly, & releases very well.

Sand for copper medals

R hat felt burnt on a covered fire, dross of iron, & burnt bone, all of which ground very finely & pestled & watered with saltwater; & make a paste of it & mold it, & wipe it over a straw fire. These three sands, pulverized and very finely ground on porphyry, mold well, and I think that separately each of them is very good. Burnt hat felt molds very neatly and releases very neatly.

Margin Notes:

[LEFT-MIDDLE] Plaster molds very neatly but it becomes porous. Bone has scarcely any body unless it has iron dross. Felt makes it release.

sand

Charcoal of vine shoots & clay earth, well cooked & well sieved, as much of one as the other, & join them together with well beaten glair of eggs, then calcine in the furnace, & to use it, temper it with vinegar.

lead

R finely pestled slate & ealeined pumice stone, mixed together. Calcine them in a well covered pot, & thrice stoppered over a good fire, & each time temper them with varnish.

R *p* a little-cooked tile, ground & tempered in white wine with burnt black tracing paper, & if you add burnt horse dung, it will be all the better. Moisten with glair of egg.

Margin Notes:

[LEFT-MIDDLE] Tracing paper burnt over a closed fire is reduced just as charcoal & very soft black, molds neatly & makes it release well mixed with the others.

Excellent sand

Alabaster calcined in a *crucible* over *charcoal* fire, so that, touching it, it turns into powder. Once cold, pulverize it finely & pass it through a double sieve & render it as if impalpable. And *d* with one lb of *alabaster*, one needs one $\frac{3}{4}$ of *sal ammoniac*. Mix well & incorporate everything together, then put them in a *cellar* cellar or a *humid place*. And with this paste, mold what you will need, & next dry the mold in the fire, & cast whichever *metal* you wish, while the *sand* is hot; & you will cast as neatly as the principal,^[376] & the *sand* can still be used by placing it in a *humid place* & drying it in the fire.

water

humid place some *sandiver*, and then place this *water* on what you want to mold, having encircled it, and place it to coagulate on the hot *ashes*. Do the same with *vitriol* & *copperas*, which, once well calcined, reduce in *water*.

copper, latten or similar metal, very neatly, and then when you have molded the hollow form in the sand, leave the figure of metal that you ~~s~~ have molded in the frame, without moving it from its place. And cast, & if there is not enough thickness press a little & push the figure down in the frame.

filth & grime accumulate. And, in this way, if you were mold the face toward the cast, some grime could be found there, & it is better that is found on the clothing, which is easier to repair.

Vinegar is better for moistening than wine. It is necessary that the frame be quite smooth and even otherwise, ~~And that the east be as you press on one side, the other one lifts.~~

press is better, for it tightens evenly, & more than your hands, and makes the coarse sand, which is humid, communicate its humidity to the soft & fine sand, which is sprinkled & pounced dry on the medal.

the one some^[138] frames, Is without stirring it because, if your hollow form is not molded very neatly, you can put it back in the right place by means of pegs, which will prevent it from shifting. But, at first, pounce your medal with very fine willow charcoal, & ~~se~~ next clean it, for this degreases it, & makes it easier to release afterward.

frame & the sand.

Bellows

Margin Notes:

[LEFT-TOP] To melt with bellows, & hasten your melt, & also cast hotter *po*, do not place your bellows at the bottom near the foot of the furnace, for fear that some charcoal might *you* enter it, put them almost under the grate. It is good that your *four à vent* be in an aerated place so that the wind might make it heat better, & that it be well dry, & reheat. One ought to plug the doors of the furnace & that there is only the entry of the blast-pipe of the bellows. And by the end, you need to give it force, as at the beginning you will blow gently.

paper & put it on the face of somebody who is making an ugly grimace. Let it dry & take your pattern to paint from it.

#^[377] & swellings. It is necessary that it not be too humid for the aforesaid reasons. Reheat little by little. And if, after molding it, you leave it to dry slowly, in some dry place & not over a big fire, it would be better, for when one exposes it all at once to intense heat, it warps. I believe that reheating it at the mouth of the oven, *after the bread has been taken out*, would be very proper. One ought not to complain about the difficulty of preparing it, for it withstands as many castings as you wish, because it renders itself as hard as marble, & you can polish it, & the mold cannot be spoiled. Once used, pestle & sieve it again, yet without being scrupulous to render it so fine, *I* for having been passed only through a common sieve, it has more force *than* and releases better, than when it is so fine.

Eau magistra

rock salt or salt finely pulverized sandiver & put on marble in a cellar, & it will dry out by reheating the mold, & will give it a bond to withstand several castings. Try to moisten it with tartar oil.

Flour

Advent,^[378] keeps for the whole year.

Sand from a mine of Thoulouse

sand from **Thoulouse**, which is taken from the **depths of the earth**, from the small hill of **Puy David**, is excellent in itself, but to make it withstand several castings, I mix it with **pulverized sandiver** & moistened, which hardens it, & takes body & bond with it, & makes it withstand **more than five** as many castings as you wish. *Try to moisten the pestled glass* and other **e^[379]** **sands** with the **waters of the aforesaid salts**. It wants to be, like all **natural sand**, well reheated before putting it to use. One pulverizes it, because it is in lumps, then one reheats it in a **copper** kettle or similar thing, until^[380] it no longer **smokes**.^[381]

Margin Notes:

[LEFT-MIDDLE] It is necessary to reheat it before using it. It is rendered better for casting because it is reheated, but when it has been used a lot, one ought to refresh it with new sand.

Sand

bone of **oxen** feet, thoroughly burned & pulverized & ground on **porphyry**, until it *is not felt between your fingers*. It molds on its own very neatly. But because on its own it is very arid & lean, it wants to be well wettted & moistened with **wine boiled with elm root**.

Iron dross, **well burned bone of oxen feet**, **felt also well burned** over a closed fire, and all three very well ground on **porphyry** mold very neatly in **lead**, without needing to be reheated a lot, & casting **it** in a hot or cold frame.

Felt alone molds very neatly once moistened & releases well, and also makes the other two release.

Margin Notes:

[LEFT-MIDDLE] These **sands** only withstand one casting.

[LEFT-MIDDLE] A **fatty sand** which is rendered very smooth, makes it porous.

[LEFT-MIDDLE] A fatty metal needs lean sand.

Eau magistra

salt water is not good, because the salt cracks in fire, & consequently should make it porous. There is only the wine boiled with elm root.

Charcoal for pouncing makes for a good release, but one finds that the one of willow makes it porous. The one of oak or beech does make it porous well without making it porous.

Margin Notes:

[LEFT-MIDDLE] Try burnt oysters.

Lead

soft lead that wants to be cast very *g* hot, and soft tin.

Sand for lead, the most excellent of all, for high and low reliefs

X^[104] I took ceruse and crushed it dry on porphyry to make it very fine, then I moistened so much with well-beaten glair of egg that it was like a paste, smoothing it perfectly with the dull side of a knife. I left it a little

Margin Notes:

[LEFT-MIDDLE] One ought to mix it well with a knife.

very clean & smooth table, & since it is desiccative, I knew it would dry out *lor*, which I let it do in order to reduce it to powder & to mold it with sand, broken up with my fingers & the sharp edge of a knife. I oiled my medal, because oil cleans it without spoiling it. And And

having dried it & cleaned it with a **linen** cloth & very small **hog bristle** brushes, I once again lightly anointed it with **clear walnut oil** & gently passed a **linen** cloth over it so that it does not remain too anointed, and I noted that, by this means, it would come out better in release, because the **ceruse**, once moistened with **water of glair of egg**, would not attach to the **oil**. This worked very well and I molded a medal of high relief very neatly, without any sticking, which a lot of good **sands**, such as **felt**, **burnt bone** & **iron dross**, had failed to do on the first try. I reheated it & my **mold** became hard like **marble**, and by this I knew that **sands** for molding high relief should be well moistened with some **water**, which gives them body & compactness, such as **glaire**, **gummed water**, **ea** **wine boiled with elm root**, &c; and lightly **oil** the medal, it withstands as many castings as you wish, for it is as hard as **glass**. But even **soft lead** & **brittle tin** want to be cast very hot.

sand, even though it is excellent & endures many castings & molds very neatly, nevertheless is fatty and makes things porous. Thus, **soft lead** and **the** does not come out so well. But try to mix it with a **lean sand**, such as **pumice**, **scales** & similar things to give them body & so that they release better. For **lean sands** barely release well and yet they receive **metal** well.

Margin Notes:

[LEFT-MIDDLE] Try to mix **ceruse** or **minium** with other **sands**.

[LEFT-MIDDLE] X

Oil & anoint with **aspic oil**, which will go away when reheating, for the **oil** makes it porous.

[LEFT-MIDDLE] One ought to moisten with **glaire**, then mix it well. And once in the **frame**, beat on top with a pestle, or other appropriate thing, for this makes it mold better and release better.

[LEFT-MIDDLE] It would be good to fill the **frame** all at once, for the mixture that is made of several **sands** with **that of the mine**, with which you fill the **frame**, corrupts it.

Green varnish for medals of **copper**

sel de verre that we use for **sand** & moisten it, & in three or 4 **days** it will be green. Next, **oil** them & keep them under the **dung**.

Glue

Flemish reglue their **earthen** pots with gold color, that is to say **minium**, **massicot** & **varnish**.

Founder

beaten glair of egg with **earth** with which they make the first layer of the cope of pieces, & bells, & all other pieces, saying that the said **glaire** makes it come out *et* neatly, & lays down & settles the substance. *En noyau* for a small work, **glaire** is also good.

Rosette, to come out neatly, wants the **mold** to be a little hot, & **lead** which has also been mixed with the **rosette**, especially for small pieces.

Mortars

s is necessary that they be of the finest substance possible, such as **copper for cauldrons**, which is better than **rosette**, in order that it withstands the blow better.

mortars for pestling are stronger & less in danger of breaking if they are of **fine copper**. And for a **private home**, they do not *ring* so much & do not carry as much *noise* as those of **metal**. [159] It is true that those that are of **metal** have more of a *ring* for the **APOTHECARIES**.

Grenades must be of **fine metal**.

Sand from the mine

great metals. Some burn it in the furnace until it is very black and grind it finely on **porphyry**. Others burn it with **aspalte**, but when it is too burnt, it does not mold so neatly, because it does not have body and is too lean. You can give it body with **tripoli** or **burnt felt**.

Experimented sands

X^[104] I have experimented with **sand from Thoulouse**, & after reheating it well twice, in a skillet, I passed it through a fine sieve, like the **APOTHECARIES'** double, without finely grinding it further on the **porphyry**, as I have done previously. I moistened it with **wine boiled with elm root** and molded with it a large piece of a portrait of **Jesus**.^[382] I found it easy to release,

without having it to knock on it, *Jen* & molded neatly with one side in relief & on the other in hollow, & of the thickness of a coin of forty *sous*. I cast very hot

Margin Notes:

[LEFT-MIDDLE] **Sand from the mine**, well chosen & well reheated, is the most excellent of all, without looking for any other mixtures, because it receives all **metals**. It does not want to be used hot, because it makes things porous. The most finely ground for big works is not the best, because it does have enough body to sustain.

material of a skillet mixed with a knob that is **potin**. And before that, I had so reheated my molded **frame**, now with the flame of my **furnace**, now putting lit **charcoals** on top of it, that it became as if red. I let it cool and cast. It came out very neatly in relief on one side & in hollow on the other, as well for the figure as the letters. It is true that the material was whitish, almost like **metalline**, but this was because of the **potin**. I made another cast with only the **material of a skillet** in the same **sand**, but not so reheated; it did not come out well.

bone of **oxen** feet, burned, pulverized & sieved through a double sieve & **hum** very moistened with **glair of egg** or **wine boiled with elm root**. I knocked on it moderately while molding. Having ~~undone~~ the opened the frame, I found that the figures had not released neatly & left the molds floury & crumbling. I ~~them~~ moistened the **bone sand** further, so that it gave a good hold ~~in the~~ between the **fingers**, and in this way, I molded neatly with a good release. And even though it seemed to me that the **pulverized bone** was coarse, if there is some **material of a skillet** thrown in, my figures came out very neatly. It is true that I had very very reheated my frame; it withstood only one cast. *I find* that when a **sand** is so finely ground that it renders itself dense as **ceruse** & even, ~~like~~ without knowing it to be arid, rarefied, sandy & rather spongy, that it molds very neatly, but it does not receive **metal** so well as if it were porous to absorb the substance. But rather, once fatty & even, it becomes porous & does not receive fine features. *I believe that the secret* to cast well lies in finding a **sand** that receives the **metal** well, one for **lead**, the other for another, for each one has its particular one. Let it be molded slowly & carefully, and leave it for a few days to become compact by itself, if you have the time for this. And next, reheat it very well, not all at once nor with a large fire, but little by little, otherwise it crumbles & always has some fault. Finally, you ought to cast **copper** or **latten** or other **great metals** very hot &, if it is possible, in large quantities of substance, which contain

more heat than small quantities. It is necessary that the frame be cold, & that you cast all at once. Always lute the entrance of your frame, for the metal, touching iron or metal,^[159]

Margin Notes:

[LEFT-MIDDLE] This bone wants to be well pestled in a mortar and does not want be reheated because it crumbles.

sand, being reheated, swells & if the by this in the middle, & in this way, the molded thing remaining higher than the cast, the metal cannot run into it easily or enter at all. Also, make sure that the mold & the cast are well reheated. Cast also all at once & out of the wind. And if your medal is really thin, put a card or two or three thicknesses of paper underneath, when you want to mold it. In this way the mold will be lower than the cast. Cast also at the place where your medal will be more es the least thick & where there will be less relief.

Excellent sand for lead, tin, and copper

[383]

burnt bone, iron dross & burned felt, thoroughly pulverized & ground finely on marble and well mixed together. I moistened them very well with beaten glair of egg. And having covered the medal with it, as in the others, then filled the frame with sand from the mine, I knocked moderately. I found it to be of very good release & molded very neatly. I let it sit an entire night. The next morning, I reheated it little by little, over the course of seven or eight hours (for if possible, no humidity ought to remain in the frame). I cast twice in copper alloyed with C, as old K.^[384] The substance turned out very beautiful, shiny & sonorous, & without a crust, and my sand was not corrupted at all. Since then, I have cast with it several casts of soft lead & tin that came out better & more neatly than any other that I have ever found.

mold, in the frame, in order to attract the substance to all sides, in this way.

[Figure: fig_po86v_1]

Potin of syringe & other *eo* works runs even better than *fine latten*. But I think that it is better half *copper* & half *latten*, which have been used & have been in very thin works, such as skillets & other similar things. I have seen this mixture of *half* come out well.

frame several medals together, for when there is a lot of substance & the *crucible* is almost full, it heats more, & then, if one medal does not come out well, the other will be good.

bellows furnace than in a *four à vent*, because it gives a more vigorous heat. It is true that *latten* melts well in the *four à vent*, because it is easier to melt than *copper*, being more brittle.

FOUNDERS have this superstition, that only *three days a week* are good for melting, namely *Tuesdays, Wednesdays Thursdays*, and *Saturdays*. The others, for them, are unlucky.

sand, because it prevents it from releasing very neatly & shakes loose the *mold*.

sand does not surpass the edges of the *frame*, for it makes the molded medal higher than the cast, & in this way, *metal* will never enter the *mold*. Therefore, always make sure that the surface of your cast object surpasses the *mold* in a straight line, and to do this, if it seems good to you, put a piece of *carton* of whatever thickness you please.

FOUNDERS, in order to prevent their large cast works from becoming porous, are careful to reheat their *molds* very well. And to know if they have been reheated sufficiently, they knock against it with their *finger*, & if they start to *ring* like a pot, then they are sufficiently reheated.

To cast their *cannons* neatly, they mix their *earth* with some *fine casting sand*, if they can find any.

Sand from Thoulouse

bo good one is *the one which is found in a vineyard near Puy David*, but the one which is most excellent is *the one from the Touch, near Saint Michel & toward Blagnac, in a vineyard that is quite high up*. The latter is finer & a little fatter than the other, & better for small works. It does not want to be reheated too much.

Sand, slate, and burned earth

Thoroughly burnt sand loses its bond. **Slate** is reheated & molds neatly. Next, it is true that it often becomes porous, as **burned earth** also does, as **fatty sand** also does.

Margin Notes:

[LEFT-BOTTOM] I find that one ought not to knock on **very finely ground sands**, for it shakes them loose & **makes** prevents them from releasing neatly. But one ought to press hard and moisten them sufficiently.

Magistra

Founders take the **roots of a young elm** when it is in sap & boil it in **wine**, or better yet **vinegar**, and keep it *all year long* in a barrel.

Sand from the **mine** of Thoulouse

Casting sand coming from the **mine**, once passed through a double sieve, next put in with **melted resin**, burns & inflames & becomes all red & inflamed like **iron**. Once cold, it is completely black and can be ground very finely on **porphyry**. Having prepared it thus & rendered it without asperity on the **fingernail**, I moistened it with **beaten glair of egg** & beat it well, until it was not pasty but rather powdery. I found it of very good release, & molded with it in **lead** & **tin** very neatly, but it wants to be well reheated & at ease.

mortar, in small amounts at a time, & thus it is *pressed together* and rendered very fine. Then they reheat it moderately, only to dry it. Next, they grind it dry on **porphyry**. And thus it becomes as if impalpable and not too dried out, **it** and it retains the body & the bond of the **earth** to which it is kin and is better than when it is so burnt. Once moistened with **glaire of egg** **passed through a sponge**, it releases **very neatly M** very neatly in low relief, but not for figures in high relief. Therefore, since then, I have experimented **lexper** with moistening it only with very strong **vinegar**. It released a figure which I could not release previously. And I believe that, moistening the finest in a fashion as with **glaire**, & the coarsest, for filling, with gushes of **salt water** or **wine**, that they do not join so well. But as they are of one nature & are moistened the same, they embrace each other & hold together one with the other.

For molding well, after having prepared your **sands**, mold *in a day*. Slowly reheat them *the next day*, then cast them on another.

Margin Notes:

[LEFT-MIDDLE] One ought to choose the one which is **as** in clods & lumps, well **deep in the earth**, for usually the one that is found **higher up** is too much a kin of the **earth**, and the lower is a kin of the **rock**.^[385]

[LEFT-MIDDLE] I have molded it from **pure lead** cast very **neatly** hot, & I had as an example the very neat principal,^[376] but the **vinegar** hardly gives it any bond, & thus it sustained only one cast.

Osier

bramble, on both sides, & those who plant the large feet against a slope say that it makes a larger stump. But it only has a point at the top, for it grows higher.

Mortars

Fine **copper** mortars do not throw fire, as long as the **iron** pestle is not tempered. The **metal**^[159] mortar does the same, because it is sour. One makes, for this purpose, the bottom of large mortars from **fine copper**.

Varnish

Turpentine oil, **turpentine** & **good eau-de-vie** to render it desiccative. Heat it without mixing on the **chafing dish**, so that it mixes **pe** by itself when melting. Next, test on a very clean knife, & you will know then if it has enough body & if it does not run too much.

is has its entrance into the incision on the sunny side takes very rarely when it is also bent.

Baker

Dust keeps **wheat** from *becoming infested with weevils*. And to clean it well when it is stained & as if rusty, pass **ashes** through the **sieve** & mix them with the **wheat**, then boulte the whole with a boulting cloth of **rough cloth** or **canvas**. The **ashes** will pass through & your **wheat** will stay yellow, clean & very beautiful.

Looking-glass tin

Sand from pulverized rock salt and **sand from the mine** finely ground on **marble**

marble, after having thoroughly pestled them dry & beaten in the **mortar**, I mixed as much of one as the other, and having reworked them together on **porphyry** & passed them through a double sieve or through the sleeve of a shirt to mix^s_[386] them even better, I put them in **paper** & put them on a **marble** in a **cellar**. In one **night**, they had been wet enough by themselves without moistening them further, because **rock salt**, like all other **salts**, dissolves **in the humidity**. I molded very neatly with it, because both were very finely ground. They want to be *f* humid enough to release well.

1387]Mineral sand

quarry or **rock formation**, & the deeper one takes it from, the better. The signs of its goodness are that it is thus amassed, and that when removing itself in the form of **rock**, it comes out in lumps & **qtt** bricks, which demonstrate its bond & that it is not too lean.

break apart between your **hands** & have very small **men** & delicate grains & of the same nature. If it is not delicate enough, you can pass & grind it finely, either through **water** or through a **sieve** & ~~when it~~ or on the **porphyry**, & in this way, from **sil** lean they become fatty & well bound. You can mold with it in **sa** frame or *en noyau* without **cloth waste**, & try it with

lead, for if with this it does not become porous & casts neatly, it will also behave well with copper. Some say that the fatty sands do not want the metal to be cast too hot. ARTISANS WHO WORK IN LARGE WORKS &, who for profit, do not need to grind & seek the curiosities of artificial sands, benefit more from seeking some that is ready-made by nature, which has the finest grain possible, & for small works, they only pass it through a sieve. But those who work in small works, finely grind it & grind it impalpable, because they do not need a lot of it.

Margin Notes:

[LEFT-TOP] *Orberé* grain makes a tawny powder, very delicate & very soft, which, once mixed, could mix mold very neatly. Try wheat flour burned over a closed fire.

Sand of burnt ox bones and rock salt

porphyry, as much as I could. Then I mixed as much of one as the other & reworked them on porphyry. Next, I moistened it in paper, folded in a wet napkin, which is previously made in the serain of the night or in the moisture of the cellar. And I have not found anything else which releases more neatly than this one. It wants to be rather humid. And if you want to cast very thin, make sure it is very hot. It came out very neatly in soft tin, like the principal, [376] and withstood several casts. For tin, I believe that it is not necessary to seek a better one, nor for fine lead either, which comes out almost as neatly as tin. *To* The bone of the foot of oxen is always so lean on its own that, without being mixed with one or two parts of some fatty sand & one that has bond, such as tripoli, salts, felt, ashes & similar things, it would not release & would not mold neatly, for it crumbles.

frame

Natural sand

lead and tin, *m* and is better very new & fresh.^[336]

Sal ammoniac and alabaster

Sal ammoniac, well pulverized *mou* & ground dry on **marble**, molds very neatly & is of a very beautiful release, & once mixed with **alabaster**, pulverized similarly, ii ȝ per lb of **alabaster** makes it release well. It suffices to moisten it in a **cave** or **in the serain** or, to be done more quickly, in a piece of **paper** between a wet **napkin**. Take heed that it does not stay for too long, for it would become so wet that it would not be good for molding in a **frame**, but rather *en noyau*, in which you will be able to use it well as long as it dries well at ease & far from the fire. Otherwise the heat makes it swell & pushes the **salt** onto the surface, which renders it lumpy. You can **in** anoint the medal with **spike lavender oil**, molding *en noyau*. It is better to put in 4 ȝ of **sal ammoniac** per 1b, and moisten it **in a humid place** for two or three **days**, & so that when you take **fistfuls**, it holds together, without, however, attaching itself & being pasted to your **hand**. You will mold very neatly with it. But let it dry & reheat very thoroughly, leaving the **mold** inside so that it acquires strength by reheating, for it becomes hard as **stone** &, in this way, is more certain to release well. Otherwise if you release before having reheated it, there would be danger of it crumbling in some^[388]

Margin Notes:

[LEFT-BOTTOM] ^[389]place because of its delicateness & fineness, even if the medal has a high relief. Once you have molded with it, pulverize it as before and put it back **in the humidity**.

[LEFT-MIDDLE] All **sand** that releases well has body & gives a good hold. **Ammoniac** is fatty and *et* **va** is nevertheless sandy, which makes it release well. There is no better bond than **salts appropriate for metals**, for once mixed in powder, they get moistened together & dry & reheat together.

GLASSMAKERS' white sand from the **mine**, mixed with **sal ammoniac**

Cominge, near the **town** of Aurignac, a **sand** white *mai* like salt and lean, that **GLASSMAKERS** & **POTTERS** use, which becomes impalpable ground on **porphyry** & is easy to grind. And once ground, it resembles **calcined alabaster**. It molds very neatly, and I have not found any that molds as delicately as this one for low^[390] relief. It is excellent to mold *en noyau* without a

frame, having ground it impalpable with **gummed or pure water** on **porphyry**, then placing it, thick as **mustard** or a little more, on the medal, anointed lightly with **oil either of olive, walnut, or even better spike lavender**. But to do it better *mo*, let it dry by itself, without fire, for one or two *days*. Although, if you are in a hurry, you can heat it well, & it will not crack if it is not put on too lightly. It is true, being thus suddenly exposed to heat all at once, it makes some holes & pustules, which it does not do when dried in the cold or at ease rather than being reheated. Once dry, reheat it & it will withstand several casts.

Sal ammoniac and iron dross

sal ammoniac, dried well in the fire & in a hot **bronze** mortar, and passed it through the double sieve; it became very fine. But to render it even more delicate, I have ground it dry on **porphyry**. Then, I mixed it with **pulverized & finely ground iron dross**, in the same way, and both mold very neatly things in low relief without being moistened **in the serain**, or in the **cellar**, or otherwise with the napkin, & it releases very neatly.

Sand

Molders from **Foix** who cast their *ur*^[391] medals crosswise,^[392] use *crocum ferri* and **calcined slate**. It is for very flat things.^[332]

sand can be rendered good

Artisans who work in large works & who need to further their profit by seeking things already prepared in nature, because she does not sell her wares to her children, and to also save the time they would use for grinding finely & for artificially preparing **sands**, seek **the one of the s mines**, which is not too fatty, the one that is a kin of **earth**, not too lean & consequently without bond, but rather that which is pulled **from the depths of the sand-bed** in bricks & clods that show its natural compaction, which is quite difficult to break & which has a very small & delicate grain, & which is found *soft when handling it between the fingers*. And because the latter is only found **near the rocks in mountainous areas** or **lean territories**, & akin to the **arenæ**, it cannot be found **in the surroundings of all the bonnes villes**^[196] where **ARTISANS** willingly gather. And thus, if they do not have it **close to their house**, they prefer to have it come from afar, like from **Lyon, Venice, Paris near the Sainct Chappelle** & similar

places, rather than prepare it. However, you can be certain that in all places you can render the sand from a mine

sieve, and if it is not yet fine enough, wash it, & when the water has rested a little, empty that which is still troubled in some separate vessel. The coarse will promptly fall down to the bottom of the first vessel, but the one which will have come from the troubled water, set apart, having settled, will be very fine. And then, if it does not have enough bond, grind it quite dry on porphyry, & you will render it impalpable, & which will have bond like chalk. Then, if it seems right to you, you will reheat it & again will grind it & mix it with salts, or linen, or burnt felt, or ashes of paper & similarly washed things.

Terre fondue of POTTERS

mortar mustard mill with some water & render it impalpable, dry it & next moisten it with salt water, which gives strength to ~~it~~ all sands to withstand several casts.

Orange trees

Italy, those who are in the colder regions, like Lombardy, make square wooden cases, a little larger at the bottom than at the top, and affix buckles on its sides for transporting them with straps, as one carries gout sufferers, because the wheels with which one could make them roll spoil the pathways of the gardens. And every two years, they do not forget to open the sides of the cases for trimming & dexterously cutting, with the soil, the ends of the orange tree's roots, because otherwise, as they find the wood, they contract & fold back on themselves & dry at the tips & would make the tree die. But as they are trimmed, it preserves for them new space eos for expanding, without finding resistance from the wood that hinders them. And know that, for this effect, it would be better to join the sides of the cases with screws & not with nails, in order to not shake the soil when one opens them.

the graft is awkward to be cut well, because there is a danger of wounding the marrow, & if it is wounded at the point of juncture, it takes uneasily, like from the vine, from all peaches & apricots.

Apricot trees have a very thin bark, & thus one needs to graft them onto young trees which do not yet have thick bark, like on shoots of prune trees & almond trees.

[illegible] take if the cut of the tree is wet. One needs then to graft in serain & mild weather, & not too cold & windy.

**than the young better, because it is harder than the young.
[393] But if the graft is all of old wood, it will never hold beautifully, but turns fragile & short & slow to grow.**

cuttlefish bone

in a humid place, for they are very prone to getting moist. If your medal is small, cut the **bone** in two, then even it out with a knife. And on a hooked **roof tile**, quite dry & quite smoothed & covered with **pulverized willow charcoal**, rub & smooth the two halves of the **bones**. Thus they imbibe this **willow charcoal**, which makes them release well & guards against removing anything. Then, on a counter bone, that is to say a piece of **brick** evened to the size of your **bone**, place your medal, & then on this one, place the **bone**, & press well with some other piece of the same size on the top. And for the second time, mold it, but before, pounce on top with **willow charcoal** & blow lightly, then press as before, and it will come out neatly. If it is for a spoon handle, one needs two whole **bones**. All cast work is brittle & subject to breaking, because the **metal** expands when cast, & retracts & condenses under the hammer. That is why one ought to retrace the cast thing with a **chisel**, & in this way the **metal** retracts. Let it thus *escrouir*. If the piece for molding is of high relief, first trace the **mold** & hollow it with a penknife to make way for the medal, & then mold. And if the medal has two sides

Margin Notes:

[LEFT-MIDDLE] Before casting, heat the **bones** in order to make them lose only the coldness & moisture.

[LEFT-MIDDLE] When the **lead** gets too hot, it calcines.

bones are joined, *eo* cut them evenly all around, & make notches *e* around it in different places which cross over the join of the two **bones**, in order to recognize well the place of the first join. Or else, with little shards of **wood**, pierce them, or *ma* coat the joins with some **clay**, & dry. Press, ~~between them~~ your **hands** joined between your **two** knees & not with a press, because the **bones** would crack. Mold also at your leisure & two or three times, until you see that it is pressed quite tightly together & well imprinted. And each time before replacing the piece, pounce with some **willow charcoal**, for it makes it release well. When you have cast, rub the medal with **oil** & with **willow charcoal powder** & with a brush, to make it dull. Take care that your medal is not too greasy or **oily** when you mold in **cuttlefish bone**. When you have cast, leave it to cool before taking the medal out, for when one takes it out hot, it brings with it some **bone**. And cast moderately hot, which you will know when the **bone** is about to change its **good** whiteness. But when it is too hot, it turns the **bone** very red. The proportion of **lead** & **tin** is as much of one as of the other. If the piece is difficult to come out & of several pieces, make the gate forked with three or four grooves, *and make* & direct these grooves to the place of the thicker parts. Also make these grooves around the medal, like straight on the heads, for this attracts the **metal** & feeds the figure better. Shake your **frame** a little when you have cast, and thus you will make very neatly several casts. **Tin** that is too hot *p*burns^[394] the **bone**, which is corrupted. Also, once taken out *from the mo* hot from the **mold**, it risks breaking.

[Figure: fig_p091v_1]

Sand Mixture easy to melt

ȝ of part **soft tin**, one part **fine lead**, one part **looking-glass tin** & one part **fixed quicksilver** makes an alloy & a **solder** so easy to melt that it can easily be melted in a dish of **fine tin**.

fine tin, which is harder to melt. And since it is neat, one molds with it. And one leaves it in one half of the frame & presses it a little so that it holds better. And next, you will cast in your frame some solder described above, or another more meltable than fine tin. And thus, the second medal will melt & mold itself on the first one without spoiling it. But to make sure this is done right, mix some lamp black with water &, with a paintbrush, give a light coat of this to the medal, which remains in the frame, & leave to dry. Thus it will not melt.

copper or silver, you can leave it in the cast if you want to cast with lead or tin. But it is necessary that it be a little hot, for the cold would make the tin contract.

Tin wants to be cast quite hot to come out neat.

Soft tin, which is the best for the cast, is the one that, once cast in grille,^[195] is burnished & shiny & polished like a mirror, & appears to have been burnished. And does not have holes like the one that is brittle & that is not shiny as if burnished.

Potin

Potin, being cast hot, runs & flows like tin. But the medal becomes whitish from this, and immediately casts out the verd^[395] which a good material does not do.

**Half founder's earth which FOUNDERS use & half clay earth g
renders very neatly.**

Sand from river tellins and mussels

shells that one finds in fresh water rivers, once calcined, make an impalpable white sand, which molds very neatly. [332]

mercury

hours in a rather large iron pot, putting in, for an ȝ of ȝ, ii ȝ of verdet of and vitriol of saltpeter ana, [375] with sufficient quantity of old water from FARRIERS.

ȝ of tin, & as it cools, purify it of its filth, which is on top, then, make a hole in it & put in this i ȝ of ȝ & it will come out like tin if you remelt it, but it will be breakable. And if you want to assay if it is tin or ȝ, redder a shovel & put a small piece of your ingot on top. If it is tin, it will melt & stay, but if it is ȝ, will quickly melt, then, crackling quite strongly, it will take flight. One ought to congeal it in a spoon or in a hollow crucible & make a moderately sized hole.

aquafortis which beforehand will have eaten a little silver. This one, mixed, makes tin & lead run.

Fine tin, congealed mercury with the smell of tin, looking-glass tin, fine lead, as much of one as the other, makes a substance that melts very promptly but is breakable & white. I think that it would be good for solder. A long time to cool.

Olives

once a month one does not refresh their salt water, which one ought not to touch with the hands, for this makes them spoil.

rustics

freezes on *Palm Sunday*, [396] it freezes all the months of the year.

the *suiv* & are lost from the *frost*, the others are usually lost also.

[397]

wind torments it, & it does not have enough strength to bud.

peach trees & all their kind & plum trees, do not want grafts in freezing weather because the cold damages their marrow, which one also needs to protect from wounding by cutting the foot of the graft.

humor grows them quickly. Otherwise ~~au~~ they dry before the humor of the sap pushes them.

Sand

white ash of all woods, which still sticks to the *wood* that burns, and which has not fallen into the *bo* hearth, molds very neatly.

Sand

Well pulverized *ash* tallow molds & releases very neatly. The one from the *kitchens*, which is fatty & shiny, from the *big kitchens*, is better.

Finely pulverized quicklime works. The same for broken-up *flint*, which works better in the cavity.

distemper

distemper dry promptly & one would not have leisure to perfect the shadows & touches on the face, one wets the reverse of the face which is on **canvas** with a wet **sponge**. Then, with a small paintbrush, one makes the shadows, which do not come undone. Next, one lays the flesh color, which does not prevent the already painted shadows from appearing. And again with a more lively flesh color, one touches the more prominent areas. And with another paintbrush, one redoes the shadows by hatching. The shadow strokes do not come undone because they are made of **bistre**, which stains the **canvas** like **rust**. The said **bistre** is good **with** for making shadows in **distemper mix**, for in **oil** it has no body & would not dry but with great difficulty. One mixes in the said **bistre**, for shadow, **ocre de ru** & a **a** little **sap green**. The best **bistre** is the greasy & shiny kind from the **fireplaces of large kitchens**. It is difficult to grind & **screeches** on the **marble**.

Azure

Azur d'esmail always wants to be cleaned, because the **filth** that can be perceived in the **wash water** makes it die. One needs to layer it two times, & the first very thick, moving the paintbrush by layering it first lengthwise then across.

[Figure: fig_p093v_1]

It is better used on **canvas**, where it is imbibed immediately, than on **wood**. **Varnish** returns it to its vigor, because being imbibed, it becomes dark. To assay it, **PAINTERS** bring their **palette** to the **GROCERS**, & temper & alloy it with a little white ground in **oil**, for in this way, the beautiful shows its *turquine* vivacity, but the bad is lavender grey. The most delicate is the best for working. It is made finer **working** by washing it.

lake

azure & **lake**, which is also assayed on the palette with white. The one is deemed beautiful that, on a polished knife or on **glass**, gives^{u[398]} a clear **red** color of red rose, tending a little toward violet. The one that is **not** dark red is not as pleasant.

Furbisher

sword are the *rivet*, the tail of the *sword*, what comes next is the *ricasso*, the rest is the *e*^[399] blade. The sides are the edge & the point. Some blades have a sharp ridge^r,^[400] which has one single elevated ridge in the middle & along the whole length, and are easy to break.^[401] The other blades are called of three edges or three slopes, which do have a rise in the middle, but it is flat as if it were a sharp ridge, but flattened,^[402] and *s* these ones are the safest. The others *are* are called fluted, which are notched in the middle,^[403] & when it is along the whole length, they are just as easy to break as those with sharp ridges & are more troublesome to furbish because the *fustée* cannot get in. But one makes one in particular which is narrow.

guard^[404] of the *sword* are the *pommel*, the branches of the *guard* & the *pontet*,^[405] which is this *iron* strip which closes off the branch which is at the end of the *ricasso* to stop thrusts from sliding into the *guard*. The rings^[406] are these two branches in half-round which start from the eye^[405] of the *guard* up to the branch of the *pontet*. The branch that crosses the *guard* is called the body. And this quillon block,^[171] by which the *sword* tail^[407] enters and to which all the branches return & are held, is called the eye of the *guard*.

wood of the grip, which one *glues*, or according to the most competent, with *gummed wax*,^[408] which is of *wax* & *pitch*, because *rosin* would be too hard. They heat it lightly, then rub the *wood* of the grip with it in order that the tang or the *thread* takes hold there. Otherwise, if a *thread* were to come loose, it would all *d* break immediately. On *iron wire* or *dog skin*,^[409] one also puts *glue* on it. The garnishment *of* which is put on the *wood* *of*, which is of *silk* or *thread*, is called the cord, which is made from two *tre* or three *threads* turned twisted on the spinning wheel, or 4 if the *silk* is thin. The slightly thicker cord holds better. The binding, which is also made of *silk* at both ends of the handle, are called the buttons.^[410]

silk, *dogfish skin*, *annealed iron wire*, *threads of gold & of fine & false silver* & of *velvet*. *Iron wire* has a lower price & is the most durable. Next is the grip of *silk*, if one does not have the convenience of being close to the *sea* to procure some *dog skin*, which is quite convenient. *Pou* The beautiful *skin* costs fifty or lx *sous* & 4 or five dozen grips are made from it. This kind gives a good grip even if the *hand* is *sweating*. To work it, if it is too hard, one soaks it for one or two *hours* in *not quite lukewarm aquafortis*, for if it were too hot, it would cook & spoil the *skin*. It is sewn with *black thread*.

Margin Notes:

[LEFT-MIDDLE]

[Figure: fig_p094r_1]

[411]

gold grips are made by putting underneath thin yellow canvas or a different canvas yellowed with chalk. And this canvas is set with glue or the aforesaid gum, this is in order that the thread holds better on it. These are made of cords like the silk ones, & between two cords one sets one or two threads to make it show up better. The silver kind is made similarly, and there is not as much trouble as with silk, and even less because it takes more to twist silk, because one needs to twist it twice. A grip of fine gold is worth 18 or 20 sous.

sword point is the sage leaf form.

Margin Notes:

[LEFT-MIDDLE] scabbard bench

[Figure: fig_p094v_1]

sword is attached & laid down to furbish it is called the chameau, it is commonly of rowan, [412] which is hard & even.

arson.

stick of the fustée.

[illegible]t l[413] on the sword to burnish it, is called the fustée.

oil horn and the other the emery horn.^[414]

iron which is made like a halberd point, square, & of very even steel, & well filed, which is called the *grateau*, [415] which serves to ~~to~~ smooth the traces of the file on **sword guards** & to give an edge to **swords** after they have been ground, which is better than with a **stone** or a **sharpening stone**, which quite often makes scratches.

[Figure: fig_p094v_2]

coupp **swords** cut better, one gives them the edge by pulling upward from the point.

Those who create **sword guards** are **ARTISANS** separate from the **FURBISHER**.

bruissone [416]

B is the **bloodstone** [417]

fustée is a square piece of wood three **fingers** in thickness, of **boxwood**, which is fitted in the middle of the stick of the *fustée* to furbish.

fresil stick is of **willow wood**, which is to clean the rust off weapons with *fresil*, which is the iron scale falling at the **FARRIERS'** forge.

Margin Notes:

[LEFT-MIDDLE]

[Figure: fig_p094v_8]

a

[Figure: fig_p094v_4]

b

[Figure: fig_p094v_5]

[LEFT-MIDDLE]

[Figure: fig_p094v_6]

c

the *flin* or *thunder*
stone

[Figure: fig_p094v_7]

D

the *baston*
a *felinder*

furbisher buys his blades by the dozen, which are not fully drawn by the tang because he does this himself to adjust them well to the *pommel* & *guards*.

Spanish ones are deemed better for being of *better steel & iron*, but they are not as *well-forged* as *swords from Vienne* in *pro Dauphiné*. The *Spanish* ones are not as well ground coming from the *forge*, because they grind them with the *foot*,^[418] & this is what makes them wavy.

Vienne commonly cost xviii or 19 *lb* a dozen.

furbisher does when he gets his new blades is to draw out their tang, which he does himself or has done by *LOCKSMITHS* or *FARRIERS*, giving him some *liard* for his charcoal. Next, they pass it over a *grindstone* to make it cut,^[419] then lay it down on the *chameau*, and with some *pulverized emery*, fine & soft as *flour*, & mixed with *oil* to make it hold, they furbish the *sword* with the *stick* used to remove the traces of the *grindstone*, and then the clean the *sword* *pewell*^[420] with the *emery* and give it a drop or two of *oil*, which they spread with the *finger* to give it luster. Having put the *oil*, they furbish the *sword* again on the *chameau* with the *felin*, which is a *thunderstone* mounted in the middle of a stick like the *fustée*, and this stick is called the *baton à felinder*. Next, having passed it on the *felin*, they furbish it with *chalk* & the *oil* which is on the *sword*. Next, they wipe it & go over it again, & furbish with *dry chalk*. And at the end, when they are ready mounted, one gives them the edge with the *gratteau*.^[415] *At*

guards which one presents to know if they are quite suitable. And taking hold of a blade such that the whole ricasso is held in the **hand**, one conjectures that it will be just as heavy once mounted.

vise between two pieces of **wood**, then with a **file**, they enlarge the opening of the **guard**^[421] if it is necessary. Then, to rivet it, one places on the rivet^[422] a piece of & the pommel a piece of **wood**, & with a **hammer**, one beats on it to align & secure the pommel well. Then, with the hammer, one finishes the rivet when the pommel is well secured & does not wobble. The **wood** is put there so as not to spoil the pommel. Next, one finishes the rivet with a **file** or **chisel**. And some make **the b** the rivet in a square diamond-shape,^[423] but it is not as good as the round one, for, when faceted, the rivet breaks.

[424] is bought ready-made by the dozen, which costs six **sous** for the small ones, but for the big ones 2 **carolus**. The end **this** is put either with **nails**, which are put on the sides of the cutting edge, but this only spoils the **sword** & destroys the scabbard because the **water** enters through the joint of the **nail**. It is best to apply some **rosin** or **glue** on it, but **rosin** is better. And it is best when the end is well adjusted & set so hot that the **pulverized rosin** melts on the end. In this way, it does not fall and cannot be undone unless it is put in the fire.

Guards are of several kinds:

Worked^[425]

Guttered, which is with round moldings

Pearled

Scarf'd, when the bands are crosswise

Onioned, which is with a flat head^[426]

In the **KING**'s manner, which are plain

furbishers buy them by dozens, the dozen of plain ones commonly costs x **lb**. The worked piece, 30 **sous** or depending on its fashion.

apprentice does is to furbish as said.

sword & make a scabbard, which is the height of the art.

wood pieces of **beech wood** for scabbards which are ready made, a hundred for xv or xx or 30 **sous**, depending on the distance from the place where they are made.

wood pieces are thus called **estelles**,^[427] and have to be very neat & without any knots & are one **finger**'s thickness across.

furbisher puts them on a small bench, called a scabbard bench, and with a ^e[\[428\]](#) plane small iron tool similar to that of the joiners' bench, they make it hold firmly. Then, with a plane plane which is like a knife with two handles, [\[429\]](#) one works the wood roughly from the top, next one passes the JOINER's plane on it the better to even it. Next, one scours it on the inside with a

round plane, also mounted with two handles, then with a small narrow plane, one hollows & scrapes it half a foot toward the end of the *talan*, [\[430\]](#) and the shorter the better. Without this scraping, the sword would always cut the scabbard.

[\[431\]](#)

leather rim set on the edge of the blade shape, [\[432\]](#) is made to stop the hangers.

estelles are well levelled, one lays the sword on top, & with a black stone, one marks the width of the blade & the length, & then with a chisel, one cuts the excess. And one passes a joiner's plane to even it well, according to the mark.

estoilles edge to edge and all around, only as far as the shape of the blade extends & not elsewhere. And this is to make the leather or velvet of the scabbard hold.

sword into the *estelles*. And precisely thus, they set it in the scabbard, which is all sewn, and rub what is glued along the shape of the blade [\[432\]](#) with tallow to make it run into the scabbard.

calf or sheep leather, the calf ones are all in one piece, but not the sheep ones. But, when the swords are long, one makes them in pieces which are sewn between leather & flesh, & then they rub the stitching thoroughly with a piece of boxwood to cover & even it. From a good calf skin, viii or 9 or x scabbards can be taken. [\[433\]](#) A WORKMAN can easily make vi a day. If they are too thick, one thins them a little with a plane. If the skin is hard, one wets it in lightly lukewarm water, and one does not leave it there for long. Next, the same WORKER WHO MADE THE WOOD PIECE has to adjust the scabbard to be well made. It is true that for COMMON PEOPLE, one may well get ones which are ready made, but they are never carried as well. When the scabbard is made & sewn with black thread, one rubs it with a piece of boxwood or with a cloth, having daubed it a little in oil. The scabbard of a good cow is better than any and also costs more, except the velvet kind. Under the velvet, one commonly puts plain canvas or a sheep scabbard or a parchment cover. But the best scabbard of all is a waxed scabbard, of

either **velvet** or **calf**. It is because one covers the **wood** with **thin canvas**, which one next **waxes**, then one covers it in **velvet** or **calf**. A **waxed** scabbard is worth at least xxx **sous**, a **cow** one xx **sous**.

Margin Notes:

[LEFT-MIDDLE] From a **sheep skin**, v or vi.

guards

bi them well, then put them in the fire, & make them pass to blue. And one needs to take good care that they do not pass too far beyond blue, for neither gold nor silver nor any color would take on it. To do this, which is called making them pass,^[434] *one takes a cauldron full of ashes, which one covers with thoroughly lit charcoal, & thus one heats them quite strongly for an hour or two, and when the ashes are very hot, one pulls the charcoal to one side & one puts the guard where the charcoal was, & one covers it completely with ashes. And when the body of the guard, which is the main thing, is completely passed, one rotates the guard onto the other side, and in this manner, the grey cannot pass too much, unless some hot charcoal touches it. The grey can be done well in the *d*^[435] ordinary fire in the fireplace, but there is a danger that it may pass too much & produce filth, which will prevent it from taking color. Blue is obtained as soon as the ash has heated the guards a little, but it is still grey in some places. After blue comes grey.*

For^[138] the color of water, one passes a soft file on the **guards** to whiten them, then the burnisher. Next, one makes them pass to blue until they turn grey. Next, when they are still moderately hot, one passes the **bloodstone** over them, and when they cool, one turns them to reheat them, for the color of water is made only in several passes. And if the **guards** were not warm, the **bloodstone** would scrape & undo the color. One needs to take heed that the **guards** do not pass too far beyond grey, for they would throw off **filth** that would prevent the color from taking. One needs almost one day for preparing, smoothing & setting in the color of water, but as they pass a little beyond blue, it is enough for grey & another color. Grey is the lesser color after **varnish**, which is of two colors, either yellow or black.

Yellow varnish

guards well. Next, one applies **walnut olive oil** all over them with a feather while they are cold, and next turns them over a good **charcoal** fire that is on the **FURBISHERS'** furnace, without them touching the **charcoal** or the **ash**. And when they do not **smoke** anymore, it is done.

Black varnish

[436] where you can see it, that it is made with **galipot**.

[437]

guards thoroughly with a soft, very soft, file such that there is nothing black^[438] left on any of the **guards**, and next heats them, & passes them as is said.^[439] But to gild & gild with **silver**, they ought not to pass more than a little beyond blue. Then, while the **guards** are hot, one

attaches them to a *vise*, & with some tweezers, one layers the **gold**, & one sets it with **bloodstone** that is quite clean & rubbed with **putty**. And when the **guards** are cold, one reheats them, then one layers the **gold** as above. And first, one gives ~~of~~ two layers, until the entire **guard** is well-garnished. And next, one reheats as at the beginning, & one gives the third covering of **gold**. Then, one burnishes very thoroughly & with great force with a large **bloodstone**. *And* But note that for burnishing well, the **guard** always needs to be warm. And to know this, *one smells it & brings it close to the nose*. For one ought not to touch it with the **fingers**, but one ~~holds it on~~ lifts it from on top of the warm **ashes** with a small **iron rod**, which has been purposely made to go into the eye of the **guard**. And when it is completely well-burnished, one rubs it very well with a **white linen cloth**, and the **gold** needs to be thicker & stronger than for **PAINTERS**. A quarteron is worth fifty or lx **sous**.

silver

guards & whiten them with a *lifillegible*] file, a little coarser ~~for~~ than for **gold**. And one makes them pass beyond grey, as for gilding. And when they are hot, one needs to double the **silver foil**, then separate it with a knife; next, apply it to the **guard** with ~~a small~~ tweezers & a small burnisher. And then, reheat & apply until they are all gilt with **silver**. Next, one needs to cover them for the third time with the doubled **foil**, as has been said, then burnish them very well & with force, not with the **bloodstone** but with a strong burnisher. Just as the burnisher ought not to burnish **gold**.

Mastic varnish dry in a half hour

$\frac{3}{4}$ of **mastic**, a half $\frac{3}{4}$ of **turpentine**, & a half $\frac{3}{4}$ of **turpentine oil**, & **eau-de-vie**, a little at your discretion because it evaporates when heated & nonetheless makes the **varnish** more desiccative. But I made it thus: I take **turpentine oil** at discretion & put in a good bit of **turpentine**, because it remains always humid & attaches itself if one puts in too much, & **eau-de-vie**, & heat in a varnished bowl the said **oil**, & when it begins to be very hot, I put in some **subtly ground mastic** & passed through a sieve, ^[440] around one-third of the **oil**, and let reheat until it is melted, which will be soon on hot **ashes**. Once all melted, try it on the knife, and if you see that it has too much body, add in a little **turpentine oil**, and if it does not have enough, add in **mastic**, and thus it will be done. And keep it well covered so that no **filth** gets in. When you want to make it, be careful to sort & choose the **mastic** that is white & purified of any dirt & dust & black dross. And when you wash it & dry it to render it very white & clean, it

will be even better. For if you do not purge it well, these **straws** & marks, pulverized into it, will remain within the **varnish**, & when you set it on white or flesh color, it will seem that they are **fleas** & blemishes. Once well chosen, pulverize it in a **mortar** and pass it through a **very fine sieve**, and next mix it in **oil**, as is said. But if you want to make it more carefully, extract a tear of **mastic**, as you know, pulverize, pass, & mix, and you will have something very singular for small works. Take heed when varnishing not to breathe on it, for this will make the **varnish** whiten & take body.

Margin Notes:

[LEFT-TOP] It almost dries when working.

[LEFT-MIDDLE] One knows that this **varnish** does not have body enough when it does not take well on a panel in **oil**, for it is like **water**. Therefore, add in **pulverized mastic** & heat until it is good. This **varnish** is very white & beautiful, & does not **go to your head** like that of **spike lavender**.

[LEFT-MIDDLE] For some, instead of **tour turpentine oil**, put **spike lavender oil**, which is not as good.

[LEFT-MIDDLE] This **varnish** is laid down cold on the panel with a very clean **fingertip**, & one needs to spread it vigorously.

[LEFT-MIDDLE] The **Italians** scarcely varnish their paintings because they layer their paintings very thick, & they are a **long time** drying on the inside, though on top they make a dry skin & crust.

[LEFT-MIDDLE] One lays the **varnish** with a **finger** so as make a lean layer, because when thick, it yellows.

workers of this art^[441] cannot work well if they do not have good breath, for if they have a bad one, their work will break in the fire in reheating.

Varnish for lutes

turpentine, & oil of turpentine or of spike lavender, & amber pulverized & passed very subtly, & make like that of mastic, & add in a little dragon's blood to color it and make it reddish, and others some terra merita for yellow.

garden

rake. And next, if it is dry, one needs to moisten it. Then, stretch the cord very close, and hit on the entire length of the cord *as* with the back of a pruning knife, in order that the cord marks a straight line, the length of which you will make a border holes with an iron stake where you will plant your rosemary. Behead & cut to measure, and prune from the bottom up.

Locksmith

tin nails well, and other work, they file their work very neatly. Then to clean it well & rid it of grease, they make it boil in vinegar, then they wipe it well with a linen cloth. Next, they heat it & pass some rosin over the top, which coats it with a shiny skin like varnish. This done, they melt some pure & fine tin in their estamiere, which is a little square iron box. And when the tin is well melted & moderately warm, they throw in rosin to burn the filth, & then they let the head of a nail or something similar soak a little, & having remained there for seven or eight pauses, they take it out and shake it, hitting the top with an iron to make the tin that is superfluous fall off, & clean it with a small stick wrapped in tow. And if it is not well tinned, you will rub it hot with a piece of rosin & do as before & let it cool. When the work cools, it becomes yellow, which is a sign that the tin is the right temperature. But it becomes blue if the tin is too hot. Things *t* thus tinned are durable & are not undone like tinning done in leaf, thus at the end of a year, they can be clarified & renewed by heating & rubbing them.

Leadsmitis say that making a lizard die in the melted tin *it-des* makes the tinning become very golden. Or else putting in sal ammoniac.

dogs

dogs who should be water-dogs^[442] are recognized by this, that they have a larger muzzle than others.

artichokes

firkin that one fills with brine. Then, one serves them all year among salads, raw with oil & vinegar, for being thus prepared, they take long to cook. But take heed to test your brine with an egg, for if it is good & strong enough, the egg will float on top. If not, it is not strong enough and would not preserve the fruits.

Birds

rod do not whistle among the company of others if they are not in a separate cage. For teaching them to whistle well, one needs to take them from the nest before they can see & cover them with down or a hare skin. Thus, having not seen their father and known his voice, they better learn the whistle that one teaches them.

putty is made of **burnt earth** which has served in the founding; this is **earth *bourre bolvene***, in *[fillegible]* which one has founded. One grinds it on a big **stone**, & with this one makes the ~~eope~~^{first} coat of the cope of bells, where there are letters & works, & **te** only needs to be reheated in the flame of **straw**, and molds very neatly.

earth which molds *en noyau* is subject to making it porous, if you do not rub well with a brush or your **finger** the piece to be molded, which should be well **oiled**. And do it coat by coat, & not all at once.

Earth or **sand** moistened or ground with **water** wants to be reheated more than **sand**.

Latten from a candlestick is not pure, for one mixes in it **iron filings** & **potin**.

Latten wants to be cast hotter than **copper**, *quod non credo*.^[443]

metals already alloyed, but take them pure & mix them.

Iron hardly agrees with being cast in a mixture of **copper** or **latten**.

sand, be it in a **frame** or *noyau*, rather than in various mixed ones.

Lean white sand without bond renders quite proper for casting, &, having body, if you grind it very finely on **porphyry** or calcine it, reddening it several times in the fire, & spread it in **vinegar** or finely grind it with **water**, as you know. It also molds very neatly *en noyau*, as I have experimented. But do not moisten it with **salt water** if you want to promptly reheat it, for **salt** boils on the fire & makes pustules, being pressed by the fire. I believe that the *noyaulx*, gently reheated, would not do this. I molded very neatly *en noyau* the **substance of skillets**. **White sand** *smells like sulfur* when reheated, and I believe it would melt. And since the substance has been cast in it, it acquires in the mold **as** a luster as if it were **leaded** or vitrified. I believe that **GLASSMAKERS** could use it.

Margin Notes:

[LEFT-MIDDLE] One ought to reheat for one or two hours and *p*, in a fire that^[444] of charcoal which lights by itself, a *crucible* with the substance inside, and then blow & cover the *crucible* with large charcoal & the mouth of the furnace with bricks, and let it consume two or three feedings of charcoal, which *se* fill the furnace above the *crucible*. At the end, stoke it to a violent fire, & when the flame is very white & the substance is in a liquid bath like water & casting off pale blue flames, cast. The secret is to cast very hot & in one go.

[LEFT-MIDDLE] [445]One needs very little sal ammoniac dissolved in water.

solder a ref cracked bell, it is considered impossible to give it its first voice.

Quince trees

Cannons

bore when they are of metal^[159] because the substance is brittle & frangible. But one *z* ought not to push the borer with too great a force nor continue all in one push, but pull it out often. In that case, one makes the touch-hole muzzle of the cannon bigger than the ball in order to avoid the necessity of boring, because the substance is cast & expands & pushes the mold. If the borer, which should be neither like a swallow tail nor a point but be cut in the round like a wimble,^[185] if it breaks, one ought not to leave it there to rust +^[134]

Margin Notes:

[LEFT-MIDDLE] +^[135]
but immediately take it out of the touch-hole. This you will do by pouring a little oil on it; then, *l* turn the place of the touch-hole downward & strike the opposite side of the piece, & it will fall down. One needs to bore gently & at ease when the piece is of metal.

your moldings for panels without gold

orpiment in leaf form & pulverize it & make moresque leaves & burnish it, and it is this orpiment which is shiny like gold. However, ground metals or ground *cristallin* or touchstone are better.

orpiment

arsenic to make it melt instead.

Varnish

mastic with two ounces of mastic and one of clear & white turpentine oil & eau-de-vie as above. Heat it on ashes until it is melted, then let it rest & put it in another vessel to purge it of dregs.

or on mat on canvas or other oil panel, one makes fatty **walnut oil in the sun or on the fire**, as said above, for it thickens by itself in this way, although there is neither **lead** nor **ceruse**. And with this, grind **massicot**, **minium** & other desiccatives, not **verdet** nor **orpiment**, for they cause the **gold** to die. It will be dry soon. However, if the *weather is not serain & dry*, do not smooth it, for if the *weather is musty & humid*, it would turn black.

observe the eyes, the nose & the beard, for these three things make strong resemblance.

Gemstones

pestle your materials in a mortar of **thick glass** & encased & stuck with **mastic** into another mortar of **wood**, in order that it does not break. This can serve for **PERFUMERS**. & ~~the t~~ the pestle, also of **glass**.

Margin Notes:

[LEFT-MIDDLE] Mortar of **glass** and slab of **glass** for grinding

salt peter

pebbles, it makes the **glass** very white. But before, one needs to calcine it on a hot tile or shovel. And that which will remain from the vapor, mix it with as much of the **white calcined pebbles**. It is true that, in the little furnace, it does not clarify well. But for large panes of **glass**, it makes the **glass** very clear & white & clean.

sun will not pass

calcined saltpeter & expose it to a **humid air or place**, and it will convert itself into a liquor which, if rubbed on both sides of the windows, the **sun** will not pass through; rather, it will give **shade**. One needs to put the **saltpeter** on some clean **thing place** & **it** put glowing charcoals on it, and continue all over until it no longer burns.

Margin Notes:

[LEFT-MIDDLE] It also serves for melting & for adding to **alkali salt** for cleaning **hands**.

Gemstones

white pebbles that are found by the **rivers** & among the **sand bank** & **paths**, which are somewhat transparent, & if they are perfectly transparent it will be better. If not, use the best & whitest that you can. Calcine them three or 4 times in your *four à vent*, & extinguish them in **water** or **vinegar**. Next, take a $\frac{3}{4}$ of them and pestle them in a totally pure **copper** mortar & with a pestle of pure **copper**, and grind them until they become very fine & soft powder, and this is a sign that they have taken the substance of **copper**, enough for giving them greenness. At that time, on your $\frac{3}{4}$ of **pebbles**, put in three $\frac{3}{4}$ of **good minium**, not adulterated by **brick** & anything else, and grind everything together again very well in a **bronze** mortar. And on all of this, put in a **gros** for $\frac{3}{4}$ of **sel de verre**; & some & the **COMMON PEOPLE** put in $e^{[237]}$ **sandiver** that they find at the **GLASSMAKERS'** or **APOTHECARIES'**. But **alkali salt**, as you know, is better. In this way, the **COMMON PEOPLE** make **emeralds** & cast in **sand**. If you do not have a **bronze** mortar, grind with a mort in a kettle of pure **copper**.

Margin Notes:

[LEFT-MIDDLE] One needs to reheat crucibles before putting in materials, and put them in the *fornaise* or *four à vent* before making & increasing the fire.

[Figure: fig_p100v_1]

[LEFT-MIDDLE] They are made in an hour & a half.

[LEFT-MIDDLE] A gros of **salt** on the four $\frac{3}{4}$ of **pebbles** & **minium**. When one says, for $\frac{3}{4}$, this is to be understood: on one $\frac{3}{4}$ of the body, & not

Emerald^[446]

of the **salts** & the **minium**.

ruby take gold leaf

furnace by two **tiles** all around, because one needs more heat for making **rubies** than for **emeralds**. And take one $\frac{3}{4}$ of **white calcined pebbles** and put it in a mortar of **glass**, & having ground it coarsely with the pestle of the same, mix in ~~a grain~~ the weight of a grain of **gold leaf** of what the **PAINTERS** **gild**, & grind

Margin Notes:

[LEFT-MIDDLE] Some say that, mixing the **gold** with the **pebbles** and the **saltpeter**, it makes the color of a **peach tree**

[LEFT-MIDDLE] Others say that it is necessary that the **gold** be cemented several times, then beaten into leaf.

$\frac{3}{4}$ of **minium**, & pestle well again all together, & put it in the *crucible*, which you will cover with an appropriate **tile**, a bit thick, in order that heat reverberates better there. Then, set it

on the grate of your furnace, having put under a few thick rounded squares. Next, fill your furnace to the opening with charcoal, so that it will be heaped, and let it kindle, and always maintain the heat evenly without letting the charcoal decrease. And for this effect, always make it so that the furnace is heaped & full of charcoal, and maintain it thus for one day. The first experience that I made of it, it only returned a yellow mass, as is vitrified minium alone, & some grains of gold in a mass at the bottom. *Try cemented gold and accompanied with antimony.*

[Figure: fig_p101r_1]

Margin Notes:

[LEFT-MIDDLE] If you need greater heat, *plie* put, on the edge of the opening of the glowing furnace, tiles, one against the other, for making the heat reverberate.

Topaz

dose is observed for all gemstones, namely one weight of calcined pebbles on three of minium, pestling all separately in a copper mortar for emerald & in an iron mortar for making topaz or amber color, with pestles identical to the mortars. The emerald & the topaz are of the same heat, & for an hour & a half on the fire, for they could burn. The ruby *en* wants more time & more fire & colored with gold leaf. I believe that pumice stone or firestone for the ruby would be better. See the enamels. Try also mixing, in place of pebbles, pieces of colored glass or enamels. If the mass is not colored enough, pestle it more in the iron mortar.

Margin Notes:

[LEFT-MIDDLE] Slightly burnt tartar mixed among this makes beautiful yellow, but one hardly needs any. The *arene* also makes it more yellow.

Salt for melting

saltpeter & common salt, and melt them together, & cast on melted copper or *eh* in a bath, & it purifies & makes it run marvellously. First, one ought to decrepitate the common salt, that is to say holding it over a good fire until it no longer crackles or, to melt it better, in a *four à vent*. And cast it neatly on marble, then pestle it & grind it very finely, then put it in a crucible on as much saltpeter & let it boil, & mix them together until

Margin Notes:

[LEFT-MIDDLE] It cleans & purifies metal well.

crucible will be red. Next, cast it on marble, and you will have a substance white, hard & even, like alabaster, with which you will be able to cast medals which will resemble marble, but keep them out of the humidity.

Jacinth

ruby, with gold, but one does not need such a great fire. The ruby wants fire for a whole day, and if it does not have enough fire, it will only have red veins.

Margin Notes:

[LEFT-MIDDLE] Always heat up your crucibles.

[LEFT-MIDDLE] One holds that rubified antimony makes jacinth.

Topaz

one part of pumice stone, calcined & pulverized, & *tr* with three parts of minium, and the stone pulverized in a steel *verf* mortar. It returned me a very beautiful yellow without any grains, more yellow than any others. It is true that it was well saturated with color. I believe it

would be better to pulverize *it* the pumice in a glass mortar, because it & the minium make enough yellow by themselves. It returned to me a mass, the top a beautiful yellow, as was said, the bottom like firestone, without transparency. With which, by mixing *d'aultr*^[447]

Varnish

Germans make minium boil well in linseed oil, & to give it the body of varnish, they mix in thoroughly pulverized yellow amber.

Gum ammoniac

vinegar, & one heats, then one passes it through a cloth strainer. All medicinal gums dissolve in vinegar.

retorts

2 lb of [illegible]^[448] ♀

One measure of coarse salt

6 terrines without lead

2 large unleaded pots for calcining

2 alembics for distilling vinegar

4 pots of good vinegar

3 or 4 lamps

2 lb of cotton

One pair of small scissors

furnace

coffer with a stone ten square thumbs in size and one foot thick, pierced in the middle

2 earthenware boxes or pots with a lid

2 small pipes of fer blanc to evacuate the smoke from the furnace

Rapeseed oil for the lamps to heat the furnace

A fire-steel

Ciment royal^[449]

lb & a half of vitriol

As much saltpeter

As much rock alum

Glass vessels

glass vessel must be made like a pear or round pyramid, of the thickness of a small knife back, round on the bottom without bending like vials, its opening of such a size that a Dutch quill can just about fit in, & with a lip at the end. Thus of a height of seven fingers' width.

[Figure: fig_p102r_1]

crystal or glass

oil without lines, except for the faces where they trace the nose & the mouth with black in small work, then they make strokes & highlights in white, next they coat all with flesh color. And as for the ground, they make it with azur d'Acre for more beauty, or with lake for a quickly-done red, or with dragon's blood for the most beauty. But one needs to layer it little by little so that it appears even & of one color, & thus for other colors. Next, they put underneath it a foil backing for topaz, or one of gold or silver.

anthos or rosemary^[450]

In the month of August, the flower is better cooked & more suitable for making oil. Take of it whatever quantity you like, and put it into a bottle well stoppered afterward, & leave to wilt in there in the shade for a day. Then put in it the first substance of wine,^[451] & leave it to rest three or four days, and next express the whole into another vessel, & into this very same substance of wine, put in seven or eight infusions of new flowers. Next, leave the last

infusion in the sun for a month. Next, distil it through an alembic, *Ap* and take ii ȝ of this water in two or three spoonfuls of white wine, but this is for the ELDERLY. Paul III^[452] used it.

Tin comes out better being thin & fine rather than thick, because being thick & in great heat, it retracts. Therefore, if you want to mold a thick piece in tin, mold it only on one side & with a cavity on one side, if it is possible, in that way you will have it more neat, and then you will be able to solder two halves together. But if you must mold it thick, *a*^[453] make it in the form, & mold a lot of feeders

[Figure: fig_p102v_1]

around the figure, in this way.

Against burns, excellent

linseed oil on a gentle fire without letting it boil & simmer, but once it is hot, put in a quarter as much of the newest wax you can. Once melted, let it cool, & once they begin to curdle, stir continuously with a new wooden spatula *t* for as long as it takes you to say one 9 paternoster,^[454] and as you say them, wash this composition with holy water, stirring all the while. Having said the s first 9 paternoster, pour out the first water & put in new one, & wash & stir the composition for the time it takes you to say 8 paternoster, and the 3rd time for as long as 7, & thus you will consecutively until add new water, doing the same as above, until the last & single paternoster of nine. Then you shall have a soft & white ointment, with which you shall anoint the burn for the space of 9 days. But do not apply it any longer than this, for it would cause *a*^[315] your flesh to grow excessively. You *p*^[455] shall bandage yourself twice a day, & each time you shall wash your face with water & wine mixed together, a little tepid, not rubbing, but as if pressing with a wet linen cloth, and you shall wipe it similarly *eff* with a fine linen cloth, & next put the ointment, over which you

can put ivy leaves. This causes hair to regrow & leaves no scar. A GUNPOWDER MAKER who had almost completely burnt himself ~~me~~ & showed no sign of the burn, taught me this.

Against dogs' mange

English, who caress their dogs a lot for taking care of their livestock, have GROOMS for them, who ~~not~~ particularly hold this office. And melting *pitch* in *water* & leaving it to soak, they rub the dogs with that *water*, or else with *water of sublimate*.

Enema

se have protruding or swollen hemorrhoidal veins, one covers the end of the tube with a piece of *chicken gut*, & one folds it back over the end, & in this way, one gives the enema.

Tin retracts when it is thick, thus it is best to cast it thin & to make two pieces out of one, then solder them if need be. One uses a strong piece of taffeta to sieve the fine sand with which one first covers the medal to the thickness of a teston.

vinegar with a little with bile & put it *p* into a glass bottle, & if you want to keep it for a long time, add some salt to it; & of this, mix some of it among your colors, & that will make them run.

Earwax

ear picker & you pass it through the foam of urine, which is readily made by those who have a headache, all the foam will dissipate.

Enamels

candlelight, you need to put your candle behind a **crystal** mirror or a **glass** globe or jar full of **water**, because this light is like **sunlight**.

gold

[374] put common **salt** into **aquafortis** in a matrass, and let it rest two **hours** without putting it on the fire. Put in the very thin **gold**, and draw it out as if it had been parted from **silver**.

[103] on iron

$\frac{3}{4}$ of **verdet**, ii $\frac{3}{4}$ of **coarse salt** & a little **sublimate**, or else grind **massicot** with **linseed oil**, and **tt** cover **this** the **quite clean & polished blade or iron** with it, & let dry **in the fire or in the sun**, and draw on it what you please. Then, to engrave it & make the **water**, take a **liard's** worth of **verdet**, & put in twice as much **coarse salt**, & about four grains of **sal ammoniac**, & six grains of **sublimate**, & the **water** ought not to be hot.

Sulfur & small gravel, as much of one as of the other, & **the third part of soufr salt, & as much terra merita as sulfur.**

silver on copper and latten

silver like the **gold**, & apply it as if you wanted to **gild**. And do not let it heat, so the **silver** does not tarnish. And after it is well applied, boil it in **walnut oil**, & next heat it a little, & thrust it in **sweet boutteure**. [136]

Enameling a cornaline

wheat flower in **white wine**, then besmear & cover the whole **cornaline** with it. And bring the violet kind to heat again, next put it to temper in **white wine** for one or two **hours**, then scratch it & leave the part you want to save on it, then reload it a little more on top.

Against dogs' mange

Half an \mathfrak{z} of stavesacre for common dogs, & one \mathfrak{z} for big ones, as fine powder beaten with two egg ~~of~~ oil whites & one quarteron of oil. Make them drink on an empty stomach, having kept them locked up *at night* without eating. Approved.

wax, either in hollow or in relief, because it is malleable once soft & obeys, and thus separates itself from the piece without leaving anything. But take heed that the melted wax be neither too hot nor too cold. Some mold with wax heated in hot water, but in pressing, the mold becomes clumsy & makes itself false. When you have the hollow wax form, you can cast in some very soft clay & thoroughly moistened & clear, & let it dry at ease. Then you will make a hollow form on it ~~ave~~ of lead or tin, in ~~you~~ which what you will form will be of good release.

Goldsmith

spangling work: it is scales of pure silver & of gilt silver with which one makes the ARCHERS' haquetons.^[456]

Spinet playing by itself

[Figure: fig_p104v_1]

quills as for a cittern or a spinet, & arrange them according to the song you want to be said, leaving ~~sueh~~ a suitable distance between. And, turning the axle either by yourself or by a clock spring, your invention will be effected.

Turtles

que head. And the females have neither the overturned shell near the tail nor the notches.

Soot black & others would not dry in oil if one did not put verdigris with it.

Painter

wood, otherwise on canvas, otherwise on walls.

in that year, & there cut a branch on which you see that next to raei the sprouting of leaves there are little buttons that one calls œilletts, which are the beginnings of sprouts. One needs to nimbly, with a very sharp penknife, cut in the shape of a shield a little bit of the skin with which contains an œillet or sprout with the leaf, thus marked B. [457] *But plusto Then, carefully make on the tender wood, s which is in sap, on which you want to graft, two lines thus de cut*

[Figure: fig_p105r_3]

, then make in the middle a cleft thus

[Figure: fig_p105r_2]

. Next, separate, with the point of the penknife, the bark & open it from the cleft in the middle, and having neatly lodged your shield so that nothing comes out but the sprout, bind it well & wrap it entirely with a **slip of linen** or **very soft thread**, so that there is nothing uncovered but the leaf, which in three or 4 days will give you an indication whether the shield should take, accordingly it will be green. Leave your graft seven or eight days thus, then unbind it & join it well to the bark, especially at the sprout, & then rebind all gently but not as strongly as before; & if there is any output or growth, leave it space to go out, & do thus three or 4 times.

[Figure: fig_p105r_1]

b taken, cut the top of the tree that exceeds your tree, *ne* three or 4 *fingers* above the shield for the first time, and *apr* then, at the closest point, in order that it closes. But heed well that when you make your shield no small hole remains at the back of the sprout, for this would signify to you that its root would be broken, & your graft would never take; but make it so that the back is intact. This type of grafting is practiced *from mid-May*, so that the trees have already budded & made new

until the beginning of August, and so that the trees are in sap. *Almond trees*, which by their nature are drier, lose their sap earlier, therefore those who want to graft onto them *mericotons*, *apricots* & grafts of trees with pitted fruit, which are the best there, they are grafted *in the month of January*. Generally trees with pitted fruit, like *mericoton peaches*, are grafted in clefts. One says that trees *de* grafted *en piolet*^[458] or by shield are later in bearing fruit than those by cleft.

Nightingale

Margin Notes:

[LEFT-TOP] It is necessary that the *iron* wire of its cage be of the thickest, in order that, thinking of leaving, it will not be hurt. Cover, from the moment that it is taken, its cage with *canvas*.

[BOTTOM] One needs to feed it the first *day*, *giving it*^[459] taking it out from its cage into the *hand* & opening its beak, & with a small *wooden* pin, put it in its throat & make it

Nightingale

Margin Notes:

[LEFT-MIDDLE] It needs to have a cage made like a **barn**, like those for **calendas**, doubled with green cloth, because it fears the **cold**. And for making it accustomed to eating when first it is put in the **cage**, one needs to give it **ants with soil** at the bottom of the **cage**, to make it accustomed to pecking **then it**, and give it **chopped sheep's heart** & immediately some **eggs** & **mealworms**.

oraches^[460] in one's **garden**, **because** when soup & broth is kept a little bit cold because of it, it engenders **worms** in it.

Margin Notes:

[RIGHT-TOP] swallow. And continue thus until it is no longer opinionated. This is done for sustaining it, for if it were to become thin, it would die.

Fountain maker

molder, **reheated plaster** promptly mixed into **water** & put on the joints of the conduits of fountains **s** resists as much as any **stucco**.

nightingales See the 15th folio after this^[461]

season of their pleasure. The **nightingale**, as long as it sings, maintains a territory for itself alone. Approach, therefore, making as if searching the ground for something. And taking some **worms** which come from old meal or from beneath kneading troughs or mills, which it is fond of, put some on your **hat** attached with a pin or otherwise, in order that it wiggles. And at five or six paces from the hedge where it sings, make a hole in the ground & put in some **worms** and your device of little crossed sticks. It will be anxious for you to leave so it can go see what you have done, and seeing **worms**, it will enter.

Margin Notes:

[LEFT-MIDDLE] Some sell them on trees.

[LEFT-MIDDLE] The coolness of *the evening and the morning, near fountains & shaded places,* are more appropriate for taking them.

Aspalte^[462] is which is found in Germany is the most excellent sand one can find for molding in a frame, because it is appropriate for silver & for gold, & the more you use it and the older it is, the better it is. One molds in it very thinly & finely.

Making gold run for casting

gold cools down very quickly, one ought to give it a mixture when **melted** *q* it is well melted which maintains the heat. **Sublimate** softens^[152] it nicely. But, because it goes up in **smoke**, it does not continue to help. Therefore, mix this composition when you want to cast: **sal ammoniac**, the best **verdet** that you can find, a little **borax** & **saltpeter** *which li*. And this, by keeping it warm, it will come out neatly. **Saltpeter** clarifies it & *p* heats it. But the most important thing in this mixture is the **verdet**, which has to be good. This mixture softens the gold *qui* so much that it becomes tractable like **lead**, even **fine gold**.

sand for molding flowers & leaves & delicate things, mix in **ground raw plaster**, **brick** & **feather alum**.

sands, **eau-de-vie** is excellent, for it grinds the **sand** finely & goes in exhalation *que* when one reheats the frames.

Sal ammoniac water is very good, is excellent, for moistening **sands**, but for lots of **water**, one only needs a little **sal ammoniac**.

[463] of **iron**, for lack of *crocum ferri*, is *exee* good for **gold**.

snakes or **lizards** you want to mold should not be kept for a *long time*, for if they are alive, they get thin, and if they are *dry il* dead, they wither.

Plaster of **Paris** is as firm as **stone** & very good. When you want to choose some for your **sand**, take it raw, the hardest possible & which does not make any powder. The transparent one and the one that thus makes powder retracts, **Which** which is not good for this work. A sign of the one that is close to perfection is that it is hard & made of lustrous grains nearing the shape of **sugar**. Finally, to mix some into the **sand** to cast **gold**, it is necessary that it endures the fire twice & is reheated twice.

Margin Notes:

[LEFT-MIDDLE] + [464]

When **gold** is very fine, it is so dry that it can hardly endure a hammer, but this mixture softens it like **lead**.

gold

gold, *if crocum ferri* is necessary, & more **feather alum** than in the following mixture. The **feather alum** mixture cannot corrupt anything. The **mold** needs to be red, & one needs to press it promptly with **iron** presses.

shell of **crabs** & **crayfish** are awkward to burn, & there is a proper fashion of molding them.

Rats & **birds** can be molded, and the feet are awkward to extract when burnt because they are small & delicate. The bodies are extracted more easily from the **mold**. The feet are cast in many **times** pieces.

Plaster[465]

Margin Notes:

[LEFT-TOP] When you have it as a **stone**, choose the hardest bits and those which do not easily crumble away with your **nail**, and clean it well from powder & **filth** before pestling it.

[LEFT-TOP] **Plaster** alone does not withstand fire but breaks up into pieces.

Tiles

Margin Notes:

[RIGHT-MIDDLE] Those of the **houses** that are **not sandy** seem to withstand fire better.

Tiles with which one covers **houses**, the hardest & firmest, and purged of **stones** & coarse **gravel**, are used to *p* mix in with the **sand** *And* for molding. But, before, it is necessary to heat them until they have been quite red for one or two **hours**, & pestle them & pass them finely through a **sieve**.

turtles, having just come out of the egg, are very nice to mold. [466]

If the **plaster** is mixed with some **dust** or is not the hard kind, it bursts in the fire & causes **flashing**.

plaster, as was said, is the best when it is from **stone**, therefore take it raw of this kind. Pestle it **well** as finely as possible, and pass it through the finest **sieve** or **sleeve** that you can. *A* [467] Being thus *p* [394] fine, put it in a **good amount** in a **cauldron** or **skillet** over an open flame, &

as it begins to heat up, stir it continuously, and heavy & coarse as it is, it will become so light & so handleable that it will seem to you not to have any resistance to handling stirring, as if it were water. Keep stirring it continuously until it returns once again to being heavy & dense, and that is the sign that it is cooked. But do not reheat it until your brick and feather feather alum are reheated & the clay circles are made. For it needs to be the last one reheated & when all the rest is ready, for the less plaster #^[134]

Feather alum is the one that gives good binding to sand.

Crocum ferri is appropriate for gold. It is that one which, being mixed among the sand, receives it & holds it within its warmth.

Margin Notes:

[LEFT-TOP] Reheated plaster *se ga* as is said here, keeps well one or two months, well pressed, in a dry place, if it is not rainy weather. But when fresh, it is excellent for exquisite work.

[LEFT-MIDDLE] It must withstand the fire & turn red like a lit charcoal.

[LEFT-MIDDLE] #^[468]
remains reheated, & more
the more quickly it is
put to use, the better
it is, for it sets
more quickly. One ought not
to reheat it until
you want to
mold. And to
reheat it, put it,
as finely ground raw powder,
in a

[BOTTOM] cauldron on ash a clear flame, & do not make it either too strong nor too violent. Always stir with a long stick to avoid the vapor, turning it around the cauldron & in the middle, in a figure 8. At the beginning, you will find it heavy difficult to stir, because it is full of moisture. As it heats up, it will start to throw off some bubbles at the edge of the cauldron. And finally, it will become like liquid &, as it were, mealy & like bran & boiling in the middle. Continue to stir continuously until you recognize that it has once again become heavy OO^[469]

Margin Notes:

[LEFT-BOTTOM] OO^[466]

as heavy as before, and like a moderately thick paste, & that it is not so easy to handle as when it is liquid. It is a sign that it is cooked enough, which you will know when it also throws off big bubbles or exhalations, in the middle & around, as long as a finger. Seeing it in this state, remove it from the fire, for it is heated enough, because if you were to reheat more, it would be too much & would not set as well. For when it becomes red & overheats, it loses its strength & spoils the sand. Leave it to cool before mixing it with the other sands. And when it is cold, mix and mold, for the sooner after its cooking you use it, the sooner it will set.

lizards and snakes

stick and attach a string at the end which has a knot eyelet slip eyelet at the end. And there being two or three to distract the lizard by whistling, approach the eyelet toward its neck, and when its head is inside, pull. The lizard is more tedious to catch by hand than the snake & bites without letting go & grips like pincers.

Snakes can be caught by hand, provided that it is covered by a thick woollen cloth, for the teeth of the snake stay in the cloth & cannot pierce like they would with a linen. The dangerous ones are recognized by their blue & asses aseures^[470] azure eyes. They hardly ever bite in water, which CRAYFISH CATCHERS experience.

sand mixture is of two parts of plaster, pulverized & reheated as said, & of one part of tile, reddened and pre in a good fire after the first cooking & then finely pulverized, and of feather alum, half as much as of the brick, namely two full crucibles of plaster, one of brick & a half of feather alum. There can never be too much feather alum, for this is what gives bond to the sand, and because it does not burn, it makes sand withstand the fire without cracking & bursting. Otherwise, without it, the sand would not withstand it. This sand, thus

composed, is proper for all **metals**, but if you want to use it for **gold**, one needs more **feather alum** & than the aforesaid composition, and mix in some *crocum ferri*. For it is this one that attracts **gold**.

sand with which you want to cast well, withstands the fire well, that is to say that it withstands *abon e* a great firing without getting spoiled.

Feather alum is awkward to pestle, and it does not pass through the **sieve**. Thus, one needs to grind it finely on **marble**. And **the white one that v in powder that APOTHECARIES sell** is good. It is ground better *su* in the mortar by pestling & dragging the pestle,^[471] thus you will render it very fine.

Crocum ferri must be set ablaze in a **GLASSMAKER'S** *fournaise* for four **days**.

Molds can only be used once because for delicate things, like **wormwood** & others, one needs to break them, but before one *them* needs to dip them well into **water** in which the twice reheated things dissolve easily. Otherwise, you would not be able *f* to release your work without danger of spoiling it.

Good feather alum is white and has a luster as of **white e silk**. It is in pieces long as a **finger**, & is very breakable & wooly as **down**. The one made of **stone** is harder & not so good. ¶ The best of the aforesaid quality is fetched in **France**, near **Rouan**. The **feather alum** for our **sand** is pestled in a **mortar** and is further ground on **marble**, especially since one cannot think of passing it finely through the **sieve**, for it is so fat & wooly that it would not pass through it. It is this, with its small soft **whieh** & thin filaments, which gives binding to the **sand** in a much more excellent fashion than **cloth shearings** in the **founder's earth** of the **FOUNDERS OF GREAT WORKS**, because these **cloth shearings** & **cloth waste** burn and **feather alum** **not** resists the fire.

molds, when you *em* throw onto the things to mold your **liquid sand**, make **your** a circle & surround with well beaten **fatty earth**.^[472]

Archanum omnibus fere reconditum est in re fusoria,
ut videlicet^[473] res exprimenda formis, sive herba sit sive **animal**
ut **lucerta**, in af inting^[474] inmergatur primum in **vini spiritum**
aprime rectificatum, deinde pulvere composito aspergatur
sive illinatur (si pulvis in formam pultis redactus sit, ut
assoleat).^[475]

snake or the animal is curved or folded, one ought to make the core of several pieces.

Test whether **distilled vinegar** is appropriate for eating away & dissolving what will be in the animal molded hollow.

Margin Notes:

[LEFT-MIDDLE] If you know that your **plaster** is not strong enough to withstand the fire without cracking, do not be so scrupulous an observer of the mixture put here that sometimes you *meeties* would not diminish the quantity of **feather alum** ^[476] a little bit, for it softens the molds with its softness. Once reheated, do not pulverize it on this occasion as fine as said, but leave it as the **APOTHECARIES** have ground it, for it does not hinder the neatness of the cast & gives more binding. When the **sand** mold, *being* having set, retains the color of **brick** and is reddish, it is firmer.

wire of the same metal that they cast because it reduces *with* & melts with its counterpart, but because when melting or folding, the core changes, some find it better to *use* **iron wire**, sharpened at the ends, because it holds firmer & having delicate ends, it appears as no more than a point of a needle. And one can apply **gold** or **silver** before using it for a work. If it makes a hole, one covers it with a small **chisel**.

Eau-de-vie prevents the **sand** from becoming porous & does not make little holes on the edges of the **mold** if the thing to mold is well moistened with it. The holes & blisters & bubbles are not made on the side of the **mold**, which is thick, but at the edges, which are thinner.

common silver, with which **GOLDSMITHS** commonly work, which alloys *And qua* indifferently. And when one were to cast with **solder**, it would run even better.

Spat^[477] is a **whitish stone** which can be found in **Germany**, & mainly in **Augsburg**, which one uses for **the most excellent sand that can be found for lead, tin, copper, silver & gold**. And the more it is used, the better it is. It is appropriate for casting flat things in a **frame**. For round things, it is not as fitting nor does it hold in the fire as well as the aforesaid one made with **plaster**.

cui thick, **greasy leather** are *pgood*^[478] to cast in the **molten copper and latten**, for it cleans it & removes from it all its **filth**.

Spalt^[477]

Spalt is white like **cooked plaster** and can be found in mounds and **stones** formed in long scales & long veins. It is very soft, such that with a **fingernail** one can scrape it, & makes a powder like our **chalk from Champagne**. And because everything which comes from **s** the **earth** is mixed with some other substance, to purify it, one grinds it, coming from the **quarry**, quite coarsely, then one mixes it with **sal ammoniac water**. **M**^[479] By putting in a piece the size of a **walnut** in a large bottle of **water**, and

p^[394] **small stones**, purging it of its impurities. Then, one puts it to cook neatly in a **pot** earthen vessel^[480] in the **fornaise** of **THOSE WHO MAKE POTS**, and one leaves it there until the pots are cooked. Next, one mixes it again with **sal ammoniac water** & one grinds it very well, and one empties the **muddy & clean water** into a separate vessel. Again, one puts the same **water** on top & one grinds, & again one puts the **muddy water** with the other. And one does thus, until it has passed everything. In this way, one purges & cleanses it, & one renders it very fine & handleable. Having taken away the **water** by tilting it or with a sponge, one takes the residue and one dries it. Then, moistening it with the aforesaid **water**, like one does with the other **water sand**, one uses it in a frame, where, if it retracts, it is a sign that it has not reheated enough & that one needs to reheat it further. This one is appropriate for molding all **metals**, and especially **gold & silver**, and the more it is used, the better it is. One needs to set aside the one in which you cast **lead** or **tin**, for it would sour the **gold** you would cast in it.

Feather alum should be reheated in a **cauldron** crucible covered with a **tile** in a strong flame fire of **charcoals**, in order that the **impurity** which could be there burns with the **feather alum**, which does not burn. This is done either in the **GOLDSMITH**'s forge, surrounded with **bricks**, or in a **fourneau à vent** with fusion fire, so that the **sand remains long enough** crucible for a **quarter of an hour** remains red. This is done more to cleanse it than for anything else. It becomes reddish on the surface & on the inside it remains white & better dried out. **#**^[134]

Clay to make circles around molds should be very fatty & handleable, and serves only to make the surrounding of the **molds**. Thus, one ought only to choose the quite fatty kind, and beat very well, & moisten it moderately with some **water**, & keep it in a **pit** or in a **terrine**, and make numerous holes with a **stick** in it, which fill with **water**, in order to keep it always fresh & soft, so that it is always ready to use when you need it.

Margin Notes:

[LEFT-MIDDLE] #^[135]

After your **feather alum** is cooled, pestle it in a mortar, then grind it on **marble**, and it will be rendered into very fine wooly filaments which give bond to the **sand** without getting burned as other things do, which is a beautiful invention. Pestle it in the mortar by dragging the pestle, for the flying dust could enter your **throat** or land on your **face**, which will give you *reason to scratch yourself well*. Put it in the mortar a little at a time to avoid the flying dust. It is better

[BOTTOM] to grind it thus, in the mortar, dragging the pestle, than on **marble**, for where e it spreads, & in the mortar, it collects on all sides. Render it very fine & *soft to the touch*.

wax

wax is too hard, one mixes in **turpentine** or a little **butter**, which ~~are pl~~ renders the **wax** more amiable and more appropriate than the **tallow** that the **Italians** put in, because one often has to put the tools in the **mouth**, which are better in **boxwood** or **bone of hart**.

Wax for molding -

wax is melted, they have **sulfur** that is melted in a **spoon** or **crucible**, & they pour some in the **melted wax**. And going to the bottom or remaining on top, the **sulfur** leaves & mixes only its substance amongst the **wax** & renders it more meltable when warming it, such that having molded, it melts in the **mold** gently like **butter**, without leaving any pustule or bubble in it. Also be advised not to give it too strong a fire.

Margin Notes:

[LEFT-MIDDLE] If

wax

mold grips without repelling in any place on a shape or image of **wax**, you need to anoint it with **oil** and moisten your **sand** with **lukewarm water**, for the **cold water** would repel the **oil** more & would not have a good seating on it.

Margin Notes:

[LEFT-MIDDLE] Anoint well, very lightly, with **oil**, so little that it hardly appears. Then, rub with some **eau-de-vie**. Next, moisten your **sand** with **lukewarm water** so that it does not repel the **oil**.

Bellows of the forge

q for they are more secure for it; next, you can lightly secure them from above. It is necessary that **blast-pipes** be 4 **fingers** above the sole^[481] of the forge.

Snakes for molding

barrel full of **bran** or even better of **earth**, **in a cool place**, or in a **glass** bottle. And give them any live **frog** or other little live animal, for they do not eat anything dead. Also, I have noticed that

Satan^[482] & his **DISCIPLES**. It has a small head but a very long body. The entryway to sin seems small & inconsequential, but the consequences of it are very great. It abstains from eating seven or eight **days**, once it has devoured some **frog**. It can swallow three or four of them, one after the other, and what it devoured is neither corrupted nor consumed in one go in its stomach, but **p** some part little by little, that is to say bones and everything. And the remains are found as fresh as when it had devoured them, such that sometimes, when one presses & torments it, it renders up what it has engulfed, parts of which are found totally consumed & others as fresh as if it were alive. It can keep a **frog** engulfed for two to three **hours** & renders it up completely alive.

Toad

piss in your hand, it would burn your hand & itch, as if you had handled nettles. But the most powerful remedy for this is to put your hand into fresh earth & to cover it as if you wanted to bury it. A frog is not so beautiful molded because it has lively skin, & the other has a lumpy one.

Margin Notes:

[TOP]

[483] When it is big, one needs to mold it hollow, & if you want to make it have an open mouth, put some cotton inside, & then on the cotton some melted wax.

[LEFT-MIDDLE] You can mold it hollow, and leaving under its belly an open notch, you will make it jump with the twisted cord of the saw. Or else, if it is small, put it on a magnet of its size, cut thinly, then put it in good vinegar.

snakes for molding

drop of aquafortis in the mouth, which stuns them well, such that the head & the part behind seem to be dead but the mouth remains alive, and when you pierce it with a needle to fit it to the mold, it moves & spoils & undoes everything. Therefore, to put them to death entirely, put it in a bottle of good vinegar & some eau-de-vie. And do thus with lizards & other similar beasts.

Margin Notes:

[LEFT-MIDDLE] If you want to keep them, you can put them in a pipe full of earth in a garden outdoors. But your pipe must be covered with archal wire, for otherwise it would climb & go up very high.

Molding

mold the thing and animal already cast, but it never comes out as well as the one from nature, with which you can make four or five molds.

Rock & grotto

pestle white & yellow marcasites & diverse kinds of minerals, & then wash them well, in order that the earthy & powdery part is cleaned & there remains only the lustrous grain of the mineral, with which you will sprinkle your rock previously covered with strong glue, if your fatty grotto is ~~r~~ not for a fountain & for touching water, and you will have a nice work.

Snakes

snakes. The main thing is to keep from being bitten before catching them, and having put your foot on top of it, as close to the neck as one can, one needs to grab it closest to the head, for it cannot bite if it does not have the means to stretch its neck & make a sinuous & oblique turn, & it cannot ~~s~~ harm with a direct attack, since he cannot move forward in a direct line, but writhes in the shape of an S. I saw that THE ONE WHO TAUGHT ME TO MOLD THEM did not take this into account, & assured me that there was no trick to it, other than, when taking it, he would pull it, a little pressed & held tightly by the neck, & passing it under a shoe, he would flatten it in such a way that it would render ~~under~~ from its bottom, which is five to six ~~t~~ fingers from the end of its tail, all nasty and venomous things that it had in its belly, and that after this, it does not have the strength to bite, and if by chance it should bite or expel through its bottom some filth, he would only dig the earth with a knife, & bury his hand in fresh & humid earth, which, when applied fresh ~~en~~ on the infected part, pulls out all the venom and nothing else. It is the same with toad's venom, which I have seen experimented.

Margin Notes:

[LEFT-MIDDLE] In three, [484] it is almost as thin as it will be afterward if it does not eat. Molding it very soon after it is caught is best, before it becomes thin. One ought to put it to death only a quarter of an hour before you want to mold.

underfoot, this pains it greatly & hurts it. If it is wounded, it will not eat willingly.

Molds

olive oil, & nothing else. And next, when you want to unjoin them, soak them in cold water, which is the secret. *L* And [440] you will see that the oil, although it seems to be imbued, will detach itself, like grease. Molds become stronger in cold water. And hot water would dissolve them awkwardly, although once reheated, they are more handleable & easier to dissolve in the water.

Wheat oil

blade of iron reddened in the fire. And the oil drips off, which is appropriate for anointing the hair of a butterfly or similar thing, for this oil is instantly dry & makes the remainder dry out. It is necessary that the hair or down of any animal that you want to mold be flat, for being upright, it would elevate the sand & become porous.

Margin Notes:

[LEFT-MIDDLE] #

If you want to mold something delicate, like a pansy, some, to give it a little thickness, more than what is natural, some rub it with butter. But it is best to anoint it with wheat oil, for it has no body, & does not obstruct the small lineaments as much, and makes the flower firm.

lead and tin

tin wants to be cast very thinly, if your medal, plant, or other thing for molding is *espe* thin & fine, do it so that there is more tin, much more than lead, namely less than the fourth part lead for three parts tin. And still, one puts lead only to form an alloy. On the contrary, if you want to mold something strong & thick, put [485] a lot more lead in than tin. And in one & the other you can put a little looking-glass tin, but only a little, with a little rosin, when you want to cast. Since then, when molding with fine and new lead, I put into one 1b two ounces of fine tin. And when molding with fine tin, I put in two ȝ of fine lead for one 1b. I made plants & snakes just like nature.

Margin Notes:

[LEFT-MIDDLE] S[illegible]

[LEFT-MIDDLE] I cast tin almost red, and lead the same, which, however, had not remained in the fire for too long, for it becomes brittle and calcines.

molds

frames readily dry out & do not reheat. For reheating is actually ~~for the second time~~ to redden & inflame the molds in the fire, and drying out is to let the molds dry themselves or to make their humidity evaporate by placing them in front of a flaming fire or a charcoal one. *Noyau* molds readily reheat & frame molds dry out.

Latten smoke

molds for casting latten, for this yellow filth *gc*, which appears nevertheless to refill the molds, casts very neatly, being of the same nature.

red copper

fine tin, for this makes it run.

Clay earth

molds. But take heed that it is not too soft, but rather as if half dry, that *hit*^[486] does not attach to your hands, because otherwise it would attach to your work. Always keep it in a humid place, and make holes in it, and fill them with water to keep it fresh.

Margin Notes:

[LEFT-MIDDLE] The gray one is best, which does not crack at all.

[LEFT-MIDDLE] It is more appropriate than a blade of lead.

Iron wire

molds that you want to make; thick like cord, smaller [illegible], & thin p, like the thick strings of a spinet, for the small works. Once de reheated, you make clamps from it to close the molds, & points, like needles of different lengths, according to your need, to pierce the animal to be molded & keep it held down. Needles would not be good for this because their points have to be empty & of the same thickness throughout, except at the point. And then, one must make them as long as you have need of. Iron wire is firmer than that of latten.

Margin Notes:

[LEFT-MIDDLE]

[Figure: fig_p111r_1]

Sal ammoniac wateer

size of two chestnuts of pulverized sal ammoniac suffices in a pot of water, and to the tongue, you find the water moderately salty, for too much is not good. [487]

Sanguine

lead & tin, one pulverizes sanguine, & with some small bristle brushes, one rubs the molded e work. [488]

Crab and crayfish

Lizards

fingers from the sides of the head, at the level of the ears, one makes them open their *g* mouth, then one takes the *a*^[209] end of its lower mandible with the end of the *fingernail*, & next, with the upper mandible, he bites the *nail*, but he cannot pass through, but he clenches very strongly. And if he were to bite living *flesh* it would *au* not let go, & there would be no better remedy than to promptly cut off his head. *In the spring*, as they have changed skin, they are more beautiful.

Margin Notes:

[LEFT-MIDDLE] The small *lizards* that one takes in the *summer*, the size of small *female lizards*, grey on the back & green on the belly, are very appropriate to cast in *silver & gold*, or other *metal*, because they have rougher scales than the *female lizards* & show better.

[LEFT-MIDDLE] like pincers

sand

crucibles of *plaster*, two 2 of *brick*, & one of *feather alum*. Do not pass through the *sieve* to mix *may* because the *alum* would not pass. Mix with your *hands* until neither one nor the other, neither white nor red, can be discerned among the other. If your *plaster*^[489] were not strong, do not mix in at all so much *feather alum*, because it softens the molds. Take heed also that your *sand* is not hot (since it has immediately been reheated) *E* when you will want to mix it with *water*, for this *them* makes molds too soft & breakable.

Margin Notes:

[LEFT-MIDDLE] ^[490] You may sometimes diminish the quantity of *plaster* if you do not find it strong enough to withstand fire & if it cracks, &^[491] in order that the part of *pestled tiles* holds up, with the *feather alum*, which you can also increase so that it creates a better bond.

sand

basin full of water to *q* soak the molds to open them, a flagon full of common water, a lead bowl for tempering your sand, a small wooden spoon to collect the wetted sand in the bowl. The big basin is for *t*

[Figure: fig_p112r_1]

Margin Notes:

[LEFT-MIDDLE] To make handles for your large oil paintbrushes, if you do not have large enough feather quills, take two of them, & slit them, & join them together.

sands

[\[492\]](#)

en noyau. Mixture of sand

sand, namely the plaster, the feather alum & the brick, & having passed them finely through the sieve, #,^[134] mix them this way: take four parts of plaster, two of brick, & one of feather alum. Mix them all together with your hands *that it* in such a way that one cannot discern one from the other. With your sand ready, you need to put to death the animal that you want to mold *de*,^[493] in this manner.

Margin Notes:

[LEFT-MIDDLE] #^[135]

except for the feather alum, which should be ground in a mortar

glass bottle *a*^[494] with bran, or in a barrel full half full of fresh & humid earth, if you want to store them or keep them a long time, give them live frogs & not dead ones to eat. For if you keep them without feeding them, they wither & grow thin & have long wrinkled *aulta*^[495] skins. Thus the best would be to mold it as soon as after possible *apre* after it has been taken. But before, put it to death in this way. Place it in a clean bottle or vessel so that it would collect no dust. And put inside such a quantity of good vinegar & urine that it can be covered. And shake it & torment it therein until it is dead, which will be in an hour or a half. **But if you are in a hurry**

Margin Notes:

[LEFT-MIDDLE] To know if it is quite dead, take it out of the vinegar and take it by the tail. If it moves it, do not mold it for it still has feeling, & when piercing it, it would draw back & spoil the mold.

[LEFT-MIDDLE] Water snakes hardly bite.

eau-de-vie or else mix a little with the vinegar. And soon it will be dead, without any lesion which deforms it. For large animals, for whom one would need a lot of eau-de-vie, one uses vinegar and *er* urine. But for small ones, only eau-de-vie, which is done sooner. When your animal is dead, take it out & clean it carefully of its old skin, if it sheds, or of the filth, or of the lice, like lizards have, and then arrange it thus.

Margin Notes:

[LEFT-MIDDLE] Now, put enough in a glass, & soak & continually keep in it the head of the animal, or the whole of it, if it is not big.

[LEFT-MIDDLE] Take heed, before it dies, to keep the eyes open *es*^[496] by blocking the eyelids with a little bit of *wax* or something else.

Molding Making the arrangement and disposition of the animal

fatty earth called *clay*, that should be grey because that commonly is the best, or another which has good binding & which should be well prepared & beaten, such that it is handleable without attaching to the *hands* nor the work, make a lasagna or like a cake of this *earth* equally flattened with a round stick which *PASTRY MAKERS* use, which should be a little thicker than a *thumb*. And on this *cake*, arrange your animal, *aya* imitating in that its nature & *fa* the fashion in which it commonly turns itself. And first, with a good *needle*, pierce it from underneath in the middle of the throat & up to *ufillegible* the top bone of the head. Retract the *needle*, & in its place & its hole, put the point of an *iron wire* of such a length that it suffices to hold the head of the animal as *q*^[497] high as it must be, & if the skin moves into the inside & when you put in the point

[Figure: *fig_p112v_2*]

,^[498] pull it out with *a*^[209] *point* the edge of your small pincers, & arrange it as it was. Push the other end of the point in the *cake* of *clay*. Thus, the head will be held high, which will have better grace, & being secured, next, arrange the gesture of the body & the feet & the entanglement as you think will look best. And so that it is secure & does not move at all when you cast in the *sand*, *put* secure the legs & *the corp* with little points of *iron wire*, having already made the first hole with a very sharp needle. Do the same on the body parts that you will deem necessary, *arranging* making sure that the *points* passing through the animal are fixed in the *cake* of earth and not so far in front that they jut out beyond the body of the animal by a

Margin Notes:

[LEFT-MIDDLE] Take a fine needle of **steel**, & which is the sharpest possible, in order that, making with it the first hole to place the points of **iron**, it passes without forcing anything, & by its roughness does not push in or pull out the skin. Next, put in a thickish point of **iron** in thick places & thin ones in thin places. But heed as a secret to not plant, in the first go, the point passed through the animal in the slab of **earth**, *for* but having planted it, take it out of the **earth** & not out of the animal, & *do ains* next, fix it. This is done because, by fixing it the first time, it pushes in the skin of the **snake**, and by taking the point out, it replaces the skin in its original state.

[LEFT-BOTTOM]

[499] When you put again the points you have already used, clean them well of **rust** so that they do not take away some skin.

[BOTTOM] The principal disposition of your arrangement is to *di* place the head raised & looking sideways. For this effect, pierce the head on a solid plank or table & *[illegible]*, making the point pass through the bottom of the throat, *s'arrestan* entering into the top of the head,

[Figure: fig_p112v_1]

[500]

qua so that *t*[501] you can take it out if you need to. And take heed that it is necessary that these points be of the most delicate **iron wire** possible which can support the size of the animal. For the more delicate it is, the smaller the hole that it leaves appears. However, one needs different thicknesses of these, because *il*[502] *de* the points which are put in the body & in thicker places, like under the throat, ought to be longer & stronger than the ones of the legs & thin parts, where the **needles** ought to be subtle & delicate, almost like the thickest **strings of spinets**. And it is better that they be of **iron wire**, which is firmer than **the one of latten**. And if the end of the tail, or the end of a nail or a leg, ought to be joined to the body, do not put the point there, not to corrupt it. But place **wax**, as much as a **grain of millet**, between the body & *ee*[503] *whieh* the end of the tail, then with a bit of flattened & hot **iron wire**, touch this

wax & join by lightly pressing. Thus having placed your animal on the *cake* shaped like a mandore, place all around a circle of the same

[Figure: fig_p113r_2]

earth, in this way,

[Figure: fig_p113r_3]

b & join everything well together in a circle, then, with a big knife, with which you have cut your *cake* to the right size, trim the outside which exceeds it, & place there a piece to close it as you see in b.^[504] Then, with a small curved instrument, mark on the inside of the circle the thickness you want to give to the mold, which will be for a common snake as thick as two thumbs, in order that when you cast in your wetted sand, you will see when it is thick enough. All of this carefully arranged, moisten well everywhere with good eau-de-vie, with a paintbrush, the body of the animal which is uncovered. For there is the secret, of the most kept well hidden, because everything that will be *v*^[505] touched by eau-de-vie will undoubtedly come out very neatly & without porosity any small eyes or holes that one calls porosity, which usually come not at the back & in the thick sides of the mold, but on the edges. And as soon as you have thus moistened everything with eau-de-vie, cast in your wetted sand without letting the eau-de-vie dry, which evaporates promptly. And wet it thus.

Margin Notes:

[LEFT-MIDDLE]

[Figure: fig_p113r_1]

[506]

and make sure that the point is longish, depending on how much you want to elevate the head, and that it be pointed on both ends. Once placed thus, plant your snake on the slab of earth, & arrange the head first and then the rest.

[LEFT-MIDDLE] If, after you have placed your animal on your **clay cake**, you are distracted with other occupations, rub your animal with **eau-de-vie**, & under the belly, so that it does not dry & attach itself to the **earth**.

[Figure: fig_p113r_4]

[LEFT-MIDDLE] If, when you pierce your animal, it renders **water** from the bottom of the side of the belly on the slab of **earth**, clean it well with **cotton** for the **sand** that

Eau-de-vie in three goes.

would touch it would be lumpy. If it is on top of the animal, clean it very carefully and touch it & moisten well with **eau-de-vie**.

sand and molding the first cast

bowl of **leaded earth** of such size that it can hold the **tempered sand** which will be needed *of* to fill your **mold** in one go, which is *mei* better than in two goes, because if you do not cast the second wet batch promptly, there is a risk that while you are preparing it, the first one will set & become solid,

And for *pl* Therefore, for this effect, take several bowls of different size which have a lip, to cast better. In these, pour some **common fountain water**, & mix into it as much **sal ammoniac water** as can be held in an **egg**, #^[134] composed as mentioned. If you want to cast in **lead** or **tin**, because one would need more for casting **gold** & **silver**, the water being in your **bowl**, **mix** put *in it* your **sand** in it & not the **water** in the **sand**, & add it *a dista dista* with such discretion that, *it*^[507] while stirring & mixing it promptly with a **wooden spoon**, it does not become thicker than **clear mustard**. And thus, cast **the** first into your mold the lighter part, **which es** as is always at the surface, with a shaking motion, & *da* from a little height. And doing so, when the animal is nearly covered, blow strongly everywhere in order to dissipate the small and big bubbles that the **wetted sand** makes & continue without delay to put all the rest which is at the bottom, & a little thicker than at the top, until everything is filled, up to the mark for thickness that you made.

[Figure: fig_p113v_4]

[134] And do not forget to shake the mold ~~in order~~ while casting, in order that the wetted sand runs & enters well everywhere. Also, tip your mold up on the side of the head, which is higher than the body, and thus your mold will have the same thickness, & you will spare sand.

fai, let it set, which will take a quarter of an hour. Then, release the clay circle, which can be used another time. And leave it to dry a little, & separate your mold from the *cake of earth*, which also *de*^[508] will be appropriate for molding right away, and trim the excess with a big knife, giving ||^[509] to it the long shape of a *mandore*. *Rasche*

Margin Notes:

[LEFT-MIDDLE] If you can, fill your half mold in one go, & with *the pre* a tempered batch, it is the best.

[LEFT-MIDDLE] #^[135]
or two eggs, because there is no risk if there will be more. *And the water* If you cast in two goes, it is enough to put *sal ammoniac water* at the first bowlful.

[LEFT-MIDDLE] Make it clear like a *pureed broth*, or like *starch water* that *women* use to make their *starch*. For there is no risk in it being very clear, because *sand* always settles at the bottom & *water* separates & remains on top. The sand that one scrapes as well *[illegible]mme* too weak & soft. And it will not^[510] let itself set quickly, for all things calcined dry out promptly from mixed *water*.

[LEFT-MIDDLE]

[Figure: fig_p113v_3]

[135]

If you do not fill in one go your mold tempered with *tempered sand*, take heed to stir your second cast with the *e*^[163] *p* surface of the first, *p* by mixing with your *spoon* or *spatula* with which you temper it.

Second cast

of the mold, which is always the weakest, and adapt it cleanly thus. And do not forget to make notches around, in order that the second cast anchors itself there & binds better

[Figure: fig_p113v_5]

without changing.

Margin Notes:

[LEFT-BOTTOM] Sal ammoniac water is not necessary to small molds, which require neither a big nor long fire to be reheated; however, when you put some in, it will only be better.

len half-mold where it is enclosed has set and is hard enough,

[Figure: fig_p114r_2]

+^[511] uncover the whole bottom part & side of the belly,

[Figure: fig_p114r_3]

now with a knife & ~~tant~~ at the thickest places, & then with a penknife, where the most delicate parts are enclosed, such as the legs, the tail, & similar things, and because the head is higher, you will also need to look for it & uncover deeper, and make a deeper notch there which ought to release easily. That is to say, widening on the outside, in order that the second mold that you will cast on it can come out well, which even the animal can help with, which is malleable and obedient, being natural. However, ~~ad~~ be more careful when uncovering the throat of the **lizard** than with the **snake**, for the **lizard** has large jaws & large bones that are not malleable and has hollow ears, where, if the **wet sand** has entered, it is not ~~aff~~ easy to release. But you will avoid all of this, if you uncover half of the head and those things that you know do not release well. Once everything is uncovered well, blow on top & wipe each part, by wiping with tiny **hog bristle** brushes, slightly moistened by the end with a little **saliva**, or with **clear water**, as you uncover it, in order that ~~your~~ the uncovered lower part of your animal will be very neat. # ^[511] With this done, dip ~~the rev~~ your mold, for the

length of a paternoster, [454] your mold in water, not from the the uncovered side but opposite & the reverse of the uncovered thing. And this is in order that, by sucking the water inside, the oil with which you next anoint the other side to avoid, is not imbibed at all, but remains on the surface & prevents the second cast that you will cast on it from attaching to it. Having therefore thus dipped the reverse of your mold in the water, take a paintbrush especially dedicated to this & anoint it with it, anoint with oil the whole surface of the mold, except the animal, which must in no way touch the oil, & take heed to retrace well & to anoint with the point of a paintbrush between the parts & through all the delicate parts. And if by chance the oil is imbibed, dip the ~~me~~ reverse of the mold, as mentioned, in water, & you will see the oil return to the surface in little drops.

Margin Notes:

[LEFT-MIDDLE] Mold small animals like big ones, except that you need to make delicate points of *fil* of *eist* cittern strings, both long & short.

[LEFT-MIDDLE] [512]

[Figure: fig_p114r_1]

remove with your small flat pincers, all the points.

[LEFT-MIDDLE]

[Figure: fig_p114r_4]

And then + now with

[LEFT-MIDDLE]

[Figure: fig_p114r_7]

However, leave the point of the throat, so that it serves as a clue to find the head, which is deeper down than any other part, because when making the arrangement you disposed it higher. It is also at the level of the head that you should make the biggest notch, & start with this one to uncover, and follow the rest through the trace of the points.

[LEFT-MIDDLE] [512] #

And if some bit of nail from a leg, or from a tail, or from another should separate from the mold, put there between the two a small grain of **wax**, & with the point of a hot **iron wire**, join it, then adapt your **mold** with a **knife**, & make notches on its sides so that the other half binds to it. ☽

[Figure: fig_p114r_6]

de first half-mold on the *cake* of **earth clay**, & put the circle also around, & make the mark for the thickness similar to the first. Then, with another rather thickish paintbrush, moisten well everywhere the uncovered half ~~& the belly~~ of your animal And with **eau-de-vie**, without leaving anything, if it is possible, which is not moistened, for this is the secret which makes it come out neat. And next, as promptly as will be possible for you, before the **eau-de-vie** not evaporates, wet your **sand** and cast it in thrusts and by blowing & moving the **mold** as you did for the first one, making sure that the ~~first q~~ beginning of that which you pour on the animal should be a little lighter than the next one so that it moistens everywhere & closely follows the more delicate parts. So, leave it for a quarter of an hour to set, then remove the circle & the **clay cake**. And, with a **knife**, arrange your two **molds** uniformly together in a long shape of a **mandore**, as mentioned, because of the cast. Then, dip a little the whole **mold** evenly, at the

level of the joints, in **water**, for this is another secret to unjoin them, otherwise you will break everything. Separate them nimbly, therefore, by this means, and next, extract gently & with patience and method the half of the animal remaining in one of the **molds**, **for** pulling it sometimes from one side & sometimes from the other, to avoid breaking any of it, or also spoiling something from the **mold**. **And** The latter being empty, **extraet** rejoin the two halves so that no dust enters it, & put them aside until you want to reheat them, make the gate & vents, & place the **clamps**. As for the animal, so that it does not dry & that you might be able to mold it four of five times, put it in **water**. And I think that it would keep even better in **eau-de-vie**. However, the best would be to mold in the same **day** the 4 or 5 **molds** that you can do, because these corrupt animals in themselves *stink* within one **day**. Having left your **molds** one or two **es days** to dry, for they stay humid for a good **month**, make the vents on one half

[Figure: fig_p114v_3]

[513]

Margin Notes:

[LEFT-MIDDLE]

[Figure: fig_p114v_1]

+

Note that when you have made your second **cast**, were you to leave your **mold** for one **day** or a **night** without opening it, you would need to then dip it in **hot water** or else reheat it before opening it, as for **crabs**.

[LEFT-MIDDLE] If, after both halves of the *noyau* have made a strong & hard set, you would not dip your **mold** in **water**, it would not unjoin at all. But as you dip the reverse of the **mold** in **water**, the imbibed **oil** collects at the top & at the level of the joints & makes it separate.

[LEFT-MIDDLE] However, take heed your second mold is of good thickness & that it is hard enough because if it is lacking in this, after having dipped it in **water**, & you want to open it, there is a risk that it breaks. Take heed therefore to avoid this, and wanting to open it, dip all of it in **water** and rub it everywhere, where it will harden if it has set well. Then, take your two molds, joined with a rough **linen** cloth in order to have a better grip, and separate them with strength as if you wanted to tear apart a loaf of **bread**. But if it happens to break, join it & on the reverse, strengthen the joints with **clamps**.

[Figure: fig_p114v_4]

[BOTTOM] Next, you can repair the faults with small **chisels**.

Making the cast, reheating the molds, &c Note about everything above

[Figure: fig_p115r_5]

Margin Notes:

[LEFT-MIDDLE]

[Figure: fig_p115r_1]

[514]

if you want, which will be enough,
or else on the two halves.
But because one needs

Margin Notes:

[LEFT-MIDDLE] to cast by the tail or from the back of the animal,
make it so that the vents come from
the head & the middle of the body to join
to the said tail,
where the
gate is done, which is the
end of the
mandore.

snake has been without eating for a *long time*, it happens that, when you want to put it to death in **urine** & **vinegar**, it fills with a lot of **water** & swells, and next it dries out as you fix & arrange it on the **clay cake**, and next it happens that when you have cast your **mold**^[515] **tempered sand** on it, & it has set, it ends up coming out such that between the **snake** and animal there is a line of distance **D**, in which enters the second batch of cast **tempered sand** **M**. Avoid this, therefore, if you can. But if this cannot be, do not let this prevent your second cast, for the **sand** which will enter in this void will be so weak that it will easily be removed with a small point & will not have set with the first hardened one.

feather alum for **molds** that should be reheated, like those for **gold** & **silver** & things that one needs to burn inside than for those which release well & that are only for casting **lead** & **tin**. However, do not put too much in either one.

Margin Notes:

[LEFT-TOP] N^[516] And having done your cast, do not forget to make in it some holes and *fillegible* notches^[517] because the metal will run more neatly thus than if the cast were even, for it gets corrupted in its notches & holes, & does not go so much at once, & does not become as porous. This done, put join t^[518] the two halves of your mold & strengthen the joints, putting around these some small clamps of iron wire of this shape

[Figure: fig_p115r_2]

. They prevent
the molds from deforming & corrupting while reheating.

[LEFT-TOP]

[Figure: fig_p115r_3]

[Figure: fig_p115r_4]

This is the shape of the clamps

snake such a curled shape that the place of the belly cannot easily come out, especially since the head & the tail, which are the two ends, are thinner, cut everything which is outside, & reheat the mold so well that what remained inside burns, then pass some **quicksilver** inside, & attracting **that which the ashes & the burnt bones** from the inside, it will also come out, because the conduit is big, & thus will not sour at all your material. You can pull really strongly the molded **snake**, because it is soft & malleable & obedient, & the mold, having set, is so firm that, because of this, the imprint will not be spoiled.

Molds

molds have been reheated *le-p* & cleaned, casting soonest is best, because if you keep them, they get corrupted and moistened. Reheat the thickest part, where the body of the animal is, at the top, so that, if there is something inside to burn, it falls to the bottom.

Mark
the part
on top to
recognize it.

mold die down a little from the outside *so long as*, being well reheated, so long as it remains red on the inside when you will cast.

tin

in **tin** is delicate & fine, it is necessary that the **tin** exceeds the **lead** in the mixture, & on the contrary, if it is thick, it is necessary that the **lead** exceeds. Therefore, for the *mixture* fine thing, put in some **fine tin**, not at all the quarter part of **lead**. And make sure that your mold is *hottish, such that you can hold it in your hand* when you want to cast. As for the **alloyed tin**, the same as mentioned, it is necessary that it is very hot & almost red for casting,

so that it penetrates. Otherwise, having to run the length of the fine branches of the plant, it will get cold before arriving there. And do not forget to mix in it a little **looking-glass tin**, which makes it run better & firms it up.

Margin Notes:

[LEFT-MIDDLE] In the **lead alloyed with tin**, or **tin alloyed with lead**, you can put a little bit of **metalline**, & it will seem **silver**. But do not put too much, for this hardens the substance & sours it also, so that for a delicate thing like legs & similar things, it would not be appropriate.

mold

es plant is very fine, you can pass a **thread** through the **clay** circle, rather than casting with a **needle**, & make sure it passes through the plant. And with the **thread** burning like the plant, a hole will remain which will give air & venting, to help clean.

nøyau molds

molds have their gate, vents & clamps, as is said, make at the end of the forge **in**, or in some clean place, a surrounding of **bricks**, and fill it with large half-lit charcoals. And place your molds on top, and leave the charcoals thus to kindle by themselves for a **half hour**, so that they heat little by little and not all at once. Finally, as they will begin to become white, beat **little by little** the thus half-lit large charcoals on top & blow with your **little bellows** until they are warmed. And thus, **little by little**, invigorate the fire, without haste, until your **molds** are quite red on the outside & the inside. If it is for casting some plant or some animal which does not release well, & if, for this reason, one needs to burn **it** in the **mold**, & when you look through the gate, & through it, you see the **molds** are very red & inflamed inside, this will be your signal that they are reheated enough. But if you do not see this signal, increase & continue the fire until it is the case. If there is nothing in the **mold** that needs burning, it will be enough that they are dried well on the same fire, if it is for casting **tin**. They reheat better in a reverberatory furnace.

Margin Notes:

[LEFT-TOP]

Do not pull out
your reheated molds
from the fire before they
have cooled
themselves, & take care
that the **wind or the cold** does not hit them while very hot, for this would make them burst.
One must not reheat them before they
are dry and firmed up, for they would
cast in a different way, and
it is necessary beforehand to make
gates & vents
& place clamps.

[LEFT-MIDDLE]

[Figure: fig_p115v_1]

Take care not to heat the fire in one go, for fear *f* that your molds crack inside.

[LEFT-MIDDLE] They are reheated enough when the entire hole of the gate is red. When it is black, it is not enough.

[LEFT-MIDDLE] For casting in **silver**, one must not reheat two times &, if there is nothing in the mold that needs **releasing** burning, simply because it does not release well. All the molds of flowers are reheated two times, first for

[Figure: fig_p115v_2]

[519]

ont^[520] wilt & dry out. Dip them, therefore, immediately in good **eau-de-vie** & then put them in your tempered **sand** mold, like **snakes**. For which one needs no release, for while the molds are being reheated *s*^[521] *s*, the plant burns, which does not happen with animals that have bones & *q*. It is necessary that for bouquets, the **sand** be not as thick as for **snakes** because, if it were thick, it would crush the flower.

Margin Notes:

[LEFT-TOP]

[Figure: fig_p116r_1]

[522] burning the plants, flowers, and animal parts which are left inside. Next, one needs to clean them & remove the **ashes**. Second, reheat them & render them red for casting. At the beginning, reheat with some charcoals, gently lit, and put your *noyau* molds flat on the charcoals surrounded by **bricks**. Frame molds are reheated on a grate.

with *en noyau*, with the same **sand**, **wax** images, or **lead** medals and suchlike

wax what does not, and then anoint your images of **wax** or of **lead** with **olive oil**, very thinly & very lightly, such that the **oil** makes no thickness nor body on the medal. Then, heat a little **eau-de-vie**, *until* & when it is lukewarm, moisten the **oiled** medal with it, for if *it is* the **water** were cold, it would reject the **oil**, it would not sit well on it. Next, cast your **sand of plaster**, *bri*ⁱ **brick**, & **wet alum** on top, having arranged your image on the **clay mandore** & having made a circle around it *de* to give it the necessary thickness. These medals are **oiled** and rubbed thus with **eau-de-vie** because they are firm & hard & would not be malleable for taking out of thee^[523] the mold, which is tenacious, as are natural animals, which are soft & flexible.

Margin Notes:

[LEFT-MIDDLE] When you have tempered your sand, do not cast it in the middle of the mold but on the sides, so that the sand descends gently and that the beginning is thin & afterward thick. If your tempered sand sounds like water falling in the mold, it is a sign that is too thin. Make it, therefore, of medium thickness.

gold and silver

molds be fiery red & ablaze when you cast in gold & silver, or you burn flowers and bouquets. The gate should not be very thick at the entryway of the molded thing because the substance flows better when at ease and without shaking the mold, & does not become as porous.

grind^[524] enamel gold very delicate gold rose e^[525] leaves and others

gold the thin leaves of a rose or other things, if you want to enamel them, you need to solder or braze your delicate gold leaves onto silver strips, which *uy*^[526] will strengthen them to support the enamel. Next, once the thing has been enameled, put the work in aquafortis *a*, ^[527] which will eat away the silver & leave all the gold with its enamel. For this, the gold needs to be passed with *ciment real*.

snakes in all weather

Aulcu Because *in the winter* they hide in the earth, some feed them *des* in quantity in barrels filled with earth & covered with manure. Others make several molds *in summer*, because with one snake, you can make four or five. And others mold lengthwise a natural snake, without it being curled, with common plaster, reheated as said *pu*, *en noyau* & in two half molds, as said, then they cast it in wax. In that way they have snakes that they can twist as they like, and then they cast them in metal, as is said.

Margin Notes:

[LEFT-MIDDLE] If, in twisting the **snake** from **wax**, some feature becomes undone, you can repair it by removing the protrusions from the molded **wax**.

tin and lead

fine tin ought to exceed the **lead** more than three parts. And if it is a thick & coarse material, the **lead** ought to exceed by more than three parts. Heat the mostly **tin** mixture until it is almost red & very hot. And when you want to cast, in removing your crucible from the fire, throw in two or three grains of **rosin**, & for one lb & a half or two of **lead** or **tin**, put with the **rosin** as much **looking-glass tin** as the size of a **hazelnut** with its shell, & mix & cast. And make sure that there is more of the **metal** than is needed, in order that some is left. However, if there is not enough, finish casting, & it will take. But it will not be so neat. Next, dip your **mold** into **water**, & with a point, release it carefully so that nothing is spoiled. Make your **cast** a bit longer. If the material is very thin, one needs for it to be almost all **tin**.

Margin Notes:

[LEFT-MIDDLE] If you **mold de plus** want to cast in **lead** or **tin en noyau** in the aforesaid **sand**, reheat your **mold** once, only if there is nothing to burn inside. But if it is for plants, flowers, & animals to be burnt, one needs to reheat it two times, however not as much the second time for **lead** & **tin** as for **silver** & **gold**. For for these, they ought to be red when you cast, but for **lead** and **tin**, let it cool until you can hold the **tip of your finger** in the gate without burning yourself, but you find a lukewarm heat.

copper and latten

red copper, one needs to put **sal ammoniac**, which cleans & purges it of all its crust when it is well melted. There are some who put in pieces of **old leather** thick **new leather**. Others, **parings of the feet of field mice**. Others, melted **common salt** alone, or melted with **saltpeter**. The principal is **sal ammoniac** & a little **fine tin**, as to what you want to cast. **Red copper** is more troublesome to melt **M** than **latten**. But when it is well melted, it runs better, especially

if it is alloyed with a with latten. Latten alloys with a quarter of copper, and one puts it^[528] in like in copper. But particularly,^[529] a little calamine makes it run well.

them *mou* not pick them, if possible, until the time one will want to mold them, so that they do not wilt. Or, if you need to carry them from afar, soak their stems in a bottle of **water** or, better still, **wine**. Make, first, a **wax** stick pointed like a large peg, of a size appropriate to what you want to cast, as you see in the margin, marked A. Put & prick at the foot of this small peg a bit of rather thickish & strong **iron wire**. And at the point of this, you will fit your flower stem or your plant. This done, set it aside neatly. And arrange your ~~mold-of-t~~ circle & shape of **clay**, as you have done for the **snakes**, in the form of a **mandore** in such a way that according to the size of your plant. Then, take the one that you have prepared to be cast, as we have taught you, & wet & moisten it very carefully with **good eau-de-vie** with a paintbrush. Then pass the **iron** stem through the end of the **earthen mandore**, in order that the **wax** q peg, where the plant is fastened, joins to the end of the **earthen mandore**. And arrange thus your plant in such a way lying down that it remains in the middle of the said **mandore**, without touching on either side, so that ^{a[209]} the **sand** that you will pour in it will be of equal thickness as everywhere & exceed is everywhere by the height of two good **fingers** the top of the *sueh* plant. And having secured the **iron** stem well, promptly pour *wetted sand*, much thinner than the one for **snakes**, in the **mandore**. And the sooner the better, in order that the **eau-de-vie** does not dry. And take heed to put in a little more **sal ammoniac water among the common**^[530] than you would do for the **snakes**. And when you will make **sand** especially for your bouquets, where you would mix in a little

more **feather alum**, it can only be better. Thus, your mold will be in one piece and it will not be necessary to unjoin it, but rather leave separate it from the **clay** once it will have set, let it dry, and then reheat it again until the plants are burnt. Then And note that if the plant you want to cast has a strong stalk & stem, you can cast it lying down, as had been said. But if it is some weak & delicate flower, cast plant it upright with the **wax** peg because the **sand** will always **east** lift it up, it being very thin. Do not forget to adapt two vent holes with two small sticks, starting at the foot of the cast, which is the pointed end of the **wax** peg.

[Figure:fig_p117r_1]

[Figure:fig_p117r_2]

Margin Notes:

[LEFT-MIDDLE] If the plants are so delicate that they rise to the top when you pour the **tempered sand**, one can fix and contain them with a **thread** passed through the circle of the **mold** with a **needle**.

[LEFT-MIDDLE] The more delicate the flower is, the thinner the **sand** must be.

[LEFT-MIDDLE]

[Figure: fig_p117r_3]

Mold en noyau

ashes of flowers and plants leave molds

meslen put **quicksilver** inside it. But, if it is a small work or fine & delicate foliage that only has *p* a slender exit, they make two errors: the first, that **quicksilver** by its heaviness can break *f* some delicate feature inside when shaken, the other, that some grains will always linger inside that will make **metals** sour & hinder the perfection of the cast. It is true that if it is to empty the **mold** of some animal which is thickish & which has big conduits & passages by which the **quicksilver** can easily exit, like a **bird** or a **snake**, one can indeed put in it some **quicksilver** *pou* to break by shaking the **calcined bones of the animal**, because the said **¶** will come out & not remain.

Margin Notes:

[LEFT-MIDDLE] The **asparagus** stalk is so hard that most often it remains as **charcoal**. Because of this, dry it out beforehand, or wet it with **oil of sulfur & turpentine**, or cast separately the little branches & **solder** them onto a thick stalk drawn through the **wire drawing plate**.

[LEFT-MIDDLE] If the burnt thing has left some **filth** or **ash**, let it cool a little, & with an **iron wire** wrapped in **cotton** that can bend according to the cavities that you have to search out, clean & blow out this defect, or with a soft brush or a cut paintbrush.

Daisies

gold. But if you want to **enamel** them, you have to make them by hand & **enamel** them & then attach them. Otherwise, the leaves would be so pressed together that the **enamel** would muddle together there.

Sand that was used

feather alum, you can use it in the mixture of other sands, & it can serve in place of **brick**.

à noyau figures of wax or medals of lead

oil with a paintbrush, but let it be so lightly that your medal is almost rubbed dry & that it hardly appears to have been anointed. Next, *destr* rub it with **eau-de-vie** and heat the **water** with which you will temper your aforesaid **sand**, with **plaster**, **brick** & **alum**, in order that being *ehau* as if lukewarm when you cast it, the **oil** will not refuse it, as it does with **cold water**, & do not forget when moistening your **sand** to always mix in it a little **sal ammoniac**.

Margin Notes:

[LEFT-MIDDLE] Medals mold in such a way very neatly.

Blood of snakes

snake inside the **mold** to burn it, cut it far from the entrance of the **mold** lest **blood** remains, for it would make a crust that afterward would not be taken away by the same **quicksilver** & would remove the impressions from your **mold**.

Snails

sea & similarly those in which certain **small crabs** dwell are very beautiful for **grottos**, if they are stripped of the first crust of their shell with **aquafortis**, for they truly appear to be made of **mother of pearl**.

à noyau

molds are of **good plaster** which withstands well the fire, & they will not crack at all, especially if, with **presses**, they are squeezed well between two boards or in a **vessel** filled with **ashes** or

sand, & in this way they will make no flashing. But if they do make some, you can remove it with a burin that one calls *chaple*, which has a tip like a small chisel.

grottos

Stones made from water called *stuf*,^[531] charcoal, the compound of tin & fine latten, paper pestled & mixed with pestled glass, cork, heated parchment, white coral are appropriate for making grottos. But fantastical pieces of wood which are found in the forests, & mushrooms, and *potirons* of trees, once dry, are better than any other because they are light. One mixes in small pieces of looking-glass tin, which has a shiny luster. One finely pestles diverse sorts of marcasites which one washes to cleanse them of earth, & one sprinkles the work with it, which is very beautiful. If there is no fountain in the grotto, one glues all *et* of this with strong glue, which and it is soon done. Take specimens of all kinds of minerals. The sulfurous marcasites, which do not have a grain but are uniform like looking-glass tin, are very beautiful.

Margin Notes:

[LEFT-MIDDLE] The old vine stocks

[LEFT-MIDDLE] Rosette is found sometimes mixed with certain brittle lumps which are pulverized under the hammer, which are very beautiful pulverized on grottos.

Looking-glass tin

firm fine tin if ~~in-one~~ one puts in ~~among~~ one ounce of it, that is to say, i ȝ of looking-glass tin in one lb of fine tin.

Sal ammoniac

It Sal ammoniac water is very natural for casting in gold & in silver.

frames

sand that was used in the cooked *noyaux*, composed, as is said, of **plaster**, **brick** & **feather alum**, is excellent for casting in frames, and I have experienced it thus: I pestled the pieces which had come out of *noyaux* molds in a mortar, dragging the pestle because this **sand** is very soft. I did not pass it through the **sieve** because the **feather alum** mixed throughout, which binds it, would not pass, but I ground finely upon **marble** what seemed to me too coarse. And having prepared it thus, I moistened it with **sal ammoniac water**, made of **sal ammoniac**, as much as two **walnuts**, in a bottle of **common water**, the same size as a bottle in which one boils **tisane**,^[532] or in a good pot of **water**, so that you find *à* the water **moderately salty**.^[533] I mixed throughout **water** of half a **glass** of **sal ammoniac**, **two ault** two **ault** **silver** spoonfuls of **eau-de-vie**. *J'a*^[534] Having thus moistened the **sand** in such a fashion that it gives a good hold, nevertheless coming apart easily, I sprinkled my medal with **charcoal pulverized** with a file, to rid it of **oil** and all other **grease**, which are necessary to avoid, for they would **make hinder** a good release. I blew on my medal & molded it, **and the female part of the frame once filled**, I marked & made a line on the reverse **of the** & edge of the medal & on the nearby **sand** as well. In order that the second frame **s'em** take the imprint thereupon to denote the place for making the cast, **having filled the female part of the frame being filled** I uncovered the outline of the medal and pounced the whole side with **pulverized charcoal**, and then filled the male part with **sand**. *Once fai* I separated the frame and did not hit the corners of the *à* medal to make it release, because that knocks the **sand** & makes it **esp** crumble. Rather, I struck the back of the **frame**, retaining the obverse of the medal on the bottom, and it molded very neatly. If it had not released thus, I would have waited to remove it until the frames had been dried out over fire. I lit **the** a row of charcoals between two little trivets of **iron** in the form that you see, and put the back **the** & reverse of the **frames** thereupon & the imprint on top, because in this way, they dry out gently. And if, by chance, from being too moistened they should crack, it is on the back, which **pr** takes the harshest fire, & the imprint remains safe & whole.

Margin Notes:

[LEFT-MIDDLE] For better, one needs to reheat the **sand** used for the *noyaux* before using it in frame, until it no longer contracts.

[LEFT-MIDDLE] *Excellent sand*

[LEFT-MIDDLE] Take a little of the same sand, the finest that you can, to cover the medal with.

[LEFT-MIDDLE] For medals & flat things, the true heat of lead & tin is when it is melted gently.

[LEFT-MIDDLE] Note that I filled the frame before pressing it and did not hit it at all, but rather pressed it only with the strength of my hands, because hitting it makes it go awry. Secure your frame that it does not shift at all, & if you put some wetted sand under it, it will only hold in place more firmly.

[LEFT-MIDDLE] Make the gate so that it is not too thick, so as not to overcharge the medal, but wide enough near the medal that it embraces a third part. Do not forget the vents.

[LEFT-MIDDLE]

[Figure: fig_p118v_1]

[LEFT-MIDDLE] To dry frames is to rid them of humidity so that they no longer smoke, being nevertheless very hot.

[LEFT-BOTTOM] Reheating is to redden the frame, which is done for gold and for silver.

smoke anymore & that, scratching the back & the front of the cast & having found that they are rough & firm & hard on one side and the other, which is a good sign of their being quite dry, I left them to cool. I took some fine tin *f*, one lb, & one ounce of lead, fine & new. I melted it in a crucible until it was, a little as it were, a little red. Being in this way quite hot I smoked & not *p* & being ready to cast, & not before, I smoked with the smoke of a tallow candle all sides of my frames & imprint & cast & everything. I set my frame, well joined, in the press. I drew my crucible from the fire. I left it a little so that the redness at the bottom of the crucible could pass die down. And wanting to cast, I threw in two or three grains of something like pitch rosin, & at the same time the size of a bean of looking-glass tin, & I mixed, & stirred the crucible a little, and I cast. And the medal came out as neat as the principal.^[376] I smoked it with the candle & cleaned it with small brushes.

Margin Notes:

[LEFT-BOTTOM] Always cast through the foot of the medal because the head, which is lower, will come out better & make the cast longish. And when you cast several medals in a large frame, they will come out better.

Good tin is that which is hard as **silver** & soft nevertheless. If your work is thin, it must be almost all **tin** & alloyed as is said.

Looking-glass tin must not be **smoked** mixed until the instant that you want to cast.

smoked until then.

sand shrinks in the frame, this means that it must be reheated & reddened on the fire.

sand, when moistened, does not stick at all to the **hand** when pressed.

perfect sand for the frame is **aspalt**, which is found in Germany, which is soft as **flour** & **presq** when wet, and almost all the others are lumpy.

Nota^[535] that the cast must be thin & hardly thick in order that it does not overtax the material, and must not exceed the thickness of ~~un~~^[188] the width of a **grain of wheat**; likewise for **tin**, which wants to be cast very thinly. For **lead**, a little thicker. There is no need to make the vents very large & deep either.

frames, the **sand that you use for the *noyau***, of the aforesaid composition, is excellent. But in washing, crushing & reheating it several times, it must be corrupt from its nature & no longer fit to make a hold & to mold *en noyau*.

a spalt^[536] *spat*^[477]

Germany, the color of **cooked plaster**, made of long filaments, very soft to handle. And because it is mixed with **earth** and **filth**, one pestles it coarsely & one makes little balls, having for this purpose soaked it in **sal ammoniac water** of such a composition that you were told above. One places these balls to reheat in the fire of the *fornaise* of the **POTTERS**, then one soaks it again in the same **water**. The **earth** and the coarseness and **filth** go to the bottom, and the pure **aspalte**, which is light & soft, and handleable as **wet flour**, adheres with the **water** and goes to the surface, clouding the **water**, which murkiness is emptied into a separate vase. When it has settled, one empties the **water** by tilting or by taking it away with a **sponge**, and the pure **aspalte** remains at the bottom. Dry it & employ it in a **frame** that has been moistened with **sal ammoniac water**. And try it in the **frame**, in which it shrinks when reheated or dried, that is to say that one needs to reheat it again on a good fire and redden it. Thus, for medals and flat things, you should use this one, because it is the most perfect of all for **gold**, **silver**, **copper**, **lead**, **latten**, & **tin**, for it withstands the fire & reddens whenever need be, without corrupting. The more it is used, the *b* better it is, & it does not spoil. At the beginning it is white, & being used, it becomes grey. However, make sure to put aside the one that served for casting **lead** & **tin** & **latten**, for **gold** would sour in it, & would not come out of it well. And to do this better, you could put it aside to be used for each **metal**.

Margin Notes:

[LEFT-MIDDLE] See **Gesnerus**^[537] *De lapidibus*^[538]

[LEFT-MIDDLE] It endures ten or twelve castings without corrupting, it withstands the fire & reddens, it is suitable for all **metals**. It is so tenacious that should the **frame** be furrowed, it holds.

[LEFT-MIDDLE] The **spat** almost does not set, even though it is reheated & is a kind of **plaster**. Raw, it breaks easily with the **fingers**.

fine gold

sand your animal and **lizard** or other thing with **billon silver**, & it will come out very neat. E But take heed to mold it hollow, or at least leave a small hole in its mouth*[illegible]* or in

another place. Next, **gild** it with **fine gold**, as uniform as it will be possible for you, three or four or five times, & until your **gold** has the thickness of a piece of **paper** or something similar, & all the scales will always show equally. Next, put it in good **aquafortis**, which, by this hole, will corrode the **billon**, & the **gold** will remain hollow & light & wonderful.

wax

wax, mixed with a bit of **rosin** so it will be harder & firmer, the relief of whatever you please, either an animal or a medal, & then, from it, make a hollow form of **latten** or **copper**. Or, **hammer it** **mold it in relief** and **hammer it in a sheet of tin**, **And pu** and then fill with **lead** & heat it. Try **sheets of gemstone foils** molded in a hollow form for **lizards**, &c.

Sand for casting in gold

Margin Notes:

[LEFT-TOP] You could cast **gold** well in **common sand of GOLDSMITHS**, should you throw therein some substance that makes it run.

common sand of **alum**, of **plaster** & **brick**, according to the composition said above. Add to it some more **feather alum**. And mix in not quite the **third part** of *crocum ferri*. However, its quantity cannot be harmful, for it is that which receives the **gold** & thanks to which it comes out very neatly. But it were good that your *crocum* had previously been in the **GLASSMAKER'S fornais**, ^[539] **three or 4 days and three days** and **three nights**, in a flat box where it should not be very thick, so that it reheats better.

Margin Notes:

[LEFT-TOP] Before the invention of *crocum*, one would cast flowers in **silver** but not at all in **gold**. It has not been forty **years** that one knows this in **Germany**.

[LEFT-MIDDLE] **Sublimate** is commonly employed by **GOLDSMITHS** for **gold**. Some add **sulfur**, but they & others are wrong, for **sulfur** sours, even as it heats. And the **sublimate** is agitated, boils, and bubbles. It is very good to clean **gold** because by its exhalations, it draws everything out as it goes up in **smoke**. But to warm **gold** & conserve its heat, there is only the **couleur**, which is **verdet**, **sal ammoniac**, **saltpeter** & **borax**. This makes it run, & you can throw in a **branch of wormseed**.

IlNightingale - [540]

cage, made like those for **larks** like a **barn** & lined with **green fabric**, to be made with a **drawer** underneath, to refresh its fresh earth *everyday*, for it takes much delight in this, & mix in it some **ants**. You can carry an **anthill** with its earth in a barrel full of earth, & keep them there & they will lay their eggs there, in order to always have some at hand when you want them, should you take pleasure in feeding **nightingales**. When you have taken it, it is fat & full, & thus, to keep it in its strength, one needs to, for the *first day*, take *wy*^[541] in the **hand** & open its beak & put in its beak with a **small pointed stick** some **mutton heart** or other **delicate flesh**, chopped up not too finely, in order to fill its belly & keep it from diminishing & growing leaner, until it has gotten over its fancy. *The next day you will give him* And you will feed it in this way three or four times a **day** & will also make it drink. The *next morning*, you will give it in its **cage** some **well-minced flesh with the yolk of a hard-boiled egg**, and change it two or three times a **day**, for it will not eat it if it is hardened & if it is not fresh. And if it goes half a **day** without eating, one needs to feed it as before & do so until it

meat & the egg some **live mealworms**, for it is very fond of them.

Crocum ferri

plastered on wounds to stop the **blood**. The best is made of **needle filings**.

Margin Notes:

[LEFT-MIDDLE] *Crocum ferri* hardens molds, once reheated, & **feather alum**, the more there is, it renders them softer & sweeter.

good quicklime.

silver run

[542] If it is for a large work, **arsenic** & **tartar**, pulverized & thrown on the **melted silver**, makes it run *If it is pou* and suffices. But for fine work, one needs some **aes ustum**, **filings of latten of thin copper**, *u*[543] **antimony**, sublimate, finely pulverized. This From this gets made a mass that does not sour. If the **s plaster** is good, one ought not to add **crocum** for **silver**, but one puts more **feather alum**. [544] It needs also some melted **common salt** & some **saltpeter** with the aforesaid drugs: **arsenic**, **tartar**, **aes ustum**, **copper filings**, **antimony** &c.

See the second leaf following. [545]

Margin Notes:

[LEFT-MIDDLE] *Sciscitatio dubia*[546]

[LEFT-MIDDLE] A little **tallow** and **arsenic**

[Figure: fig_p12ov_3]

state all year

rooms & **cabinets** *out of season, when winter denies flowers*. Take heed, therefore, to **ee** pick them when they are in full vigor & growing. For if you were to take them when their **season** is past or when they are starting to wilt, they would not keep. Having thus chosen them, therefore, take **sand**, the leanest & driest you can find, which should be very fine, like that which **GOLDSMITHS** *use use* to work **enamel** or like that for stampings. But above all, it must not make **dust**, nor remain on the **hand**, or leave a mark on it when you have pulverized it & then poured it. For it is

Margin Notes:

[RIGHT-TOP] River sand washed by the current of the waters is good, being passed through a linen cloth to shake the powder.

[LEFT-TOP] +

Flowers are also kept in their same beauty in distilled vinegar ^{in [547]} a well sealed vessel which does not allow any wind, which should be well sealed with wax & mastic. Carnations & roses, the residue of common vinegar makes them rot. If the sand makes dust, & clings to the flowers, & is not easily removed with a paintbrush, it is no good. The leanest is the best.

[LEFT-MIDDLE] +

Make sure your box is well joined, in order that the sand does not trickle out. Keep it uncovered in sunlight and remove it from the serain & the moisture of the night, & cover it & keep it in a dry place.

[LEFT-MIDDLE] That Take heed not to put the said flowers in big vessels, for when one pulls out one, one needs to pull out all.

[BOTTOM] Take good heed not to pick your flowers *q* in rainy and humid weather, but when the sun has been shining on them.

too coarse, for with its heaviness it would weigh down the flower & make it lose its form. Having thus chosen it as is needed, take a box, in which you first make a mound of the said sand, on which you will set the stalk of your flower, ~~in such a way~~ laid down so that the flower touches neither the bottom nor the sides of the box, but remains in the air. Then, weigh down the stalk with more on sand in order that it remains firm & fixed. Finally, take some of the same sand & with two fingers pulverize & cast it delicately on the flower, *e* imitating in that the flow of an hourglass. And when the flower is as if half covered, strike your fist on the table where the box is set in order that the sand drops & enters everywhere. Finally, cover it all over and thus lay in other flowers, in order, one over the other, as many as your box can contain. That being thus arranged, expose it for several days to hot sun. And while the flower dries, the sand, which ever accompanies it & holds it, does not allow that in contracting, it shrivels & closes in on itself, but it must dry in the same state as when you put it there. Now take heed that you choose for that effect cornflowers, marigolds, the yellow

meadow flowers called *ranunculus*^[548] or *palta lupina*,^[549] amaranth & suchlike, and broom, and others that your experience will teach you.

Margin Notes:

[LEFT-MIDDLE] The sand with which GOLDSMITHS buff enamels or the white one that GLASSMAKERS use, & any lean sand that does not hold together, pass it through a horsehair sieve, for it ought not to be so thin. Next, dry it well in the sun for several days to remove all humidity from it, and ventilate it like grain so that the dust goes away. Once it is rid of that dust & well dried, use it as you know.

[LEFT-MIDDLE] Pansies are kept thus.

year

serain & s quite dry weather & by the stem without touching it the fruit with your hand, and put them in glass bottles that have a wide opening, like tall glass boxes for putting preserves. Fortify them with straw or something else so that they may not break, and seal them well with wax so that they may not breathe. And if they had a glass lid, well-sealed with wax, they would be all the better. Put them in a case in your well, or in your cellar in a vat, or in a cos^[550] of earth full of water.

Margin Notes:

[LEFT-MIDDLE] For where the hand will touch, it will rot, and it is even good not to breathe on them. You can also put in leaves from vine.

silver

sand two parts d out of 4 parts of plaster, of two parts reheated brick, & one part reheated feather alum, and mix it well. Then, having been prepared thus, and you wishing to mold it, take the three parts of an earthenware bowl, from which the PEASANTS eat their soup, of the aforesaid sand, & add to it pure feather alum, reheated & pulverized in

the mortar, as much as you can take with 4 fingers and the thumb, or a small double handful. Then, mix mix well & wet with a little sal ammoniac & the rest of the common water, +^[551] & stir it with your spatula so that it all becomes like a thick sauce or thin mustard, & having rubbed the animal with eau-de-vie with the paintbrush, cast, & blow, and beat the table to shake the mold, & do as with others. Do not forget to put in it crocum, for it prevents the molds from cracking & is appropriate for all metals.

Margin Notes:

[LEFT-MIDDLE] Alloyed silver is better for casting than the fine one, provided that it is sweet.

[LEFT-MIDDLE] One needs the feather alum to be well pulverized and well mixed.

[LEFT-MIDDLE] Sal ammoniac is a friend of gold & of silver.

[LEFT-MIDDLE] which needs to be placed before the sand in the bowl, which is put in the water, & not the water in the sand

[LEFT-MIDDLE] Latten is the enemy of gold & the friend of silver.

Silver for casting

not fine silver but alloyed, & which does not become perfectly white on the fire because they put it to whiten after the fusion to also clean it of the solder or of this. When you need to attach some leg animal against another or to repair, it is commonly teston silver. And all alloyed silver, as long as it is sweet, is good.

in silver, one needs to have earth of which which withstands the fire, like the sandy earth of *qu* mixed with cloth waste which FOUNDERS use to cast their cannons, or any good lute which withstands the fire, in order to surround your molds & fortify them, for they must be all red. One needs to also bind them with iron wire.

casting *l'ar* reheating the molds, you have the mixture one needs to make the silver run.

goldsmiths knew knew the substance to make silver run in their works, they would buy much of it. Some buy it five sous for a denier.

Margin Notes:

[LEFT-MIDDLE] *I have used silver from the Capital*

[LEFT-MIDDLE] Before binding luting & strengthening your molds for gold & silver with the aforesaid earth, one needs for the cast to be made & the vents, & the molds to have been reheated of very red to burn the animals, flowers, and plants that are inside, & to clean them well of the ashes. Once quite clean & prepared, lute them & bind them with iron wire, & reheat them again until they will be quite red.

female lizards entwined while biting each other, & which is the most difficult thing to mold because of the number of feet & because of the tip of their tails, which are very fine, One take heed that if some part should *trou* be uncovered that remains as if suspended in mid air to steady it, in order that the second cast, which you will do on top for the second half, will not vary. And to steady it over the void, take a little **wax** & rub^[552] it, & lengthen it on a table into the form of a thick needle, then cut that which you will need, & with the tip of a hot **iron wire**, join it where it will be necessary. Steady also on the frame mold all that will have detached from it (when you uncover the half of the belly) with some **wax**, taken lightly with the point of a penknife, & joined & melted with the **iron wire**. And when you make your gate, you ought only to bring the wax to the place & to the edge of the **wax** which, being joined to the animal & melting, will continue the gate up to the animal without spoiling anything, which is a secret.

[Figure: fig_p122r_2]

snakes bound together in embraces of love, but that is when they are small.

[Figure: fig_p122r_1]

Margin Notes:

[LEFT-MIDDLE]

[Figure: fig_p122r_3]

[Figure: fig_p122r_4]

snake

snake some flower *q* or some branch of a plant which contains the **antidote** against its bite, take a little branch, as best arranged as you can find, & pose its stem into its mouth. Then put two little pieces of **wax** around the stem of the plant. And with the **end** of a **iron wire** that is **hot**, melt the **wax** a little, & with the other **hand**, close the jaws of the animal. And then you can cut the head to make it burn with the flower. If the plant *s* is strong enough, it will hold up by itself, and should it be weak like **wormwood** leaf, which droops, the **humidity** of the **sand** will lift it up, & make it swim & hold up without putting anything there, although you could pass underneath it some **thread**, going through with a needle.

bowl and the spoon with which one tempers the sand

bowl & your **spatula** or **spoon** with which you temper your **sand**, because *it*^[502] if it dries in them, it crumbles & falls into the **fresh sand** & makes a hole or a fault in the work. Also, when the **mold** is reheated, these little pieces crust up & flake off & prevent neat casting.

Wax on its own cools too quickly & does not run well everywhere, & tallow keeps its heat well & runs everywhere, but on its own it is not good. But when wax & tallow are mixed, the work is all the better. Crayfish & other small animals can easily be molded hollow for the body, but as for the legs, it will be awkward.

Margin Notes:

[LEFT-MIDDLE] The first part of the mold, that is, the first cast on the clay slab, cracks more readily in the fire than the second.

[Figure: fig_p122v_1]

, but rather in this way

[Figure: fig_p122v_2]

, which embraces the medal well. For the other way, with legs, is only done to accommodate more delicate works and the other, which is wide and in one piece, works better for flat medals. But take heed that all gates be very thin close to the medal & almost not as thick as the medal, if it is not very thin like paper. And then, from the medal toward the gate, thicken it as it goes, for it comes out better thus. If the gate is thick at the entry to the medal, the work will never come out well. Make sure that desp it is moderately thick from the half of the gate at the top, & from the same half at the bottom very thin. Do not forget to make grooves at the heat in the top of the gate to prevent that the metal runs furiously.

di far correr lotnegra [553]

white arsenic, two ounces, 2 ʒ

Orpiment or yellow arsenic, two ounces, 2 ʒ

Aes ustum, two ounces, 2 ʒ

fine copper filings, moderately ground, 2 ʒ

Antimony, 2 ʒ

Rock salt, 2 ʒ

Raw tartar, 2 ʒ

Sandiver, 2 ʒ

Saltpeter, half, that is to say 1 ʒ

Coarse common salt melted, half, 1 ʒ

Sublimate, half, 1 ʒ

Borax, half, 1 ʒ

Sal ammoniac, as much as borax, that is to say 1 ʒ

Margin Notes:

[RIGHT-MIDDLE] Note that you need
to lute well your crucible,
in order that the substances
do not take air, for
they are exhaled.

[RIGHT-MIDDLE] Lute well your *crucible*,
in order that it does not break.
For if it breaks, the
substances evaporate
& the fume of it is
dangerous. If within xii
hours it is not melted
and mixed, it will not be
well made.

[LEFT-MIDDLE] GOLDSMITHS who have knowledge of this substance sell a denier of it for five sous to other GOLDSMITHS, & especially to THOSE WHO WORK IN PLATE AND LARGE WARES, for at the end of their works, they can solder over the first solder by means of this mixture. In general, all those who want to mold & cast something delicate. This material should not be divulged, lest it be abused.

[LEFT-MIDDLE] The grain is like broken steel.

pestle them separately, keeping your face covered, over the nose & the mouth, from the eyes down, to avoid the exhalations of arsenic, sublimate, and orpiment. Mix them well, all together, then put them in a good crucible that is so large that the substances can have the fourth or fifth part as empty space. Cover the crucible with a good tile, adapted in a circle precisely on its opening. And having bound it from top to bottom and on the sides with iron wire quite strongly, lute it with earth mixed with dung or founder's earth that ARTILLERY FOUNDERS use. And in this, be careful & diligent, & do not forget to mix in pestled glass throughout the lute to fortify your crucible in such a manner that it takes no air, for the substance would be worth little, because the ~~4~~ five last ingredients would be exhaled.

lute being dry, put, in the early morning, your crucible in a four à vent, & at the beginning, give slow fire, as much for reheating your crucible as for gently letting the fury of the saltpeter pass. Then, invigorate little by little & with judgment the fire. And there leave in the full vigor of the fire your substances for xii hours or a natural day. Make each time a good quantity of this substance, so as not to do it often, because the fumes, which are dangerous, could hurt you. And before working at it, take in the morning good buttered toast, and hold the said butter, or zedoary, or gold coins, in your mouth, and ada cover your face with a cloth from the eyes down. From this mass, the crust will serve you make run to clear the great works ~~d~~ the silver from the metallic mass like snakes & similar things when it starts to melt. But And then the grain that will be at the bottom of the crucible should be put aside for principally delicate flowers and herbs putting a little in the melted silver when you want to cast it However it is necessary to always put a little of this grain in the silver when you want to east it is well melted and when you are ready to east. Thus, do as you make fine tin on copper, & for looking-glass tin on lead and on tin. And just as looking-glass tin sours lead and tin too much if you put it in too great a quantity, likewise, the grain composed of the aforesaid substances would sour your silver if ^{4[554]} you were to put in too much and obscure it. This aforesaid composition will suffice you for a long time, when it has been for a whole day on

a gentle fire at the beginning & invigorated degree by degree until the end. Then, having given it one load of charcoal, let it consume it by itself, & let your *crucible* cool. Next, break it. You will find two hard slabs & *cakes* in the *crucible*. The upper one is as if petrified *Onee*, composed of *salts*, *sublimated & mixed together*. The lower one is *metallic*, composed of *filings*, *aes ustum* & *antimony*, having the grain very small. Pulverize the upper *cake*, made from *salts*, & put some to clear, & clean the *silver*, and the *metallic grain* will serve you to put in the *melted metal*.

Margin Notes:

[LEFT-MIDDLE] Charcoal fire

[LEFT-MIDDLE] Or else after you have had your drugs pestled by some *RUSTIC*. And having put them in your *crucible*, & the latter luted & dry as said & placed into the furnace, have the fire managed by a *SHOP BOY* familiar with charcoal.

[LEFT-MIDDLE] One sells well to *SILVERSMITHS* this *metallic* mass to soften their *solder*, because when melting, *latten* exhales. And with a little of this substance, they *solder* over the other *solder*.

to clumped together. Starting, one ought to keep it flat with something dessicative & that makes it firmer. And in this, the most singular thing is **wheat oil**, with which you will anoint it. Once cast, you will be able to repair it. The bodies of **butterflies** and plants that have a stem & leaves which are wooly with a certain capricious & downy hair, also need to be anointed with the same **oil**, to keep this down flat; likewise flowers that have very delicate & thin leaves, for dry **wheat oil** makes them rigid and firm. And if someone brags about molding what is presented to them, give them to mold the downy head of the plant called **dandelion**^[555] or a **pappus**, which comes from the seeds of **burdock** & flies away at the slightest sigh of **wind**.

Noyaux for molding hollow

gold & **silver** can readily be molded *s* hollow, to avoid weightiness and costs as well, if they are not very small. But to make the core & the *noyau*, one needs the **mold** to be freshly molded & not dry.

Spider's web

water & thus cannot be molded *en noyau*, but one casts the **spider** and then one draws the drawn threads between the grass that they make **in the fields** on some **quartoon** with a point. One makes around it an edge of **paper**, glued to the **quartoon** & one casts with **tin**, **very little alloyed with lead**.

Fine gold

gold which, even though it is very fine & unalloyed & has been passed through **aquafortis** & **antimony**, is nevertheless so brittle that it hardly withstands the hammer. And the composition of **verdet**, described above to make **gold** run, makes it as soft as **lead**.

Rouge clair enamel^[556]

Fine gold is opposed to it, for *fillegible* on it, it remains yellowish. But alloyed **gold** is more appropriate for it, such as that of **écu** & **pistolet**. If **Gold** ~~f is not put back on the fire~~, with its own pale color, renders the **enamel** a dead color. *Ma* And for this occasion, once cut, one puts it back on the fire to give it a reddish color, to make the **enamels** beautiful. ~~Otherwise, they are matte.~~

rouge clair which, once it is used with the **arene**, loses its beauty.

grains of gold inside, and it is also the opinion of good **GOLDSMITHS** that the good one is made with **gold**.

gold

Molds are reheated better & more surely in a closed fire, such as **pot** in a reverberatory furnace. So that when **GOLDSMITHS** want to cast some important piece ~~of~~ **gold** *e* that has cost a lot to model in **wax**, they put the **molds** in a **pot** & cover them, & fill the **pot** with **earth**, sustaining the fire that holds them together & tight. Then, they reheat the **mold**, **earth** & **pot** together, and when everything is quite red, they cast the **gold**. **Fine gold** does not run well, but alloyed **gold** does.

Margin Notes:

[LEFT-TOP] **Gold** & **silver** do not sour, being entirely red and hot, quenched in **water**.

[LEFT-MIDDLE] **Gold** is a quarter heavier than **lead**.

[LEFT-MIDDLE] When **gold** reaches its perfect heat, it is green like an **emerald**.

[LEFT-MIDDLE] Take care that in the place where you want to cast the **gold**, no **lead**, **tin**, or **lime** of these has fallen in the **forge**.

lizards

uso^[557] delicate and thin that the gate would struggle metal would run with difficulty, especially when it is curled, roll wax in little threads of this thickness

[Figure: fig_p124v_2]

and apply some with the hot iron wire, as is said, one at the end of the tail & the others, that are applied in the same way, from one edge side of the tail to the other, as you see depicted. But take heed to make sure that with the end of the hot iron wire, the end of the wax barely touches the animal, for the sand of the second cast will not touch this part. But make sure that the end of the wax arranges itself only at the edge of the empty part of the first mold. Make also conduits of wax around the legs & around the contours of the body which are a little long, & they will serve as feeders for the molded thing.

Margin Notes:

[RIGHT-BOTTOM] Follow here
above ദ^[558]

[LEFT-MIDDLE]

When the tail, which is delicate and closer to the gate, comes out well, the rest will also come out well.

[LEFT-MIDDLE] The principal thing is that the ears of the snake come out well-molded.

[LEFT-MIDDLE] Your gate must be very thin at the entrance of the animal & of the thickness of a knife.

[LEFT-MIDDLE]

[Figure: fig_p124v_1]

& from these conduits & feeders, you can also put in small threads of **wax** which are joined to the body, in order that the **metal** goes more easily from one part to another & promptly runs everywhere. And from these conduits, you lead your gate & your vents without spoiling anything.

You can divide it also in two or three branches thus

[Figure: *fig_p125r_2*]

when it approaches the molded thing, and always make holes in the gate.

Margin Notes:

[TOP]  [559] From small rolls, you make your gates and vents without danger of crusting & removing anything from the **mold**, because the **wax**, being taken away, leaves the empty space all made. Make your vents

[LEFT-MIDDLE] coming from the head, which is in the bottom, toward the gate. Make also your gate so that it is ~~too~~ but a little thick, and make within its course two or three notches, for this breaks up the fury of the **metal**

Plaster

v mold something to cast **wax** in it, you mold in **plaster** alone, reheated after being pulverized. For, once reheated in **stone**, the outside is cooked & the inside stays almost raw. **Transparent grey plaster is not strong, but the one that, being tempered, is white & sets very quickly, is good.** However, the grey I have found to be quite firm & hard after having set, but it takes *longer* to do so. One needs to know the nature of each. **If you** You will never mold very neatly if **not** you do not temper, very thin & liquid, your **plaster** or your **sand of noyau**. Temper it **immediately** quickly after it has been reheated.

Margin Notes:

[LEFT-MIDDLE] +

If you mold with **plaster** *erud* alone, reheat it nevertheless as said. One needs to **oil** well the first **mold**. And when the second one has set well, and it is ready, soak it for a long time in **water**. And if it does not want to release, soak it in **hot water**, for **cold water** hardens it.

Scimitars^[560]

workers from **Damascus** or from **Hungary**, neighbors to the **Turks**, separate, in the **ore**, **iron** from **steel**. And, from this first **steel**, first melted from its **ore**, they cast **scimitar** blades in **sand** *sab* which afterward cut the other **iron** without any difficulty, because any **melted iron** is harder than **soft iron** beaten from pigs & bars. Thus is the **steel** of **scimitars**, but it is quite brittle. When one un-hilts *b* a **scimitar**, one recognizes by the tang that enters the hilt that it is cast in **sand**.

Margin Notes:

[LEFT-TOP]

To know^[561]

Margin Notes:

[LEFT-TOP] And **hot water** softens it further. **Cold water** does not penetrate it like it does with the mixed one, because it is harder & the mixed one is more spongy.

Hearing from afar

ear fully there, *at night or at a silent time*, & you will easily *hear* the noise.

Margin Notes:

[LEFT-TOP] With this **plaster**,
thus reheated as powder,
one can cast medals of it
that do not fear the
rain, especially if they are
varnished. One can find these in **Germany**,

Secret^[562]

Margin Notes:

[BOTTOM] **on the houses**. But take heed that the **water** be very hot, & if it is boiling, there is no danger. All **plaster** molds, alone or mixed, release in it.

Vipers and snakes

viper, which, for casting, is more appropriate than any other **snake** because it has scales beautiful & very visible on all the body & principally on the head and under the throat. It has a flat head, the snout reddish, tending toward incarnadine, & snubbed like the **horned asp** or like **a** the top of a **pig**'s snout, big jowls, the eyes very close to the snout, and the mouth wide open, where it has double canine teeth on each side, all coming out of a strip of flesh that covers and clothes them. It also has, in the throat, a tube of flesh, made like a **dog**'s penis, from which comes its stinger. Other **snakes** have a double row of teeth.

Margin Notes:

[LEFT-MIDDLE] If you want ~~eat~~ the to mold the **snakes** with the mouth open, you must cut off the head & leave it inside, for it will not be released.

turtles

snakes, & plants, and flowers because the cavities that are between the two shells require several pieces. They are molded in **plaster** to be cast in **sugar** without making a gate as do all things that you want. [563]

Plaster for casting of **wax**

wax in the **plaster** mold, you must know as secret that there is need for your **mold** to be in **hot water**. Never does the animal come out so neatly as in **metal**, because the **wax** sticks. But it is to model an animal closest to nature **and** to repair it afterward. One needs to smooth well away all the scales, **when** for **wax** would enter there & not release well. In molding thus the animal, flatten down the scales for **wax** &, on the contrary, rub them in reverse in order that they stand up for animals, for they will only be more visible. Also, do not wait for the **wax** to a **bit** cool completely to release it, but do so when it is still a bit warm. When you have also molded the first cast of the animal, uncover well the half, in order that, in its release, there is as much of it in one half of the **mold** as in the other. Make also strong wide gates, close to the animal, in order that it is fortified when it is released, & afterward you cut this off.

Margin Notes:

[LEFT-MIDDLE] +

Alabaster, commonly called so, which is nevertheless **plaster**, is very hard but it shrinks a lot. It is very good to make medals, but it wants to be very finely sieved.

sugar

Sugar is fatty when runny and brittle & breakable when dry, and with it, one casts well round things & large muscles, but awkwardly things fine & delicate. However, try **well-clarified sugar**. One needs to soak for one **night** or one **day** the **plaster** mold before casting the **sugar**, in order that it is very full of **water** & does not imbibe the **syrup**. One needs also for it to be of easy release, for the **sugar** is sour & brittle. Finally, do not consider casting anything in **sugar** that does not release well and that cannot be neatly molded in two halves, to open it when you will need to. If you want to mold a bunch of **grapes**, one needs to take it, like any other fruit, in

its true vigor, for if it is withered, it will ~~not~~ come out that way. Take heed, therefore, to make your molds in the natural *season* of ~~that~~ all things. The *grapes* that are usually wanted cast in *sugar* can be made artificially or with *wax* or *earth*, or even with some *grapes* attached with some *melted wax* on some slab & other full thing, so that they are very close together and release well, & only make up one half. Or, if you have some of those *grapes* called *chauchés* or *sauvignons*, which have the *grapes* very close together, encase half of them ~~on~~ in the *clay* slab and cast on the other half. And if some *grape* is not released, pluck it out. Note that neither in *sugar*, nor in *metal*, can a *bunch* which has light & separated *grapes* be cast properly, because the end of the bunch is so delicate, especially if the *grapes* are kept, that it could not sustain the large *grapes*. Thus, you will need to cast hollow, which you could not do if the *bunch* does not have the *grapes* close together & *molds* without having them scattered & spread apart.

Margin Notes:

[LEFT-MIDDLE] To cast *pears* & *apples* in *sugar*, one ought not to make any gates, but rather, fill one half of the *mold* and then join the two, and keep turning it until the *sugar* has set and is cold. One ought to mix nothing in the *mold* apart from *plaster*, reheated as you know.

[LEFT-MIDDLE] +

One needs for the *mold* to have soaked one day and one night in *cold water* for, and to be humid, when you cast in *sugar*.

[LEFT-MIDDLE] The sign that the *syrup* or the *sugar melted in water* is sufficiently cooked to cast fruits, is when it makes threads

[LEFT-BOTTOM] when shaking it. And if it passes that point, it is not good, for it will always be humid. If the *sugar* sticks, one needs to throw some *wheat starch* in the *mold* or rub it with an *almond*.

Crocum ferri

iron rust than with *filings*. For if the *vinegar* is good, you will see it boil with large bubbles as if it on the *rust*, as if it were on the fire; on the *filings*, it does not boil unless it is put on the fire or *hot ashes*. However, when the *filings* are passed through *vinegar*, & you have made it evaporate & heat up, & it is very red, if you do this again for a second time, the *vinegar* will

have much more strength, & the *crocum* will only be finer for it, & redder. Those who use it to cast in gold *ven* buy the ounce for forty or fifty *sous*.

Margin Notes:

[LEFT-MIDDLE] It does not harden the molds, and, in scraping, one cannot tell that they are harder from it. But it makes the mold less dense, and it drinks in and attracts the gold better.

Plaster

molds from large works & pieces of wood, it will not release well unless you *boil* make your wood imbibe very hot wax. For the wood absorbs & drinks & in this way attracts the plaster. You can assume the same thing for any other large piece of work. But the cure is to *lab* saturate *Fourvra* with very hot wax the work on which you want to cast your plaster. For by this means, it will not drink it up & will release very neatly.

Margin Notes:

[LEFT-MIDDLE] If the plaster shrinks, it will always make flashing. Seek the hard kind and *it* put your molds well in the press before casting.

[LEFT-MIDDLE] It is not good when it shrinks.

noyau

wood is very difficult to burn in the *noyau*, such as *asparagus*, *thyme*, & similar things, because they stay as charcoal in the small conduits, & if they do not reduce well into ashes, it is not possible to empty them from the mold. Some reheat them, to do this, two or *a* three times. Others, putting several plants together in the mold, pass through *threads* the plants & the *es*^[564] molds circle of earth, which is to receive the tempered sand, *plusi*

Margin Notes:

[LEFT-MIDDLE] This does not proceed from plants that have a stem with lines, because **rosemary** burns well, but it is in the nature of certain plants.

by when you throw in your **clear sand**, as to give them venting when the **mold** is reheated. For, in doing this, the **mold** **thread** burns & leaves some empty space around the plants, which serves as vents & places for evacuating, & to give air to the plants so that they burn better. For what makes them stay as **charcoal** is that they burn in a closed fire & without empty space because of their fine sprigs. Try, therefore, to thicken the main stem with a little **melted wax**, & let it cool, then mold it. And when the **wax** melts, it airs it, the principal stem, with space & as if loose so that it burns better. Or else, anoint them with **oil of petrol or sulfur**, of **turpentine**, **oil of brick** & similar things, or **aquafortis** or **eau-de-vie**, or make **sands** with **crocum**, **iron scales**, loops of **iron**, **emery** & things that withstand several **days** of great firing.

Animal bones are not so difficult to burn & reduce to **ashes**, because once the **flesh** is burnt, the **bones** remain loose & the weight of the **quicksilver** makes them break & disintegrate, once calcined & burnt.

Margin Notes:

[LEFT-MIDDLE] **Asparagus** always stays as **charcoal**, like little pins. Try to take it, and **thyme**, at the beginning, when they are growing, so that their stem is still thin.

Molds of **plaster** for **wax**

mold of **plaster** is done & dried, take heed that your **mold** be of good release, for sometimes it happens that the animal, being wounded or thin & withered, makes wrinkles, where **retire** its scales are, where the **plaster** enters. And this not being of good release, the **wax** animal would attach itself & would break, & you would never have it perfect. *Take heed also to make your gates for the **wax** very wide. Thus, & the gates should not be too thick. They are made when the animal is*

[Figure: fig_p127r_1]

the molds have been made from both sides & the animal is outside of it.

FOUNDERS' earth

terre bolvene mixed with **dung** or **cloth waste**, which withstands fire, which you need to always have provision of to lute your molds that **have b** are meant to serve for casting **silver** & that one needs to reheat. Those where one needs to burn some flower or animal should not be luted until they have been reheated once, and they have been cleaned of **bones** & **ashes** remaining inside, and, having removed the **clamps**, you have opened the two halves to see if they are cracked. For there is **plaster** that is not so hard in the fire, one as the other. Moreover, there is some which makes crusty the things which stay burning inside. And these are imperfections that one needs to avoid, either **by** by bathing well with **eau-de-vie** the animal before casting in the **tempered sand**, or mixing in more or less **brick** or **alum**, or reheating the **brick** more, or in place of the **brick**, mixing in **crucible bottoms** & similar things which resist well in the fire. Having therefore reheated your mold to burn it inside, leave to cool well. And if it is neat & not cracked, put the **clamps** back & lute it with this **aforesaid FOUNDERS' earth** & sprinkle a little **sifted ash** & let dry a little. But keep yourself from luting **that they are not** until the **molds** are cold. Those for casting **silver**, where there is nothing to burn inside, only need, except when the gate & vents are made, luting & reheating once. Do not lute the end of the **mold** where you want to make your gate, but leave it uncovered & the exit of the vent as well.

Margin Notes:

[LEFT-TOP] The **earth** that **LOCKSMITHS**
use to **braze** or **solder**, which is

[LEFT-MIDDLE] **sandy clay earth**, or else **clay** mixed with **sand**, after having dried & sieved & then composed it, is good for luting your **molds** because this **earth** melts rather than cracks. And any **earth** that melts **is** cannot be lacking in this.

[LEFT-MIDDLE] Iron wire to give it bond

[Figure: fig_p127v_1]

[LEFT-MIDDLE] Lute thickly your molds, & if they are small, you can reheat them immediately in a good fire, especially those of *crocum*.

[LEFT-MIDDLE] If the earth is good, & *l* does not crack while reheating, & does not separate from the mold, the molds will also not crack & will not make flashing at the casting. Reheat with slow ease in a closed fire, & do not expose them hot^[565] to the air.

[LEFT-MIDDLE] Lute rather thickly in two or three layers, especially right in the joints, in order that the silver does not come out of the mold.

If the molds that were *do* to crack, it is made thus at the first reheating, for at the second, they no longer crack.

The smallest molds are reheated more quickly. Take them therefore, the first reheated ones when you cast, for you can put several of them to reheat.

forge or in some other place nearby, & having placed your molds on a layer of good embers, not burning too much, to have a slow fire at the beginning, put there & adjust a little the half-lit charcoals in the forge.

Margin Notes:

[LEFT-MIDDLE] Reheat in a reverberatory furnace.

[LEFT-MIDDLE] To test if your earth is good, before putting it on your mold, lute at the place of the *fe* wall of the forge which is around the blast-pipe & barrel of the bellows, & light the fire, & if it withstands this without cracking, it will be good.

silver and gold

metals a small stone of pulverized borax at the bottom of the *crucible* & the gold and silver on top. This makes it so that if the *crucible* gives off some vapor or sour fumes, it will not impair these two metals. For gold in particular, this is good.

molds to cast, do not think of filling them in one cast, for the metal would be cold. But having cast while hot & filling one, remelt & cast in the other.

Margin Notes:

[RIGHT-TOP] Some let the silver rest a little outside before casting.

[LEFT-TOP] Gold and silver, melted with the aforesaid things, scarcely become porous.

[LEFT-MIDDLE] For gold, one does not need ~~a~~^[566] as much tin crocum as feather alum.

mold starts to redden on the inside, & that the cast loses its blackness, then put your & when looking inside the cast you do not see *plas* a single point of blackness, continue to maintain it in this heat &, if need be, add in some half-lit charcoals with your pincers. However, *eom* put in the forge your *crucible* with a little ground borax at the bottom, & the silver that you want to cast in your forge should be on top, letting your *crucible* reheat between the lit charcoals *jus* without blowing until it is red, for before, one ought not to blow. And when you do blow, push in a longish & continuous movement the bellows, giving them a little shake when pushing & another when pulling toward you. In this way, the heat becomes stronger. *Com Do not* Take heed to raise sometimes your *crucible* with the with hot pincers, because *il*^[502] if it is placed right in front of the blast-pipe & the bellow *b* wind hits the wind of the bellows hits the *crucible*, it will cool your silver rather than heating it. Make sure that the lit charcoals support it from above the blast-pipe, & take care that it is at a distance of three good fingers from the wall of the forge. In this way, it heats better. Therefore, when your silver starts to melt, if you recognize that it is brittle, seeing cracked & burst lumps, take the size of a hazelnut of arsenic & two times as much of raw tartar, coarsely pulverized, for in this way, they have more ability to heat. And occasionally throw it in the *crucible* on the silver, which clarifies it. But if you have some of that crust sublimated on a

metal substance, which looks like grain of steel, as previously described,^[567] take a little of that, leaving #^[134] the others, & throw it on your melted silver.

Margin Notes:

[LEFT-MIDDLE] Small molds are reheated quickly, but big & small ones should dry beforehand in the furnace, for the humidity of the mold, by the *e*^[151] *fo* heat of the furnace, is attracted outside. But the fierce heat of the charcoals chases it from the exterior through the inside.

[LEFT-MIDDLE] All alloyed silver produces film, and all other metal as well.

[LEFT-MIDDLE] Silver does not want to be uncovered when melted.

[LEFT-MIDDLE] #^[135]

Coarsely pulverized

[BOTTOM] A lump of adulterated silver vitrifies in red because of the arsenic & orpiment.

quicksilver, prepare yourself to cast. And to this effect, have some lean delicate sand, in a *terrine* or another vessel, that you would like to help yourself to. Make a pit in your sand, then, with your pincers, take your well-reddened mold & place it in this pit of sand. Cover immediately the opening of your mold in order that no ash & dust enters inside, & then enclose it with sand up to the edge of the gate & the vents. This done, uncover your mold & throw on top of your well-melted silver, the size of a pea or thereabouts, some of this metallic grain, which will immediately spread through all your silver & make it boil & turn. Cast as soon as you have put in this substance, for it is this that is the secret to making the silver run, since its crust heats it & clarifies it. You can cast silver finer than the alloy from the capital and like that of the real, but you must add this grain in.

Margin Notes:

[LEFT-MIDDLE] With all of this, do not let yourself forget to put, before all things, a little borax in the melted silver, for even though GOLDSMITHS do not put any in, nevertheless it is good, and I have seen it practiced well. Next, one puts in the crust of the substance at two different times & then the metallic thing. Then make sure *[illegible]* that it be placed at the end of your forge.

[LEFT-MIDDLE] If you want to blow the ash that is around your mold when you hold it between the pincers, hold it with the opening at the bottom, & blow.

[LEFT-MIDDLE] When silver is well melted, you can uncover it and blow with the small bellows, not continually like with gold, but only to cast out the charcoals in order to put in the substances that make it run.

silver

base silver, & especially the Germans, and that such an alloy readily makes a film or crust, ~~which is contrary to our some GOLDSMITHS from France~~ are usually quick to whiten their works, especially rough ones, because they only use common *bullitoyre*, which is tartar & common salt, nearly as much of one as the other. But I have seen an excellent German working thus. Having in my presence cast a little lizard with an alloy of teston, he made a greyish ~~not~~ crust. And to clean it from it, he boiled it in the above-mentioned *bullitoyre* of tartar & pulverized common salt and mixed with common water, in the fire of his forge. Once taken out, he brushed it. And because it was not as clean of this crust as he fancied, he burned some tartar in some paper until it was black & no longer smoked. Then, he wetted the aforesaid tartar ~~d~~ with the water of *bullitoyre*, composed of salt & tartar, & covered all his lizard with it. Then, he put it between the live ~~of~~ charcoals of his forge & blew a little. When the lizard was red, he took it out, let it cool, then reheated it in the *bullitoyre*. Next, he brushed it in clear water.

Margin Notes:

[LEFT-MIDDLE] +

Note that the *bullitoyre* for *silver* is never good in a *crucible* because the *water*, taking the form of the *tartar*, evaporates. But the *vessel* for boiling, being of *copper*, is excellent for the whitening of *silver* & for the mixture which colors *gold*.

[LEFT-MIDDLE] He took heed not to let his *water of tartar* boil so much that it would have poured out on top, because then its strength goes away. Therefore, when this first fury of boiling comes, remove it from the fire & put it back. He held as a secret this *burned tartar* put on top for *base silver*.

metal

gum or because oil takes a *long time* to dry and runs if it is layered thinly, as the plants require. And if you still want it done promptly, temper your color with *glair* beaten with *peelings of the fig tree*, and your work will soon be dry. But layer it thinly.

wormseed^[568]

vert de terre, *white lead* or *ceruse*, a bit of *massicot*, *stil de grain yellow*, and *cendré*^[140] of *azure*. Mix & compose your color according to a natural branch that you will have.

Viper color

snake that can be molded, because it has very beautiful scales, & hard & transparent. Its true color is made with good *verdigris* ground well with some *good vinegar*, if it is of *lead* or *tin*. And if it is in some place darker, fumigate this first color with *sulfur*, as you know. And if one needs to lighten and whiten, like under the throat, rub with *coarse linen*. The male ejects from its nature,^[569] which is at the bottom, when it is firmly pressed, a little mass like half an *arquebus ball* made in the genitals and full of very venomous^[570] spurs.

Margin Notes:

[LEFT-MIDDLE] +

Put a bit of *metalline* in your *tin* & your *lizard* will resemble *silver*.

roses

obl avoid this, one needs to anoint them with *wheat oil*, which is very dessicative. And having quickly dried, it firms & stiffens the petals to be able to separate them & withstand the *tempered sand*. The same is done with *flies*, with *pansies* & similar delicate things, with flowers from the *caper plant*.

oven for a long time

slab of *earth*, arranging them with points of *iron* wire, as if you wanted to mold them, and *they* dry them in an *oven* after the *bread* has been taken out. And they always remain thus, as much for *snakes*, as *birds* and other things. But it is necessary that they be dried promptly.

Margin Notes:

[LEFT-MIDDLE] Note that one needs to give them their shape & put them in the *sand*, as with flowers, & promptly dry them in the *oven*, which is hot enough, like when one takes out the *bread*. And it should stay there a day & a night in order that it is *chatt* dry, for otherwise it would be *smelly*. However, take heed that the *oven* not be too harsh, but rather like the heat of the *sun in June*, otherwise the animals cook. Once dry, do not wet them, but clean them with a paintbrush or clean them with a brush.

copper

d [270] having cast them in *copper*, to burnish them like *gemstone foils*, to see if they take color similarly.

Do not Be careful to not make your gate very wide, and do not forget to make in its conduit two or three holes and notches, & as your gate approaches the *eh* molded thing, divide it into three or four parts like **fingers which are pointed & are not very deep. For the **metal** runs more gently without being hindered by vapors & fumes.**

Margin Notes:

[RIGHT-TOP]

[571] Always make
the entry of the gate
near the medal
notched & lumpy,
to draw out the fury of the
metal.

[LEFT-MIDDLE]

[Figure: fig_p129v_1]

Spider molded on a leaf

very big ones usually have hairy feet, which are vexing to mold if you do not lay them flat, or burn them with a candle, or stiffen them & lay them flat ~~with some~~, anointing them with **wheat oil**. Kill them in **vinegar** & **urine**, like **snakes** &, or in **eau-de-vie**, and then shape them on a well-made **vine** leaf or other thing. Next, you can give them back their capricious hair with *bourr* the sieved **fine hair of cloth waste**, having anointed them ~~with a~~ with **fish glue** or similar. Their true color is of **vinegar** & **verdet**, & then fumigate them in various places with

sulfur. Having made your *tourt* clay slab, place on it your **vine** leaf, and the dead **spider** in the middle, & pierce with a point of **iron or latten wire** the middle of the **spider**'s body & the leaf together. Next, place diagonally small points of **latten wire** around the **vine** leaf to secure it well. Then fix, with a little **melted wax** and the point of a hot **iron wire**, the end of the legs, adapting them with the end of small pincers. Do the same thing with the end of the small cornicles of the **spider**. Return ^{+[134]}

Margin Notes:

[LEFT-TOP] To make the gate
for the **spider** on the
leaf and to prevent
the **sand** from covering the **spider** from underneath the belly, furnish the end of the
tail & the bottom of the body with a little **wax, melted** & applied with the hot **iron wire**, as you
know. In
this way, when the leaf burns & the
wax is melted, there will remain
two little holes in the leaf which will be the gate of the **spider**.

[LEFT-MIDDLE] ^{+[135]}
Once the **wax** is cool, scrape the excess with the point of a penknife in order that the end of the legs stay neat. Next, place the circle of **earth** around & cast your **tempered sand**, like for other things. In this manner, you will need to burn the **vine** leaf in the mold, otherwise not. And to cast more easily, let the animal die fully, in order that, when struggling, it does not mix up its legs. Having made your first cast, uncover the reverse of the leaf and make the second cast.

oven

s cats are skinned and one removes their eyes & all their entrails. One puts a small stick vertically between their teeth to make them open their mouths wide. Then with **iron points** one attaches their feet to a small board, giving them the fitting attitude & gait. Once thus attached by their feet with small rings of **iron wire** thus,^[572] one needs to suspend them in the **sun** with the backbone downward. In this manner they take **& d** their shape & dry, & the belly tightens & the tail remains high or with the bend that you will have given it. Once a little dry by this means, one turns the head as one wants, securing it with some tool. Then one finishes drying it in an **oven** when the bread is drawn. Next, one places in the hollow of the eyes balls

of **lead** or of **wax**, painted according to nature. One paints them with **well-gummed ink** so that they seem to be jet. One gives it a painted tongue, horns, wings & similar fancies. Thus for **rats** & all animals.

Margin Notes:

[LEFT-MIDDLE] [573]

[Figure: fig_p13or_1]

which, surrounding the fingers of the paws, stick in the jacket of **clay**.

crayfish, which will seem boiled

quite good vinegar in which there should be a little **eau-de-vie** & hardly any, & they can be served as cooked & will move around.

spider

clay slab, as has been said, on a **vine** leaf, and make there your first cast; & once it has set, uncover the **spider** up to half its legs, then make the second cast.

Margin Notes:

[LEFT-MIDDLE] In-order

The hairy feet of large **spiders**, like any animal hair, does not mold well if it is not flattened, having anointed it with **wheat oil**, which stiffens it & is quickly dry. Hairy things mix with the **sand** & do not burn well.

vine leaf

points of fine iron latten wire & place diagonally on the clay slab, then cast the first mold. When it has set, uncover the baek reverse & make the second cast, which once set, you can take away the leaf. And you will need to reheat your mold only once, because there will be nothing to burn.

crab

mou^[574] burn & in this case, one it needs to sometimes reheat the mold three or four times. And with all of this, it leaves a hard crust, grey like ash. But because it does not mold in one piece & one cast like plants, but rather in two casts like snakes that release well, one removes this crust, not with quicksilver, which would do nothing,^[575] after it has been opened, with the very fine point of a penknife with dexterity, as with the little crusts of the second cast, which enter in the nooks that the sand or the molded animal made. But, la^[576] because it has curved legs, here is the cunning & secret for releasing it.

Margin Notes:

[LEFT-MIDDLE] It is painted like a crayfish.

mold until you have first reheated it well. Otherwise, because of its curved legs, you would break everything. In this lies the dexterity. If you recognize, after having reheated & opened it, that the crust is not burned enough, reheat until it is.

Margin Notes:

[LEFT-MIDDLE] Know that For opening the mold, there is no need to soak it, for once reheated, it will open by itself.

Stag beetle

crab, therefore do for it as you did for the **crab**.

en noyau *la*^[209] the first *e-figur* mold, let it dry well before taking away the figure of **wax**, ~~in-order~~ in order that the mold does not corrupt. Next, make a small lasagna of **paste** of such thickness as you would like, and having anointed with **butter** your the hollow of your first hollow mold, adapt the **paste** to it, and then make your second mold on top. If you were to anoint with **oil**, it would be absorbed & would not be as appropriate as **butter**.

Plants that are awkward to burn in the mold

charcoal from inside.

Margin Notes:

[LEFT-MIDDLE] *Trial*

paper

ink or with any color which has body & which does not erase once moistened with **eau-de-vie**. Then, place your **paper** on a **clay** slab & moisten it with **eau-de-vie** and cast on one side & the other.

beds, mirrors, and suchlike

quite flat **slate** to adapt it to either round or flat things. And having cast it in **mixed tin**, quite thin, you can **gild** it with **gold leaf** & adapt it to whatever you want, and fill the *vui* bottom of the relief with small **rubies**, **orpiment** & little grains of diverse colors.

dogei^[577] well

cheese that has been held under your **armpit**. Which must be a bad drug, & for the **MASTER**, if he is red-haired, & for the **APPRENTICE** too.

waxes

wax composed of **ceruse** & **lead white** are not for burning & melting in a mold where you want to cast **gold** & **silver**, for this would sour it. And then, if you think about taking away these **waxes** composed of things coming from the **metals** reheated in the **mold**, you will be wrong, because, the asperity of the fire making them seethe *ir*,^[578] the **wax** goes away & the composition of the **ceruse** or other metallic color attacks the **mold**. And for this reason, if you want to rough out something

Margin Notes:

[LEFT-MIDDLE] +

Nota^[535]

White **wax** is more delicate than the other & it does not leave any **filth** when you want to make **noyau** and mold hollow.

gold and **silver**, put only in your **wax** what you prepare for this effect **sino** from all these drugs, except casting with **melted sulfur**, since it is melted, & candle **smoke**. The melted **sulfur** goes to the bottom and nevertheless leaves its quality in the **wax**, making it melt promptly in the fire & giving it firmness. In this way, you can melt in the fire this roughed out *ei* figure of **wax**. But if it is composed of **ceruse** or suchlike, it is necessary that you put your **mold** in **boiling water**.

Margin Notes:

[LEFT-MIDDLE] For figures of flat wax, there is no need for all this, for the wax releases & does not stay in the *la*^[209] mold.

tin or lead becomes porous

wax which you can gild afterward with silver or gold. To prevent this, if you cast thin, the alloy of one ȝ *d'est* of lead for one lb of tin is good. But if you cast with lead for a thick thing, one needs for one lb of the latter, two ȝ of tin, for the lead, being fatty & weighty, carries more. From this alloy, I cast a large lizard like a natural one. In thick things, if which keep their heat a long time, if there is little tin, it makes it porous. Your mold must not be cold, but of such a heat that you can handle it without harm, or that you can keep your finger in the gate without burning yourself. It is also necessary that your lead or tin be as if red. Melt first the lead & then the alloy of tin on top. And as you want to cast, put a piece of rosin & then a little looking-glass tin. If you put too much lead into the tin, it does not run very thin. And to know this, if *l*^[554] the tin cries loudly, it is a sign there is not too much lead. If it cries weakly, that means that there is too much. Take heed

Margin Notes:

[LEFT-MIDDLE] You can solder with the *les* same substance, then repair it with the burin, file, chape & suchlike.

[LEFT-MIDDLE] Tin is a metal that penetrates, that becomes porous & burns, and is fanciful to use, more than gold and silver.

[LEFT-MIDDLE] Lead wants not only to be red, but also lively & runny & liquid as water, which is a sign of its perfect heat, & the mold *eh*^[579] is so hot that you can bear putting your finger in it. Do not open until it is cooled. It is a sign of a good cast, as much for it as for gold & silver, when it exits by the vents.

mold too hot, for this sours it, makes it porous & contracts the **tin**, & makes the molded thing break. Also, do not quench your hot mold in **water**, for this makes the ~~the met~~ **tin** or **lead** contract.

Mold made in two casts

clamps on again, one lutes the mold & especially the joints, then one slowly dries the **earth**. And then, as it no longer **smokes**, one leaves the mold to cool until you can hold it without harm. Next, put in the **presses** or in the **sand** in a *terrine*, & cast in **tin**. For if you were to cast in **silver** or **gold**, it would be necessary that your mold be reheated twice & cast when it would be completely red.

Margin Notes:

[LEFT-MIDDLE] If your **mold**, through the fault of the **plaster**, retracts in the fire, you need to open it after the first reheating to tighten it again, & clamp it and lute again, and tighten again.

molds

charcoals in the **forge**, & then arrange them in rows in a corner of it, according to the size of your **mold**, in such a way that it can be furnished with three or 4 **fingers** all around, and especially at the bottom of the **mold**, which is the thickest and which. Your **charcoals** thus arranged, place your **molds** on top of them, & not on a **grate**, as some do, because they would take the fire too harshly. And leave for some time thus, & little & by little, warm your **oven**, always adding some lit **charcoal**. And as long as the **mold** is humid, the **charcoals** will be as if died down from below. But as it dries, they will kindle by themselves. And when it is dry on one side, turn it to the other. And when it is dry on both, & it will no longer **smoke**. At that moment, invigorate the fire & cover it with lit **charcoals**. And as it will begin to redden, do not blow the **charcoals** with the little **bellows**, for this would make it **blow** burst. And similarly, when it is red, keep it well covered with lit **charcoals** & do not uncover it, for it would crack. Make sure **wind from a window** does not beat upon it. Let cool

Margin Notes:

[LEFT-MIDDLE] When you want to reheat your molds, & be they luted or not, mark on the belly the place to put at the bottom, against the lit charcoals, ~~that~~ because if the ardor of the fire were to make them crack, it would be better that this be at the belly & from underneath than on the back.

[LEFT-MIDDLE] If your mold is small, one ought not to leave it ~~rest~~ so much in the fire, for it corrupts and cracks there, for it reheats more quickly than a big one.

Common sand from the *mine*

frame, if one casts hot, it becomes porous; therefore, one only needs to dry it out.

Crocum ferri

d^[580] passed it through *vinegar* & reddened it in the fire, I had it finely ground on *porphyry*, until no roughness was *perceived on the fingernail*. Then, I wet it with *very good vinegar* & left it there *a*^[581] two or three *days*, stirring it several times each *day*. Finally, I boiled it & reddened *in* the pot & *crocum* all together in the *four à vent*. It came back in a mass full of small bubbles, but that can be pulverized very finely between the *fingers*. I put some in the *sand*, *a* half as much as *feather alum*. I tempered the *sand* quite thinly & molded out of it a *very small female lizard*, which molded very neatly & delicately & very finely. The *crocum ferri* does not render the *mold* harder, but it firms it. And when your *mold* is soft & fatty *when scraping it with the fingernail*, it is a sign that the *crocum* is good, very fine, & well prepared. The quantity cannot spoil the *mold*, because it is a friend to *gold*. And I believe that *silver* would come out well. And that the *mold*, through this means, does not crack. *Make it from filings of needles.*

Margin Notes:

[LEFT-TOP] I have tried to make it so the molds where it is mixed do not crack during reheating & thus do not make flashing.

[LEFT-MIDDLE] It is better made with **distilled vinegar**.

[LEFT-MIDDLE] One can put some amongst the molds, where you want to cast **silver**, for it firms the **molds**, and *you will find it so, by scraping a little harder than the other where there is none*. It molds very neatly.

[LEFT-MIDDLE] This one is appropriate for all **molds** & keeps them from breaking & bursting in the fire. And for flat medals, it withstands several casts. The one of **steel fillings & needles** is redder & better.

Gilding animals cast in **silver**

gild them with **amalgam** without spoiling any of the features, if they are made of **silver**.

Hard wax for imprinting seals

white wax, which is harder than the other, & one mixes in **very finely ground ceruse or lead white** until it becomes as hard as you fancy *it*, adding to it a drop of **turpentine** to bind it. Next, mix in whatever color you want. This is the **wax GOLDSMITHS** use for modeling.

small[s]^[582] female lizards for **gold** and **silver**

d^[566] you uncover the belly & the bottom of the feet, cover them lightly with **wax** & then cast the second **mold**. And the **wax** being removed, it will leave a *g^[583]* little gate for the said feet. And should the bottom of these come off in one piece, you can repair it well. And the scales from the top of the toes will come out well.

[Figure: fig_p133r_1]

Margin Notes:

[LEFT-MIDDLE] At the end of the nails of large lizards, place make on each one a little circle of wax, to make the gate thus

points of iron wire which are found on the head of the animal

L[584] With the points, one has previously set the stance, especially that of the head. But the head being pierced, there remains around the hole some moisture and a little exudation, which hinders the sand from covering the point & there always remains some little opening g. But to avoid this, you can plant in the slab of earth an iron point, arro cleaned & rounded at the top end, & on this end place there a little hard wax or some a little mastic or cement and, by means of the hot iron wire, hold in place the throat of the animal, which can be removed when you come to uncover the belly & the throat to make the second cast.

Clamps and broken mold

clamps, and you have the opened your mold to clean it by blowing with quicksilver, which is used only in enclosed molds, close the mold again & put the clamps on again, but not in the first place where they were. Lute again & dry again. But if it is for a cast with silver or gold, lute with the remainder of the sand that was used, for it is the safest. If your mold, while reheating, is broken, you can adjust it with some clamps & lute.

Margin Notes:

[LEFT-MIDDLE] X

mold

small molds, one after the other, in the same bowl, for the last one is cast from the bottom & thickest of the bowl, which readily becomes porous. The thinnest casts more finely & more

neatly, provided that one blows strongly enough when casting on the tempered & cast **sand** in order to dissipate these small bubbles.

Margin Notes:

[LEFT-MIDDLE] When the **sand** is cast thickly, it readily becomes porous

mold, but cut it with chisels in one go, in order that the **blood does not fall on the mold & does not create **filth**, which, once reheated, is difficult to remove. Next, put your mold in the oven or similar heat, in order that it dries promptly & retracts before making a crust or **mold** on the mold.**

Margin Notes:

[LEFT-MIDDLE] +

When you mold **small female lizards** and you want to uncover the part first molded, begin to uncover the heads & you will recognize its place by the **pin**. Do not attempt to uncover the legs until you have uncovered the rest of the body, in order that the stripped body, as it moves, does not remove the legs from their place, where it is vexing to put them back. When you remove the little points which hold the legs, fix them & press them with something, in order that, when removing the pin, they are not removed from their place, or, in the end, you can put them back with some **wax**.

snake entwined with a lizard, one biting the other, or a snake that eats a frog or a wall lizard s^[585] & suchlike. But because these entwinings can in no way make a good release, cut what you can & leave the rest to burn. And to keep a wall lizard, which is small, in the mouth of the snake, which is raised & needs to be supported in the air *po* because the head of the snake is posed raised, put underneath the wall lizard se^[586] an elevation of earth suited to support it. And if you put your mold in the oven, the animal, drying promptly, will retract & will burn better afterward. ~~if you see~~ These entwinings are also made to cover a wound or fault in the animals, which one usually wounds when one catches them. Also, do not forget to attach & join with some wax s, finely applied with hot iron wire, all the parts of the animal which pass one on top of the other or those that you notice are not well fixed on the wax earthen slab, in order that the tempered sand does not remove it. And it is to

points, which should not be put except at the raising of the head, at the thickest places of the body & the simple & delicate parts in the middle of the lizard's feet, the nails of which you will enter into the clay slab, in order that they remain secure. When you have made the first cast & uncovered the belly of the animal, do not forget to put small thin s^[582] slabs of wax at the end of the lizard's legs. But, if it is a small wall lizard, lightly cover with wax the entire bottom of the foot, *and and this* the wax, being removed after the second cast, leaves a cavity which fills these small fingers with metal, & then one repairs them. Take heed therefore to attach well with wax the parts of the animal which pass one over the other, in order that the wetted sand entering between two does not take it away. *And if* For if this were to happen, the mold would spoil shape *in the first placee* would spoil corrupt & your mold also because it would not have the thickness that *it*^[502] you think & would be pierced & spoiled. And, even though to avoid

this you can make the mold thicker, however, should ^t[\[554\]](#) this mishap happen, you will be able to repair it in this way.

mold

to not have and deviates from the stance that you gave it, because it was not quite dead or because it was not well attached with the iron points or with melted wax, and it does not have the thickness that it needs on the outside, at the middle of the swelling, or is pierced, before removing the animal from inside, uncover what seems to you the weak part, or the place that is pierced, and make small holes all around ~~all-around~~, then soak the back of the mold. And cast promptly on top of the same tempered sand, which will enter in these openings & mold & attach to the other. But, one will need to lute this place well afterward.

Sand of crocum

crocum ferri in molds for silver as well as for gold, for it firms them & keeps them from cracking & making flashing. And I believe that for flat things it would withstand ~~well-de~~ several casts, which, however, for gold & silver is hardly practiced.

Margin Notes:

[LEFT-MIDDLE] Try, for lead & tin, *crocum*.

run[\[587\]](#)

Verdigris & sal ammoniac, as much of one as the other, borax & saltpeter, as much of one as the other. But the ~~s~~ borax & sel armo saltpeter together must only weigh half of the others, that is to say, as much together as the verdigris. Grind them finely into powder on marble, then grind them again with some good strong vinegar until it is fine, like a couleur and verdet ground in oil. Next, leave it to dry on its own, if you have time, or in the slow fire of the forge, & make sure it is well dry.

Margin Notes:

[LEFT-MIDDLE] Grind

[LEFT-MIDDLE] spider

[LEFT-MIDDLE] One of the principal things for the cast is to cast very *gee* hot, *s* especially the great metals.

gold in large works

clamp the molds well but to fortify them with good bindings of **iron wire** or little bands made for this.

Margin Notes:

[LEFT-MIDDLE] Before casting in **gold**, clean your forge well of **lead & tin**.

soldering **gold** and **silver** in small works

gold or **silver**, by fault of not having made a gate of **wax** underneath, beat some **soldering gold** very thinly, then cut it in as many small spangles as you need. Take some of this **phlegm** or **white thick which saliva that is found on the teeth**, & with the point of a burin, apply it to the place you want to **solder**, & place there a **little spangle of gold**; & next, with a little **fat earth** wetted with **saliva**, make a small layer on the opposite side to hold the **solder** better. Next, pulverize on top a little **borax** & put in the fire. **Boiled water of quince seed** & others also.

Couleur^[588] for **gold** or mixture

Verdigris & **sal ammoniac**, as much of one as the other, & as much as a **bean** of **saltpeter**. For if you put a quantity in it, it would make it all boil so much that it would boil over. **Saltpeter** is only put in to make it boil, in order that one recognizes when the substance has boiled enough.

couleur, put on **brittle melted gold**, renders it soft immediately.

Margin Notes:

[LEFT-MIDDLE] *Softening*^[152] **gold**

big molds, at the very least, it is necessary that it have four or five fingers of length. You can make it wide up until the middle & then divide it in three points in this way. And as much as the molded thing will be small, it is also necessary that your points be small. And in the middle of the gate & of its points, make there some openings in order to prevent the fury of the metal & make it run gently. One also needs to *e* conjoin the folded parts of the animal with little notched lines, *a* especially the end of the tail or other delicate part, in order that the metal flows everywhere & carries itself from *e*-^[589] one part to the other.

wax for the feet of **lizards** & delicate things like this.

Margin Notes:

[LEFT-MIDDLE] When you have molded an animal in the first part of the **mold**, do not let this part dry before you have taken away the said animal, for the **mold**, in drying, contracts and would also make the animal contract. Keep it therefore in some **moist & humid place** until you have

[Figure: fig_p135r_1]

done it.

Vine leaf and small frog

vine leaves to mold as they are in growth, likewise with all plants & flowers, or a young vine growing again after having been cut, or when they rebud *in autumn*, because the new leaves are more lumpy & have more apparent lineation. On the contrary, old leaves are smooth on the inside & pierced in several places. Therefore place your leaf bottom down on the clay slab, and secure it with small points, nevertheless leaving it its natural curve. And make a notch in the clay to hide the stem at the first cast, which, once made & dry, you will take away the stem from the leaf & clean with it well with small bristle brushes & fix it with a small mound of clay. Next, make several gates around the leaf with wax, as you know, & gee make the gate thin & with several lines & lumpy.

Margin Notes:

[LEFT-MIDDLE] The vine leaf is painted with green made of *stil de grain yellow* & *verd de terre*.

[LEFT-MIDDLE] You can cast on the leaf a spider or frog & whatever you will like.

⌚[590]

crucible with a capacity suitable for what you want to put in it, coarsely pestle a little borax & put it at the bottom, then the ☀ on top. Arrange the crucible on the charcoals of the forge in such a way that the wind of the bellows blows on it from underneath and not at the side, for this would cool it & would not heat it enough. Make sure also that it is distanced three fingers from the wall of the forge, in order that it can be surrounded with charcoal. Let the said crucible reheat until it is quite red. Then, make your boy blow on it with long and strong pushes, for in this way it heats well better. And nevertheless, blow by when the gold is melted, blow on top with small bellows, for the gold will become brittle & take on a crust. And as long as it makes swirling fumes as you blow thus, it means that is not soft enough for the cast. Uncover therefore the crucible, & without moving eh^[591] it from its place and without interrupting the blowing, make it lean toward you in order to see well inside. Throw in it the size of a bean of borax, & blow inside in jolts with the small bellows. But if there is charcoal inside, blow a little stronger to make it go out. And if the gold smokes & swirls, put some more borax in and note blow on top, making sure that, if it is still brittle & not

softened^[152] enough, it does not cover itself^[592] when you blow, as if it had cooled. But if it does not make this sign, it is soft enough. At that point, blow very strongly in order to heat it well, and as you think it is hot enough, throw in on top, in the *crucible*, the *couleur*,^[588] composed, as said before, of *verdet*, *salt peter*, *sal ammoniac* & *borax*, a little. And let rest blow always with the small bellows, and the *gold* will become shiny like

Margin Notes:

[LEFT-MIDDLE] If you cast in *gold* some important piece, lute your mold with the same *sand* where there is there is some *crocum*.

[LEFT-MIDDLE] If you want to cast some large work in *gold* or which is important, make at the foot of the forge, or at one end of it, a *four à vent*, where you can hold your mold in the completely *n*^[593] red *sand*.

[LEFT-MIDDLE] One can cast two or three 1b of *gold*.

[illegible]^[594] cast, put again a little of the *couleur*^[588] & let rest a little, always blowing with the small & large bellows. Finally, arrange your very red mold between the *moulets*^[595] or in a *crucible* full of very hot *sand*, & cast. And when it has set, throw, if you want, in *water*. For *gold* does not get damaged like *tin*, which jumps.

gold in ingots, it is of no importance to *gee* blow on top with the little bellows.

crucible of *sand* needs to be put in a *fourneau à vent*, to become entirely red at the end of the *fournaise*.

gold that the *wind* hits or that one forges becomes black. But a little *aqua fortis* uncovers it immediately.

latten sol^[596] on *latten*, as one does small statues, put between the *gold* & the *latten* a *plate of lead*. And before reheating the *gold* & putting it again in the fire, soak in *aqua fortis* & it will be soft.

[illegible] of the medal, that is to say from the middle of the gate to the medal. But if the medal is very thick, one ought not, for this reason, to thicken the gate, for a very thick gate

never comes out well. *Mai* Also, it could be made wide, as much as can be done, to embrace the medal.

DEsm^[597] Enamelling thin works

Goldsmiths scrape gold leaf with the brim of a burin, & then set the enamel down on it.

latten

latten from skillets in which one makes the mush for LITTLE CHILDREN, which is soft, is appropriate for the cast. Some say that German tokens are contain a lot of calamine. However, as they are thin, the calamine exhales out when melting them, as it does in all *meta* remelted latten, which, through melting again, would return to red. However, fresh calamine & on its own, put again on melted latten, makes it run & cast neatly, because the one that is in the remelted *de* latten is half corrupted from its nature, & makes it become porous & blusters because it is disposed to exhaling. Therefore, use calamine alone, on its own, very recent, on the melted latten. Take heed to cast very hot & that your mold be red like for gold, silver, copper & metal.^[159] If you cast with recent calamine, keep away from the fumes, for they are pernicious. I wanted to use German tokens to cast medals & took thirty & xii nails of rosette, like for chairs, which are of soft latten. This substance, containing a lot of calamine, like all strong yellow latten, has made great fumes, which is what prevents latten from running and makes it porous. Make many vents & cast very hot, that your latten is white like water or melted silver & similar to a very polished steel mirror. The second fusion comes out better, for what calamine there is has been exhaled and does not make fumes as much. If it is in a frame which does not break & withstands *a*,^[209] the second cast comes out neat because it is imbued with calamine fumes, which embrace & receive the second one. Sal ammoniac alone, put in latten, renders it neat & shiny. *Huile tingente* even more so. It does not need any sand other than the previous *en noyau* & that the mold be red like for gold. Make many vents. And if you cast yellowed latten with the prepared tutty, you will not have any bad fumes.

Margin Notes:

[LEFT-MIDDLE] This metal is very fanciful to cast because of the calamine smoke, and one ought not to leave it *pass* rest even a little bit outside the fire, like some do with silver, for it is immediately cold when it feels the air and the wind. It always leaves some type of tail, like glass, when you cast it. CASTERS do not usually take that very yellow latten, because of the calamine passed through the fire. But when wanting to cast red copper, they yellow it either with fresh calamine or with prepared tutty. Wanting to cast, one purifies it well of charcoal with a stalk of copper or iron, and one covers it with a cloth soaked in pig fat mixed with saltpeter or sal ammoniac, to keep it from the wind & from cooling.

red copper

Pure red copper from a cauldron or other thin works is appropriate for casting. And to make it run, throw in some sal ammoniac, & when you are ready to cast, put in a little fine tin & very little. And note that one needs to cast copper very hot in the mold, which needs to also be inflamed & entirely red like for gold, silver, latten & metal.^[159] You will recognize that it is hot enough when it is smooth, thin & shiny like a mirror *of eu* of steel, newly polished, or like melted silver. Keep it from the wind, for it will quickly cool. Stop the cast with tows or to keep it from cooling.

Red copper comes out more neatly than latten, which has strong smoke that prevents it from running. I molded it *en noyau* neatly like the principal^[376] & thin like paper. It is necessary that it be so hot that it is white & shiny & polished like melted silver and like a mirror. I cast it in the same sand as above *en noyau*.

Margin Notes:

[LEFT-TOP] Copper and latten are the longest to melt, longer than any other metal, especially red copper. But also it flows & comes out very neat, provided that it is cast very hot, that it is like water.

[LEFT-TOP] Removing your mold from the fire, plant it in *des*^[598] a brazier that fills a pot or a vessel.

Huile tingente^[599] to make metals run

ꝝ sublimate of **Venice**, true & not **arsenic sublimate**, a pea, *aes ustum*, a pea, **sal ammoniac**, a pea. Pulverize everything separately, & next mix everything in a **glass** bottle & put on **hot ash**. You will see that everything dissolves like **wax**, making many colors. Let it **everything** set & put a little of it on each **melted metal**, & it will run marvelously.

Margin Notes:

[LEFT-TOP]

FOUNDERS OF LARGE CASTS FOR STATUES throw in much **tartar** to clean it of its **filth** & **nastiness**, & much **sal ammoniac** to render it thin & neat. And when they want to cast, they put in much **tin**. The **cold & humidity** strongly disagrees with it, which renders dangerous the work of the **FOUNDER**, for one only needs a **spring of water** in the pit to lose everything.

Clamps

flat pincers of **iron wire**, reheated & refolded, then beaten at the ends on the anvil. When they are thus fine, they are subject to burning, being put often in the molds for reheating. Therefore, use some new ones.

[Figure: fig_p137r_1]

sand for molds of flat medals

wax or **metal** are **oiled** very lightly & then are touched with a **eau-de-vie**. And in order that the **mold**, wetted with **water**, takes without refusing the **oiled** thing, one heats the **water** well for tempering the **sand**, for with **cold water** it would refuse. Medals are **oiled** because they are not malleable & thus could break the **mold**. And animals, which are malleable, do not want to be **oiled**. **Hot water** should be of such heat that you cannot hold your **finger** there without feeling strong heat. Temper your **sand** thicker for flat medals & solids than for **lizards** & fine things. Your **sand** having set, clean & scrape

your mold on one side & the other, & make a notch at the foot & the border of the medal on the side of the gate, in order that you can take it away better. Lower also the mold, scraping the medal all around, in order that, from all sides, you can take it away without it corrupting the mold. Next, make your scorings around of the the first medal cast mes, in order that the second cast joins with it without varying, & especially make a notch at the bottom of the mold where the head of the molded thing is. Make some also at the sides of the gate. This done, dip the reverse of the first mold in water, oil it, & thus it will not be imbibed. Rub the reverse of the medal with eau-de-vie & secondly cast, tempering in hot water. If you have molded a medal *en noyau*, having made the first cast & this one having set, outline, with the point of a knife, the surround of the medal, in order that it is raised on the cast & not buried in it. Then having made the second cast & having opened your mold, have take away the medal in one go, with one two knife points q, and that one takes it from the side of the gate & the other from the side of the head, which is opposite.

Margin Notes:

[LEFT-MIDDLE] Take care not to oil your medal too much, for if the oil seeps out, it diverts the sand from becoming smooth & amassing, & makes it wavy & lumpy. One should only touch the middle of the medal of the p^[600] with the point of an oiled paintbrush, & then spread the oil everywhere.

[LEFT-MIDDLE] Make especially sure that the gate is the widest you can p toward the medal & embraces it well, that the entrance of the gate is ample, always narrowing toward the medal. Do not forget also to notch the entrance of the gate.

gold, silver, copper, or latten, it is necessary that they be perfectly red & inflamed on the inside when you cast, & perfectly reheated two times if there is something inside to be burnt & cleaned.

molds of animals that one burns must be heated in such a way that the animal burns. But if it has thick bones, it is troublesome to pull out & q often breaks some fine things by its weightiness. One does not put q in molds that can open. This readily happens with flowers, the mold of these does not open because they are made all in one go.

molds, put the clamps on the joints, in order that, when reheating, they do not bend, contract, or break. This is done after the gate is made.

scrapings of the mold can still be used, using them in place of **brick**, after having reheated them, & also the **pieces of the molds that have been used**. One lutes with it also important things, like works of **gold** or **silver**. One also reheats it, & prepares it with **se sal ammoniac water**, as **spat**^[477] from **Germany**, & it is **excellent sand** for frames for all **metals**.

molds of things which one needs to burn inside the mold are **souf** not opened until the thing that is inside is burnt, like with **molds of crayfish, crabs, stag beetles, portraits & pieces of sulfured black wax**, which do not release well.

brick or **wood** because they **l'ea** drink & attract **water** too soon, and do not allow the **sand** to set. It would never be better than on a **fresh clay** slab. Yet, I have experienced that **grey earth** dries the **mold** too soon. **The yellow** is better.

Margin Notes:

[LEFT-MIDDLE] For medals and flat things it is necessary that the **sand** be thick enough wet, because it sets quickly. And when the **sand** is thus thick, one can hit and shake the **table** where the **mold** is placed, to make it run everywhere. But when the **sand** is thin, like for flowers and plants, one ought not to hit, nor when there is something attached with **wax** or another thing that is subject to coming off, like **crayfish** legs or similar things. And if the **sand** is, by chance, too thick, you promptly put in it some **pour water**. Having put the **sand** in **water**, **it** examine that it is thick at the bottom & thin on top. The thinnest is cast at the beginning, and then blow, & the thickest at the end in order to fortify the **mold**.

Talcum mixed in the molds

oil. I crushed it very finely even more **s** in a **steel** mortar with a pestle, very lumpy like a file. I rendered it very fine & in a cottony & downy powder. I mixed it with **sand** & mixed it together & cast it **en noyau**. It molded **en no** very neatly & one ought not to doubt that it holds in the fire.

Gold cast very thinly

goldsmiths have something to **solder** promptly and do not have leisure to **forge** it, they melt some **gold** and then throw it on a **cloth** or other things that withstand the fire, and they flatten

it immediately with a hammer or similar thing. And it ends up very thin & even receives the impression of the cloth.

Fine gold, not alloyed, can be cast in medals, but not in plants & lizards & very fine things if it is not alloyed.

pansy anointed with wheat oil can be cast in alloyed gold.

soldered.

Counterfeit^[98] diamonds put in a work

black modeling wax, then anoint the inside, thus waxed, with wheat oil, & then powder this with lamp smoke, for it is necessary that this its color not have luster for false stones. This done, set in your stone & then with a bit of wax, then, with a steel point & a small finishing hammer, join the edge of the setting to the stone in order that daylight does not enter in. But keep from knocking the stone, which would break.

lead and tin

When it is often melted, it becomes brittle & fl frangible because it is cast very hot & renders it half calcined. Therefore, use new.

lizards & snakes is two ȝ of fine tin for one 1b of new & unadulterated lead.^[601] The mold is made of the aforesaid sand, common to all^[602] metals; when it is reheated let it cool until you can hold your finger without harm in the hole of the gate. As for lead, one melts it in a crucible *jet* in the fire, with bellows, until the crucible & the lead are red. When it is in this state, purge it of charcoal, either with a scraper made for this purpose or with the wind of the little bellows. *t*^[603] This done, let it rest thus red, & reheat a little on its own, then throw in, if you want, a little rosin to burn the filth. However some find it better not to put any in, because it leaves filth. But, when they are ready to cast, they ought not to forget to throw inside, as well, as much as a bean of looking-glass tin for each 1b of lead, and that it *e*^[604] should be red like melted metal when it enters in the mold. And if the mold is big, it is better to put it in a press, in order that it joins well & that the lead does not spread outside the mold. However, should this happen & that for the first or second or third time your mold has not filled, cast boldly, for, provided that your metal is red, it will set again, & join with the other, and come

out very neat, like the principal.^[376] The same can be said for **fine tin** for thin things. And the alloy of **fine tin** is one $\frac{3}{5}$ of **new lead** for one **lb** of this. Large molds should be placed in very tight presses, between two **sheets of copper** *pwt*, & then bury them in the **sand**, which is better than **ash**, because *t^[605]l* by its weight it seals better. Otherwise, these large molds are subject to opening slightly by the weight of the **metal**. Some make **square pots**

Margin Notes:

[LEFT-MIDDLE] When the medal is thick, one is not compelled to cast as hot as when it is thin.

[LEFT-MIDDLE] +

Note that if you want to cast them in **cuttlefish bone**, they ought not to be very hot because they will burn the **cuttlefish bone**. Test for this effect with **paper**. If it turns the **paper** red, it is enough, it is good to cast, but if it blackens the **paper**, it is too hot.

[LEFT-MIDDLE] If you want to cast a **written paper**, make your alloy with **plom** half **lead** & half **tin**, & as soon as it is melted, cast between two **cartons** in a very flat & level place, & with a point of **gold** or **hard wood**, engrave on the left the writing that you want. And having poured **lead** on a **carton**, press on top with the other adapted **carton**.

earth or **plates of copper**, or **iron**, or **wood** covered with **fer blanc**, to bury more easily these aforementioned **molds** between the **sheets of copper** & the stirrup or screw of **iron**.

wax to represent an animal that one has not got

white wax, which is more appropriate for this work than anything else because it is firmer & does not leave as much **filth**, as much as you need to mold the animal that you propose, & no more, and half as much **charcoal**, pestled & finely passed through a **linen** or a **sleeve**. The **charcoal** gives color and body to the **wax**, which would otherwise be transparent & the features would not be seen as well. Therefore, put your **wax** to melt in the charcoal fire. And when it will be well melted & liquid, take, for a **bowl with handles** full of **melted wax**, as much **sulfur** *la* as a large **walnut**. Pulverize it, melt it over a slow fire, & when it is melted, do not leave it on the fire, because it will become too hard, but take it away & agitate it always with a little stick, & let it finish its bubbling, & when it is as liquid as **water**, throw it in the **wax**

that you have removed from the fire. And mix & always stir the one & the other, in order that they mix well. Next, mix in, always stirring & in several goes, **the aforesaid pulverized charcoal in several goes**. And as it will be well incorporated, take heed if *your wax has passed its high heat, which you will recognize* when it no longer **smokes**, when it makes large tracts ~~se~~ repulling at the edges, & motionless & close ~~to~~ one to the other. For, if you were to cast too hot, you could not separate your **wax** from the **mold**, & it would set in the cast. When it is in this good state, stir it with a **little stick**, in order that the **pulverized charcoal** is everywhere & not placed at the bottom. And in this way, cast in your **mold**, little by little, & not in one go, because the **wax**, by its unctuousness, does not flow

Margin Notes:

[LEFT-MIDDLE] This **black sulfured wax** is for modeling round figures that are not for releasing and that one needs to burn in the **mold à noyau** before opening it, **pe** like those which have arms & legs out front or entwined. And then this **wax**, by means of **sulfur**, melts with very little heat and exits without leaving any **filth**. If, by chance, the pestled **charcoal** remains there as **ash**, by opening the **mold** & blowing inside, it stays neat.

[LEFT-MIDDLE] To make **snakes** with **wax**, or another thing to fix on a **candle**, one needs to cast with **modeling wax** of all colors.

mold is full. As for the mold which is of **white plaster**, pulverized & reheated as for previous **sands**, you should make it **well in advance**, for it serves several times. But before you use it, soak it for **a good hour** in **cold water** & for **at least as long in water so hot**, that, at the beginning, you cannot hold your **finger** in it. And **q** take heed that it does **not imbibe b** more, **thus** but rather that it shows itself to be very wet everywhere, without the **water** being imbibed in it. And, removing it from the **hot water**, closed, cast your **wax** in such a state of heat as has been said. And neither the first nor second cast come out readily until the **mold** is imbibed. Let it cool before opening it, in order that the cast thing does not break. You will recognize that the cast is good when the **wax** tipped out of the **mold** is thin and smooth. Remember to make many gates all along the **mold**, in order that the **wax** may run better, thus

[Figure: fig_p14or_1]

gate twice as large as for other molds. And if, in the first cast, your work becomes porous and does not come out neat *[illegible]*, it is all the same, for it is necessary that you realise that the three or four first ones are not readily good. In the first one, you recognize if there are some barbs, which keep from releasing well and you remove them if they do not remove themselves at the second or third first casts. And the more you will cast, the neater you will make it, and your mold will serve you for more than a hundred times if it is well managed. But it is good to soak it one *night* or one *day* before casting in it, in order that it be well imbibed. The same must be done for fruits of *sugar*. *This wax is very soft & amiable & pliant as copper, and it is so strong because of the sulfur, which renders it meltable much before the other, such that you can prove it on a hot slate.* And the *sulfur* that you will have put in it will be found, the second time that you melt it, cracked at the bottom. Having thus passed through the *wax*, it does not inflame from a *candle*. And on this occasion *that*, I think it will cast very neatly for medals. One uses the same *wax* in place of *varnish* to engrave [103]

Margin Notes:

[LEFT-MIDDLE] When your animal is cast, cut with a hot penknife the flashing & superfluous things. And if you want to refold it & twist it around on some stick or taper, put it to soften *on* in *hot water*, and hold it while twisting it around.

[LEFT-MIDDLE] Cut down the protuberance of the gates, in order that they are smooth & that the *wax* has more of the *silver* to run in one go without turning around in the folds of the *snake*.

[LEFT-MIDDLE] X

engrave *on silver & copper* with *aquafortis*. With this also, one takes the hollow form of the relief & then one casts in this hollow form some *tempered sand*, which once more represents the relief very neatly. And then, you can cast on this one its hollow form in *copper, gold, and silver*, and make seals of great singularity.

Margin Notes:

[LEFT-MIDDLE] *Seals*

sulfur

sulfur, arrange the bread pith under the brazier, as you know. Mold in it what you want & let dry, & you will have very neat work.

Margin Notes:

[LEFT-MIDDLE] Try sulfur passed through melted wax, because it no longer inflames & no longer makes eyelets.

Margin Notes:

[LEFT-MIDDLE]

I tried plaster & brick alone and molded *en noyau* like others. My mold was very neat, having lightly oiled & rubbed with eau-de-vie my medal. I made my gate ample at the entrance, becoming narrower up to the medal, which was very thin. I notched the gate which embraced well the medal. I dried the mold well on a slow fire &, at the end, heated it well without reddening it. I let it cool in such a way that I could hold my finger to it without burning myself. I made an alloy of 4 3 of tin & six deniers of lead. I cast red, and it came out well. Next, I put in for 4 3 of tin, xii deniers of lead; it came out very well.

[LEFT-MIDDLE] When there is nothing to burn in the mold, it is not necessary to reheat it for lead & tin. But for flowers & what should burn, yes.

Mold it with **bread pith** coming from the oven, or as the aforesaid, & in drying out, it will shrink & consequently the medal that you will cast in it. You ~~it~~ can, by this means, by elongating and widening the imprinted **bread pith**, vary the figure & with one image make many various ones. **Bread** coming from the oven is better. And the one that is reheated twice retracts more. You can cast **sulfur** without leaving the imprint of the **bread** to dry, if you want to mold as big as it is. But if you want to let it shrink, make it dry, either more or less.

lead and **tin** in **plaster**

mold, you can cast in **plaster** & **brick**, mixed like above, and not in **plaster** alone, for it contracts too much, feeling a harsh fire if it is not accompanied. But, with **brick**, it holds well. However, take heed to dry out your **mold** at length & on a slow fire & with patience, for there is no need to reheat it. But when your work is of flowers or other things that want ~~to be~~ their molds reheated & set ablaze, mix in some **feather alum** & even some *crocum*. I have molded in **plaster** & **brick** very neatly, & it withstood several castings.

crayfish

Margin Notes:

[LEFT-MIDDLE] The gate is made by the tail, very thin.

Margin Notes:

[RIGHT-TOP] If some little thing is missing from it, you can reattach it or else fill it with GOLDSMITH's cement, because it can be painted.^[606]

crayfish is one of the most fanciful to mold, but also provides an example for casting many other very difficult things. Males are distinguished by the eggs that females carry and by the four legs little white leglets at the back that males *ap* have inside their tail, after the eight main legs. It is only a good thing to dry them out a little, because the lumps only come out hard rougher & more beautiful, for everything that is of shell does not diminish. It is true that if you let them dry too much, these little inside leglets diminish & become more slender & do not have as much body. If also they are too dry, the flesh separates from the scales. Take heed, therefore, to use moderation. They have some hair between the legs & at the end of the tail. And because all hair is vexing to mold, because it gets mixed up with the sand & is not released, you can burn it with a hot iron on the crayfish, so that no one sees it. As for animals that have hair or feathers, it is necessary that you anoint them with olive wheat oil, which is quickly dry & which will keep the hair flat & spread out. Thus, you will have the form of your animal and the hair will also show, but made wavy, and this is something which can be repaired. If your crayfish has eggs, which are delicate and which would be awkward to uncover without breaking, you would do better to make the first cast on the belly & eggs, in order that *you* you only need to uncover the back, which is hard & easy to handle. And the belly & the eggs will remain in the mold, and one will need to burn them inside before opening your mold & *en* for the second time. Thus, *all* it will open easily, for what is burned will no longer be attached. Thus, the second cast, which is made on the first one, which has set well, separates easily from the first after having been reheated, which is a singular secret for similar molds.

Margin Notes:

[LEFT-MIDDLE] Do not forget to rub with **eau-de-vie** before molding.

[LEFT-MIDDLE] **Stag beetles, crayfish & crabs** are molded in the same fashion.

[LEFT-MIDDLE] If your **crayfish** ~~ad~~ has no eggs, mold the back on top & the belly on the bottom. You can give it some.

[LEFT-MIDDLE] It can be molded hollow as for the body, but the legs cannot. And to do it well, **crayfish** are already fanciful enough to mold without looking for the hollow; this ought to be reserved for **turtles**.

[LEFT-MIDDLE] When you open your mold, you will find the **crayfish** with **white bones**, but not in powder. And without opening it, the ♀ will have done nothing.

[BOTTOM]

Layer these **oil** colors very transparently.

[RIGHT-BOTTOM]

To paint it, boil it with **wine** & a little **salt**, in order that they become very red, & take this as a model. Paint the back with **vermilion** mixed with **lake**, & the sides & underneath^[607] the belly & the legs with **vermilion**, & **yellow ocher**, and **white**.

crayfish dry a little **in the sun** or on its own, if it has eggs, they will shrink while drying and will only be more beautiful. Therefore, make your slab of **yellow POTTER's earth**, like for other figures, lay your **crayfish** on top, the ~~s~~ back on top on the bottom, & the legs, belly & eggs, which are all the most fanciful parts to mold, on the other side and on the top. Push the back down in the **clay** slab, up to near the legs, which is about halfway. And fix the body with an **iron wire** point in the middle &, if it seems necessary, another at the end of the tail. And in order that the big legs show themselves lower than the head, which is ~~enf~~ half sunken, extend them &, from underneath, add to them a little **clay** to raise them. Hide also the horns in the **clay**, under the big legs, to arrange them afterward as you like. As for the small legs, extend them on the **clay** until the joint, and the other half of the legs remain above, curved, for the

first cast. However, in order that they do not move & detach, secure them well, not only on the **clay**, but ~~att~~ fix them with **wax** & a little hot **iron** right in the joints. And if you want to find the most fanciful cast, you can attach the end of one of the legs with the same **wax** on the body, or on one of the big legs, and also make, if it has eggs, the tail to be half folded on the eggs, & fix it in this form with an **iron wire** point. Above all special heed, since the thing is ~~s~~ thus arranged, that it can be well cleaned. Lastly, having rubbed the **crayfish** with **eau-de-vie**, cast your **sand**. Having set, uncover the back of the **crayfish**, the head & the eyes & its little pincers, the big legs, and the small legs all along, for one needs to uncover the most that one can, both the long horns & the tail, except if you have folded & curved it to hold the eggs. Other animals

[Figure: fig_p141v_1]

Margin Notes:

[LEFT-MIDDLE] Secure what will detach itself, like the hairy brows near the mouth, with some **melted wax** underneath.

[LEFT-MIDDLE] Uncover the most that you can, but take heed that the notching that you make in the mold will release well.

[LEFT-MIDDLE] Make the mold lean on the side that will be the thickest of the animal.

[LEFT-MIDDLE] To paint it, one does the middle of the back **mixed** with **vermilion** mixed with a little **lake**, and the sides & the belly & underneath the legs is with a flesh color made of **vermilion**, **white of ceruse**, a little **yellow ocher**. As in this & all other things, have always the natural one in front of you to imitate it.

[LEFT-BOTTOM] Lay the horns on the big legs, &^[608] or make with **whitened latten wire** & **solder** them.

[BOTTOM] Take heed ~~d~~^[372] when modeling to arrange the legs in such a way that they do not pass the belly of the **crayfish**, *Aultr* and that, placing them, they sit well on the belly, otherwise the legs would break from the weight of the body, which is massive.

crayfish is awkward to burn & clean, one needs to uncover as much as one can, especially the little legs until the end, for these are awkward & if they were not to be uncovered and you were to have to pull them, you could break something in the *mold*. While uncovering with the point of a knife, or even a burin or other appropriate thing, clean very carefully the *sand* which will be in the joints & elsewhere with your little brushes. And if something gets detached, attach it with *wax*, as said. And attach also the horns in the same way. And make also the gate, along the end of the little legs, with some *wax*. And fill the holes made by the *iron wire* point with it. And once everything is quite neat & more than half is uncovered, *oil* your *ut^[609]* mold & *n'oubli*, after having dipped the reverse in *water*, & do not forget to *oil* all the delicate parts which are between the legs and the little pincers. Then, rub the *crayfish* with *eau-de-vie*. And make your second cast, having flattened the first *mold*, in order that the clamps join better. Your *mold* must be wider on the side that is imprinted than on the back. Do not open your *mold* after the second cast unless it has been *luted* & reheated & unless what is inside is burned. Do not forget to put *crocum* among your *sand* when you mold *crayfish*, for one needs to reheat strongly, & the *crocum* withstands marvelously. Molding a *crab* & a *crayfish*, it is^[610] all the same. When you have uncovered your *crayfish* on one side, only delay making the second cast as little you can, for *el crayfish* dry *se* out. It is not just about uncovering the *crayfish* well, in such a way that you see an entire half, but take heed that your *mold* itself, in which you uncover, releases well, for even if the *crayfish* were well burned, you *despouï* would not be able to open your *mold* without breaking.

[Figure: fig_p142r_1]

Margin Notes:

[TOP] Repair with penknives, *fillegible*^[611] files, little *chaples*, or burins, &c.

[LEFT-MIDDLE] Make all around them, as you see, a gate of *wax*, & at the end of the tail, also two or three, from which you make the principal gate.

[LEFT-MIDDLE] Make a gate of *wax*, elongated in a line like a *thick thread*, all along the end of the legs & at *ut* the extremity of the tail. If there is also some piece of leg or other part that is further away from the line of the others, or raised above, or folded on its own, give it a gate of *wax*, which from its extremity joins either at the body or at one of the big legs or at some other place which receives a lot of *metal*.

[LEFT-MIDDLE] Having uncovered it, attach & secure with **wax** the two little hairy horns of the **crayfish** & other things which are not *en despouti* secured at all.

grasshoppers and things too thin

written paper to mold that is too thin, after you have made the first cast & it has set, give a little thickness to the reverse of your **paper** with **melted butter**, which is the most appropriate means there is, & for fortifying the wings of either a **butterfly** or a **grasshopper**, or some delicate part of an animal to which you need to give thickness. But take heed to apply this **melted butter** underneath the wing or in whichever place it cannot be seen. For giving thickness to a **pansy** or other flowers, **butter** is not good, but rather **wheat oil**, which is soon dry & holds firm. **Wax** would not be appropriate here for it is too hot once melted, & it makes the thing to which it is applied contract. But **butter** is amiable and handleable.

Margin Notes:

[LEFT-MIDDLE] If you write on **paper** or on **common carton** & if your **letter** is of **gum**, the humidity of the **clay** slab or the **wetted sand for noyau** will moisten your **letter** & undo it. Therefore write with **cinnabar** wetted with **oil** on **oiled paper** & press in.

[LEFT-MIDDLE] [612]+
Reheat your **molds** with **charcoals** previously lit in the **forge**, in order that the fire is not so hot & does not break the **molds**. And do not make as much fire where the **mold** is thin as in the place where it is thick.

Molds

mold than on the outside, for in this way, they have more strength. Keep from reheating in one go & in too ardent a fire, for this makes them **melt** break.

Margin Notes:

[RIGHT-MIDDLE] Do not keep them in a **humid or enclosed place** if they are not quite dry *e*, for they go moldy. So do dried animals.

[LEFT-MIDDLE] One ought not to reheat molds twice when the animal can be removed without burning, like a **toad**, which can well be molded hollow like all thick animals. However, it is always good to redden the **mold** once.

Lute for luting your molds

lean earth of which the **FOUNDERS OF ARTILLERY & BELLS** make their *trusseaulex*^[613] and molds, which is lean & sandy. Temper it *e*^[163] moderately like a very thick **mortar**. Mix in it about half **horse dung**, & then have it beaten well. Next, mix in a third part of **discarded cloth waste** or **shearings of cloth**, and beat it again quite strongly. You can reheat your mold as soon as the lute is placed.

turtles

water turtle is more beautiful to mold because it has prettier scales & straight legs. And **those of the garrigue** have crooked ones. They are of long life; getting ready to put them to death, open their mouth & pass a long penknife through all the intestines, & then make it swallow some **vinegar** mixed with **eau-de-vie** or **urine**, as for **snakes**. One needs to mold them in several pieces, & the back itself, sometimes, because the sides for some are narrower than elsewhere & are not released on this occasion. To make them die, one ought not to boil them, for they come apart, & even the shell, from the **hot water**. They come out better hollow, because their great thickness corrupts the **mold**. **Those from water** are more vigorous. **Those of the garrigue** are thinner, slower & more sleepy. If you scratch **those of the water** on their shells, however sleepy they are, they move. **Those of the garrigue** do not.

Margin Notes:

[LEFT-MIDDLE] They die rather quickly in vinegar mixed with a little eau-de-vie or urine, as with all other animals.

[LEFT-MIDDLE] They keep themselves, in the winter, with their eyes closed & are as dead, being numbed by the cold. They hide in the earth or under wheat chaff or warm manure, & live only on the moisture of the earth.

[LEFT-MIDDLE] One ought not to mold them as soon as they are dead because they are still too stiff. But on the following day, you will manipulate them & fold their legs as you wish.

Molders from Foix

[392] make their sand with crocum & calcined slate, but slate always retains its asperity & becomes porous, because it is fatty. En noyau, it is not good; in sand, it can be accommodated. They sieve their sand, grind it on porphyry, and wet it in water, & they take away the finest, which is on top, then reheat it.

Toad

metal, it is best to mold them hollow, for they come out better. You could make your cast in one piece & large, but it s would be awkward to cut. It is best to do it in three or 4 parts, which are a little wide close to the animal, & include as much of the edge of this, which is close to the gate, as can be done. Make also some gate conduits from the end of

Margin Notes:

[LEFT-MIDDLE]

[Figure: fig_p143r_1]

Let the mold cool before opening it, especially for thick things.

wax, that you have put at the end of the feet to attract the **metal**. Thus, the gate being made by **wax**, you are in no danger of encrusting something from the molded animal. And it is more expedient to make thus the gate of **wax**, to cast the second **mold** on top, than to wait to do them after the **mold** is reheated *q*, for at that point, it is necessary, if possible, that everything be ready. One needs to heat well & evenly redden the **molds** where there are gates of **wax**, in order that it melts well & leaves nothing inside.

à jour

crayfish *en noyau*, first on one side, that which is hollow being raised up with **clay**, & then one uncovers them from the other side & one makes the second casting. They can also be cast well in frames, provided that they are released easily. If they are not, one models them in **wax**, or else one fills the cavities that cannot release with **wax** or **clay**.

Iron filings

filings are mixed with **filth**, it is good to redden them in the fire to burn the **impurities** and then wash them in **clear water**. In this way, the dirt will go to the top of the **water**, which you throw out, & the **good filings** will go to the bottom.

Carnations

or *bi* they are weighty, & for this reason, one makes them with **leaves & sheets of silver**.

Turtles

Those of **water** are more beautiful & easier to mold **than those**, being flatter & having a longer head & tail **q** and legs straighter & better to release than **those of the garrigue**, which are lean, wrinkled & well ensconced in their shell, which also have a rounder top of the shell & nevertheless narrower **v** on the sides than near the middle, which is the reason their **l** top shell cannot be molded well in one piece like **those of the water**.

Margin Notes:

[LEFT-MIDDLE] When they are better mortified & rested two or three **days**, they bend and are handled better.

Therefore Thus, you will mold their top shell in two pieces, the bottom ones in two or three or four, according to the need. But, note that if you want to release your **turtle** from the mold without burning it, it needs to be molded thus in several pieces. But, if you want it to be burned **p** inside, you can mold the top shell in one piece. Therefore, to put your hand to the work after you have killed it entirely in **vinegar** & **urine**, as said, let it dry well. And clean it well with your small bristle brushes. Next, **not** take your **clay** slab and put it on top and **smudge** it a little, in order that the bottom shell fastens to it, having, nevertheless, earlier shaped the head with a strong point, as with other animals, making it hold high by the means of **one** a little **fresh clay** that you will adapt from underneath. Stretch the said head & legs with your little pincers. The head arranged, dexterously place **d** a **grain of yellow millet** in each eye with pincers, because as soon as they are dead the eyes are burst and putrid. You can do this as well with all other small animals, with some **grain of large amaranth**, **some of small**, and **grain of rapeseed**, & this done, you will arrange the legs, securing them with **iron** points and then, with some **clay**, fill up all the empty space around the **turtle**, that is to say what is between the two shells, in order that the **sand** entering there does not prevent it from releasing. And because the legs should be lower than the shell of the **s e^[237]** of belly, make a little pit in the **clay** slab to adapt them there. Your **turtle**

[Figure: fig_p144r_1]

[Figure: fig_p144r_2]

Margin Notes:

[LEFT-MIDDLE] animal eyes of my invention

brushes, place the the circle of clay around the slab. Then, with a band of clay placed on the middle of e^[237] the the back of the turtle, as you see, & at the widest place, divide your mold. Subsequently, oil with your paintbrush dedicated for this the half of the shell you want to mold. Temper in hot water, so that without burning yourself, you can hold your finger in it without burning yourself, your sand, a little p thick. And f before casting it, rub the shell with eau-de-vie. And next, cast your sand & let it set, and note that all things that have shells or that are hard or are not malleable, like snakes & lizards, want to be oiled to release. Things that are malleable do not need this. Hot water makes the tempered sand in water set better on oil, which otherwise would be refused.

[Figure: fig_p144v_1]

turtle is thus desp molded, separate it, with its half mold, from the clay slab that you will set aside to return it to when it is necessary. Next, clean your half mold & smooth it & flatten, like the others. But because it happens that because u^[310] of the clay entredeux, the half mold will consist of more than half of the turtle, cut & pare down smoothly the excess, & clean everything well with brushes. Then, make on the top edge of the mold, on the side that is cut & halfway, two notches, like for other molds, and return your turtle to its slab as it was, & secure its two legs, which are not molded, with iron wire points. And stuff all around what is empty, up until the edge of the top shell, with clay. Next, place the circle around and put a clay entredeulx on the first mold, a little above the notches. And having oiled the e^[580] first half mold, & its notches, and the shell of the turtle, & having also showered it with eau-de-vie, heat your water, temper you sand with a little sal ammoniac water & the said hot water, & cast. Having set, adapt the sides of these two molds smoothly, & on each side secure their joint, which can only just be perceived, with two clamps, in order that when uncovering afterward the underneath of the turtle, they are not undone. Next, uncover the side of the belly & of the

throat, in the way that you uncover a **crayfish**, which is the most difficult to mold of the little beasts, which are molded in two halves.

[Figure: fig_p144v_2]

Margin Notes:

[LEFT-MIDDLE] You can mold the **turtle** with one piece for each side, but one would need to burn it. And afterward, to make the hollow, the reheated **mold** cannot be **oiled** because it drinks the **oil**.

[LEFT-MIDDLE] +

If there is some *crocum* in the **sand**, the joints of the **molds** can hardly be perceived.

[BOTTOM] Turn to the second leaf.^[614]

frames

frames **bronze** mortars & similar things, which are easily released, namely the body of the mortar in one, ~~the two frames~~ the core in the other, and the ~~eore~~ bottom of the ~~mortar~~ in ~~un~~^[615] the third one, ~~for small work~~ because otherwise the molding that is in it would not be released.

Margin Notes:

[LEFT-MIDDLE] Inquire^[616]

[LEFT-MIDDLE]

[Figure: fig_p145r_1]

A

Cuttlefish bone

tin or lead too hot in it, for it would burn the bone & come out lumpy. And to know when it is at a good heat, dip a little piece of twisted paper into it. If it blackens it without lighting, it is at a good heat. But if it burns it & catches fire there, it is too hot. Gold & silver are able to be cast well there, but it never comes out very neat. To mold something delicate well, it is necessary that the bone be not so dry *If*, for it is brittle & does not release as neatly & crumbles & flakes. However, before casting in them, dry them, & especially for gold, which does not want humidity. You will recognize that they are dry enough when, after having brought the inside & the imprint of these to the fire, *they cry & crackle once brought near the ear*. Then, join them & lute the joints with a little clay, & make it dry lightly by the fire, & cast, & then shake the mold or scratch over rough scales, & let it cool before opening. Usually one cuts the bone in the middle, and the dullest part and that which does not have any half circles

[Figure: fig_p145r_2]

is the most delicate and smoothest for molding, & thus one always imprints there the principal;^[376] the other is scaly on the inside, as it demonstrates on the outside. Thus, one does not use this for delicate things that are molded on two sides. One smooths & flattens these two halves on some smooth wood, then one scrapes charcoal on top to make it release well. And to make the charcoal run evenly everywhere, one knocks on the side of the hand that holds half of the bone. Once both charcoaled, one takes the main bone that is prepared & rounded on the sides, and having set the medal on top, one tightens and presses it quite strongly.

because the fingers do not press evenly, for one if you press on the edges, the middle will remain hollow. Begin, therefore, by the middle, & then follow the edges. But to make it better, put on the medal something flat & smooth, or some large square file *e*, & press with this, for you will press equally, sometimes *after l* with your knee, other times with your foot with your shoe taken off, & make the bone be on top; thus you *Lemprand* will imprint it without breaking it. If, on the first go, it is not molded well, return to it several times. Then, repair & smooth on the sides your *d* halves of molded bone. &^[617] And to cut it well, always begin coming from the softest part to the scales. And if your medal does not come out by itself, scratch the bone from the back, which is rugged, and it will release. When you want to cast,

secure & join your two **bones** with some small points of **wood**, &c. But to mold very neatly, there is only our **sand**.

+

Flowers

Margin Notes:

[LEFT-TOP] When you mold them, if they are not strong enough to hold themselves upright, pass a thread through the **mold** to keep them from rising up, & cast the **sand** little by little, & always blow strongly in order that it settles everywhere, otherwise it will become lumpy.

[LEFT-TOP] Because you did not put in this a **clay** slab, the **mold** sometimes holds to the **table** where you cast it. To undo it, hit a great blow of a **hammer** at the side of the **table**.

clay slabs, because plants or flowers are not laid on top but as in air, without touching on any side anything. &^[618] Only the **es** circle & contour are needed, which should be higher than for flat molds. And thus, take heed to make it strong and thick according to the size that you want, otherwise it would burst, the **sand** being inside. Secure it & fortify it well by the foot, & join well all the joints. Then, take your flower, well joined & securely adapted to the end ~~of eir~~ of the gate of **wax**, which should not be rough but rather smooth, in order that it can release well. Then, wet your flower or plant in some **good eau-de-vie**, or else **moin** placed in a long glass

Margin Notes:

[LEFT-MIDDLE]

[Figure: fig_p145v_2]

Margin Notes:

[LEFT-MIDDLE] It is enough to reheat
your luted mold once
for flowers & to heat it the second time
if you cast with **tin** & **lead**,
for with **gold** & **silver**, one needs
to reheat it twice.

[RIGHT-MIDDLE] Cast your **tin** very red in the mold, *of such heat that you can hold your **finger** there without harm in the hole.*

large paintbrush dedicated to this. Then, pass through the end of the **mold** which closes the circle your bit of **iron wire**, which holds the **wax** gate, and cleave with it the **clay** closure, as you see, & **it** place it low, so that the plant or flower touches no thing & can leave enough thickness for the **mold**, for the **tempered sand** always raises the plant or flower. Thus, if it is not stiff by itself, pass with a needle some **thin thread** **pe** on the flower to keep it from rising. Or, if you were to forget, lower the flower with some **b**^[619] small stick until the cast **sand** begins to **d**^[372] thicken. Your flower being well arranged, **d** choose a bowl big enough to temper in it as much **sand** as it takes to fill your **mold**. Put in a little **sal ammoniac water**, then some **fountain water**. And when the **au-en**^[620] bowl is nearly full, put in, by sprinkling, your **sand**, & mix & dilute it well in order that it all becomes smooth, for if it were to coagulate, it would spoil the **mold**. For flowers, it does not want to be so thick, and especially at the beginning, you will throw, in thrusts, the clearest one on the flower, & when it will be half covered, blow strongly everywhere, to make the little bubbles disappear. Next, finish filling & blow always. Make the **mold** lean a little toward its widest part, and if you find the remains of **thick sand**, which has not thinned well, cast it rather toward the gate than elsewhere. Finally, you can even cast some **thicker tempered sand** in order to make **make** a quicker set. I have molded thus a **marigold** with its leaves. The **crocum ferri** is safer for flowers, and when there is **crocum**, lute with the same **sand** that has served, and is the most excellent of all.

Margin Notes:

[LEFT-TOP] The alloy with which I cast a large branch of marigold, which came out neatly like the natural with its flower, its buds, and its leaves, was of one lb of fine tin mixed with two ounces of lead.

[LEFT-MIDDLE] If there is some flashing, repair with a penknife.

[LEFT-MIDDLE] Uncover the molded flower by gently undoing the mold with the point of a knife, & better yet, wet it well in water. Next, use small hog bristle brushes, a bit of iron wire, &c. When the mold is reheated the first time, leave it to half cool, then gently pass through the gate an iron wire to make an opening for the burned ashes inside. Next, blow inside with bellows, then turn the mold at the gate to make everything come out, & sometimes suck and draw out with the mouth.

[LEFT-MIDDLE] Take heed not to attach the tail of the flower too much to the gate of wax, for fear of spoiling something when you pull out the gate of wax. To pull it out, one needs to dig out all around a little, & then pull it with your little pincers by the tail of iron.

turtles

[621] When you have well uncovered the part of the belly of the turtle, the underneath of the throat & of the legs, & having cleaned it all well, do not forget to neatly uncover this cavity that these animals have in their shell between the neck & the shoulders. Those of the water do not have ones as deep as those of the garrigue, which are leaner. And among these, there are some that have ones more ensconced than others. Do not forget, therefore, to uncover all of this well to better represent its nature. But if there is some cavity which twists too much inside and can neither be seen nor released,

wax, & with points of hot, thick iron wire, stretch & adapt the said wax. Then, bouch stuff with soft clay the entrance of all its cavities. Put the clay circle around your mold, made already of two pieces, which contains the back of the turtle. And to mold its belly, one needs to divide in three, as you see. That is to say, you will put an entre deulx of clay on top of the throat & another on the edge of the shell of the tail, #^[250]. And having oiled and the shell of the belly & having rubbed it with eau-de-vie, cast your sand a little thick, & temper with hot water as before. Having set, remove these entredeulx of clay, then uncover well the front & back legs,

that is to say the part underneath & the tail & the throat, & remove the **clay** from the cavities **qt**, all in one piece if you can, for this will show you if this cavity will release well. And if the pulled-out **clay** brings with it the **wax** that you put there, put back it in the places that cannot release, as is said. And if some part is taken away or let go, attach & rejoin it to the **mold** with some **wax** & the point of hot **iron**. Do not forget to put some **pō** **melted wax** at the end of the nails of the **turtles** to make the vent. Your belly shell molded and uncovered, your mold can be seen thus.

[Figure: fig_p146v_1]

[Figure: fig_p146v_2]

Margin Notes:

[LEFT-MIDDLE] in such a way that only the entire belly shell be uncovered, to mold it alone

melted wax, with a hot **iron**, all around the edge of the top shell which is toward the tail, in order to make the vent better. And make two little strings of the same **wax**, **p** connecting from the end the belly shell to the said edge of **wax** that is around the shell of the spine, and make sure that **turtle-of** the tail of the **turtle** stays between these two strings. This is to make the vent better. This done, **oil** your **mold** and what appears of the shell. Put the **circle** around & cast with **hot water**, as before, observing there what you have observed. Do the same to mold the third part, which is the tail. And having set, **You Uncover your mold** remove the **clay** contour, clean your **mold**, & smooth it & flatten it on all sides with a knife, like for other molds. Dip it lightly in **water**, then try to release it. Usually one begins **ment** with **e^[163]** back the back shell, **it is** that is to say, the **mold** on top, which is in two halves, and this one is easier to release. The other one follows after, but because it is neighboring the shoulder of the **turtles**, which are deeply ensconced, it is sometimes awkward. Thus, when moving & pulling the **mold** gently, take heed to pull the one which will present itself as the easiest, for one needs to release one after the other. The most awkward of all is the one which molds the **e^[163] of** throat, the underneaths of the legs & the hollow shoulder pieces, which are of such bad release that if you had not provided for it, by filling with **wax** before molding what does not release

well, it will be awkward for you to pull your pieces out without breaking something. But should this happen to you, there is still a remedy, provided that you keep *pi* the broken pieces.

points of **rather strong iron** & fill the crack or fault that could be there with **melted wax** & the hot **iron**, as with others, in order that the core for molding hollow is made better. Next
Go to the second leaf^[622]

Margin Notes:

[LEFT-MIDDLE] To avoid breaking when releasing, take heed to uncover well up until what can hold.

+ Casting of **copper** alloyed with **C**, which is like **very base solder / ard**^[illegible]^[623] and **old K**^[384] and some **R**^[illegible]
^[623] out of xii

paper. I have cast very hot in the very red mold, and have put in the melted substance of this the two substanees compositions, which make **silver** run, & have made as if I had wanted to cast **pure silver**. This alloy is white in *bullitoire*, like any alloys which resemble, however little, **C**. For casting something delicate, use this one.

Lute

that has which you have molded, namely pieces from your molds. But one needs to choose those better reheated.

Crucible

fingers from *fe* the mouth of the bellows, & that the said bellows beats from *tis*^[149] underneath the bottom of the *crucible*, otherwise it would cool it.

latten

latten skillets, which are beaten & forged thinly. *I*^[624] Once well heated, I cast in it two or three grains, like *peas*, of *sal ammoniac*. This clarified it like a mirror. Once very white from the force of being hot, I cast in it some *pulverized calamine, raw & pure*. I cast it in its very red *mold*. It came out very neat & thin like *paper*, & hollow on the reverse. But because it had crusted, I reheated it, that is to say reddened, let it cool, then put it to the whitening, of one part *raw tartar* & of one half *common salt*. Once well boiled, I rubbed it with a scratch-brush in *clear water*. And because the first time it had not

Margin Notes:

[LEFT-MIDDLE] Do not let it cool when melting. It always makes a tail, like *melted glass*, because of the *calamine*.

[LEFT-MIDDLE] Usually, the *soft latten of skillets* becomes red from casting, especially when it stays a *long time* in the fire, *in* because the *calamine* exhales itself. But *sour latten of candlesticks* becomes yellow & *pin filings*.

scratch-brush. It came out very neatly. You will do thus for *copper* and *silver*. And if you want to give^[625]

latten

scratch-brushed it well, make it boil in *water* & *turmeric root* or *terra merita*, and it will become very beautiful.

Whitening

silver, do not pestle your *tartar* with *iron* but with the handle of a hammer, for if you touch & dip *iron* in your *whitening*, the *silver* would become red like *copper* & you would need to reheat it & put it again in *whitening*. Mix nothing with your *tartar* that should not enter the *whitening*, for this corrupts it. Do not let it spill out of its first boil, for in this is all its strength. The *whitening* is made with one part *pulverized tartar* & a half of *common salt*.

bittern, or of the eagle, or of other birds [626]for the foot of saltcellars or vases

Margin Notes:

[LEFT-MIDDLE] in three pieces

[627] *Crocum ferri*

filings in an iron case, stirring it often. Then sprinkle it with good vinegar & let it evaporate, & without removing it from atop the fire, let it redden & inflame. Once cooled, pulverize it on marble & return it to the fire, *rou* sprinkle with vinegar, and then inflame. Thus it will quickly be colored & made fine.

turtles

[628] Next, reassemble the parts of your mold and clamp carefully all the joints, as much as above & below as on the sides, having not forgotten to notch the joints of the molds, as with others. Having clamped it all, undo the clamps on the side & not the others. And thus, your mold of several pieces *sem* will open as if it were only in two halves. If you want to mold hollow, make in the middle of the *of the part* mold of the belly a hole, from side to side, which, inside, is of such capacity that the end of a little finger can almost enter it, widening like a *clervoise* the outside of the hole. This is to cast the core. But note that all these difficulties would be nothing if you wanted to mold hollow, because you could mold your turtle in two pieces *fillegible* and burn it inside, as with other animals, and it would be done quickly. But since the turtle is massive & would be weighty if it is not hollow, one considers it better molded in this way hollow, and in *eha* this fashion, to make a mold well, one really needs three days. Take heed in hollow & fanciful molds to have some strong plaster, which endures the fire without bursting, if it is possible. But if you cannot have any such, mix a little more feather alum & add to it also some *crocum*, which fortifies it & makes it so that the flashing, if there is any, comes out so finely that it is easily undone. Also, do not forget to tighten your molds well with a press to avoid flashing which is made either when the mold is not well joined or when it bursts. To repair, if the features are not apparent enough,

retrace them lightly with a burin, then soften them with a small chisel. The flashing is removed with the *chaple*, a type of burin. For the lumps & scales, they are made either with a little gouge or a little round cutting-punch, or with the point of a small chisel, not tempered, & struck on a small file.

Margin Notes:

[LEFT-MIDDLE] Make this hole before molding joining your molds.

iron and rendering it very soft

sublimate, quicklime, soap from Venice, horse dung, a little less sublimate than the others. Wet all of this together like paste, & impaste the iron with it, & envelop it in this with some bad linen. Then make it reheat until it is very red. Or leave overnight in a good fire until the morning. It will be very soft for engraving on it well whatever you want.

Base gold from Germany, electrum

gold from the Rhine, which one finds in the rivers, and is spangle gold. Goldsmiths from Germany wanted to refine it, thinking to separate it from this whiteness, which they deemed to be silver. But it always remains whiteish, which demonstrates that this whiteness is fixed, & it does not lack color. This is electrum, from which one can make cups which will demonstrate poison.

Germany

water mills, & most of the ARTISANS OF METALS, OF GOLD, & OF SILVER, & OTHERS, make have their large works beaten with these trip hammers. And to draw iron wire, they redder large masses of iron, & having made it into a point, they hook it thus all red & thus promptly draw the wire.

tin & copiously put in looking-glass tin to harden it.

Goldsmiths who work in large wares and plate get whatever wooden forms they please turned on a lathe. And then, with some wax, they model on top masks, festoons, and whatever they please. And next they mold in three, in four, or several pieces.

Gold solder

gold denier, one grain of the fine alloy, like old douzains are.

fly

Large flies can be molded & ^g^[629] made by casting. But one needs *par-d* to anoint underneath their wings with wheat oil, which dries quickly and fortifies them & gives them a little thickness. The same is done to butterflies, cicadas, grasshoppers & similar things. But to cast them more easily, one applies them on some leaf or bouquet. The others are made by hand with a very thin silver sheet. One ought not to keep them once dead, because they dry out and their legs break. ^[630]

Margin Notes:

[LEFT-MIDDLE] Wheat oil is put underneath delicate things to render them more rigid & firm & to make them hold their natural position. Because being weak & delicate, the tempered sand, weighing down their tops, would change their form.

Bat

mold & it would not be certain that the **metal** would run sufficiently. Thus, when you want to mold them, choose the medium-sized ones & make the pose *qu* so that they have their wings half folded. Because in this way they will come out better, but support the side of the wings with **wax**, as you know, to feed the cast well.

Very strong wax

rosin and **bole**, and do not cast it very hot.

[631] Various alloys of **tin** and **lead**

turtles, half **fine lead** and half **tin**.

tin, namely a 1b of **fine tin** and two ȝ of **fine lead**.

lizards that are as thick as one or two **fingers**, almost all **lead**, namely a 1b of **fine lead** and 4 ȝ *es* of **fine tin**.

Molds

recui on the fire, & a long time on the fire makes them corrupt, especially when the **plaster** is not strong.

mold on its own than several together, because one needs a larger & more violent fire for several than for one. And, **glowing charcoal** stopping up the space between the molds, the heat reverberates from one to the other in such a way that more often you will find your molds burst & cracked on one side more than another.

molds alone, not making fire there, except to cover it.

lead and **tin** become sour when frequently melted red, to soften,^[152] melt it without reddening, and cast in a rod.

Brick cools the **metal**, & if this were not for giving bond, it would not be necessary.

Margin Notes:

[LEFT-MIDDLE] The reheated molds cannot withstand several casts. But those in which one wants to cast only lead or tin and or flat medals, having been only dried, withstand many.

[LEFT-MIDDLE] Very finely ground iron scales render them very firm & strong.

iron wire point, which is put thus *bi* through the hole, is to better hold the core & keep it from shifting. All of this being *d*^[494] thus arranged, lay your mold on the table, the hole at the top, as it is marked here on the side, & then adapt a circle of **soft clay** *aultr*, two **fingers** high, around the hole, like for other molds. And then temper your **molding sand** moderately thick, & cast it through the hole until it is well ~~well~~ filled, up to the surface of the **clay** circle. But take heed to not cast *r*^[632] in through the middle of the hole, but rather from the side, for, since the already made mold drinks and sucks the moisture ~~of the new~~, the new one that you cast in ~~which dries quickly~~ on the edge of the mold, being quickly dry, *s* would obstruct the mold, & it would not finish filling. And when you cast from the side, if you recognize that it is obstructed, you can clear a path. Having cast in, blow on the *f* the wet gate, & put the **end of your finger** in the hole a few times, *pe* or some small point, to unblock it, & make the hollow **wax** fill up. Cast in, at the end, the **sand**, tempered a little thick to give strength to the mold, for **water** coming to the surface *s* of the mold always makes it softer. Having set, scrape off the **clay** circle & the excess which is on the hole through which you cast the *noyau*, & nothing will be discernable. When your mold is thus prepared, lute it all around with the same **sand which served for the** molds. Next, reheat it in a slow fire at the beginning, & the mouth of the gate at the bottom, in order that the **wax** flows out gently. For if you were to give it great heat until the **wax** came out, it would boil inside & leave some pustules & lumpy things, although

Margin Notes:

[LEFT-MIDDLE] This point is placed in the middle & through the hole of the gate when the mold is in several pieces, like a **turtle**, and this is done in order that the core does not shake. But when the mold is only of two pieces,

[Figure: fig_p150v_1]

it is not necessary to put points in the middle of it.

[Figure: fig_p150v_2]

[LEFT-MIDDLE] Before casting the core, make some notches all around the hole through which you want to cast, in order to always better secure the mold.

[LEFT-MIDDLE] Mixed **tallow** is the reason that, when emptying the **wax**, the hole does not become obstructed. One needs half **tallow** & half **black wax**.

[LEFT-MIDDLE] All very thick pieces come out better in hollow, because a thick mass of mostly **lead** remains hot a *long time* & eats the mold.

[LEFT-MIDDLE] You can, after the cast is done, mold **a** the part of the shell of the belly where you have made the hole on the natural one,^[633] and reattach it with **solder**.

[BOTTOM] X

Note that, after your core is cast, it is better to put the mold

in hot water to open it, in order to remove the most wax that you can, always softening *a*^[634] it in hot water. For the less wax that remains in it, the better, in order that, when reboiling in large quantity in the mold when you reheat it, no pustules or lumps are made in it. And then, if there is hardly any wax, you will not need to reheat it as much. When opening the mold, the cast will break. But it can easily be repaired, even though you cast A^[635]

[Figure: fig_p150v_4]

white wax with which you have composed your black sulfured wax, has such little substance, since being dry and purified, that it leaves nothing inside, and flows very gently. As for the charcoal which is mixed in, if some remains, it burns & reduces to ash & is emptied afterward by blowing through the gate. You could even open your mold after the wax has melted, if there is no fanciful thing which could break, like some reattached thing or similar. After having covered the clamps with the lute from your sand & having covered all of the mold, give it on top a layer of common lute, & then sprinkle this with some pestled brick, in order that you can handle it better. Let the lute dry slowly before firing it, which melts the wax. The wax having left through the gate, that which remains with the charcoal will burn. Being reheated for the first time, lute it *peu* once more, to reheat it the second time because the plaster, not being good, will have readily made the mold retract, and the joints will crack open, which might make large flashing. And for the second time, one ought not to reheat it if you only want to cast in lead or tin, but rather only make sure that the lute is quite dry & the mold moderately hot. For these turtles that have a large size & enough thickness, it is better to mold *auft* cast your lead an alloy half of lead & half of tin, especially for hollow things. For, if you only have very thin & very weak things to cast, like flowers, rely rather on the abundance of lead than of tin, which becomes porous once cast a little thick, & readily makes some flaw around the cast. MAISTRE Alexandre^[636] says that he has never gone wrong with half tin & half lead for things weighty & with the thickness of the back of a knife. If there is crocum, the joints hardly appear, & consequently, the flashing is very small & thin. You can repair & through the hole of the belly, pull the earth of the core, leaving it wet a long time;

Margin Notes:

[LEFT-MIDDLE] When you have cast your **black wax** in the *a*^[209] mold, & when it is quite cold, you need to *the* open your **mold** halfway, to make the cast. And if the figure of **black wax** breaks, there is no danger, for it can always be reattached with a hot **iron** touching point. Or else, if the pieces are not separated from the mold, *qua* they meet up & join like beforehand by joining & binding well the two halves of the mold. When the figure is large, one needs to cross inside many **iron wires** to sustain the core.

[Figure: fig_p151r_1]

[LEFT-MIDDLE] **A**^[637]

only in **lead** or
tin. One needs,
however, to redden
the **mold** nearly as
much as if there were
inside some
animal to burn,

[BOTTOM] in order that the **wax** melts well & leaves nothing inside & flows on its own by keeping the **mold** leaning toward the gate when reheating it. And when the **mold** is reheated, leave it to cool gently, then blow inside, and draw toward yourself, while sucking, in order that the **ashes of the wax** come out. Do this with **bellows**.

turtle, for you will use this **earth as cement** if you need to embed something or repair with the small chisel. If there is some flashing at the joints of the **mold**, you will remove it, either with the burin called a *chaple* or a very sharp penknife, or with a small file, & then with the small chisel, always having the natural one, to do this better, in front of you. You can curl on a file the point of a small chisel which is not quenched to make something lumpy. For these **two turtles** & hollow things that presuppose being large enough, cast your alloy of **half lead & half fine tin**. There is more work in molding a **turtle** than for twelve **molds** of flowers. If there is some *crocum* in your **sand**, there will not be flashing, & if, by some chance, there is some on the sides, it will be thinner than **paper**, as long as your **mold** is tightened well with a **press**.

turtles or other animals, you can make some little small chisels in the fashion of a round cutting-punch, others in the fashion of a gouge or the scale of a **snake & lizard**, and others on a file to make the curly & lumpy bits.^[638] The **turtles** which are not molded hollow do not have as much work, for they are molded in two pieces, to repair them with small chisels,^[639] small cutting-punches, small gouges & small serrated chisels.

[Figure: fig_p151v_1]

Wheat oil

sparkling hot **iron plates**, especially the lower one, which will be sloping, on which you will put some **wheat**, quite even & uniform. And then you will place the other, all red, on top, & you will press it until you see the **black oil** drip well. Reiterate that until you have enough of it. This **oil** dries immediately. It gives gold color to **silvered** & burnished things, augments the color of **gilded** things, serves as a **varnish** on **iron** for engraving^[103] on it afterward, for varnishing **sword guards** tawny. And could also serve **MAKERS OF GILDED LEATHER** well.

Margin Notes:

[LEFT-MIDDLE] One needs to use it when it is newly made. And for things to be molded, it must not be as thick as for coloring.

[LEFT-MIDDLE] It is not for anointing hairy animals, for it is too strong & stiff, but it is good to give form to the legs of a small animal, like a **fly** & suchlike. It is also excellent for coloring **false white stones**.

rat

d[270] the **tyrant of Syracuse**,^[640] & afterward you can replace them with *d'arg* natural **silvered** ones. The tail is beautiful molded because it is made of scaly circles, nearly like the one of a **lizard**, & in order that the hair does not hinder good molding, burn it in the fire of a little candle. The rest of the body should be anointed with **wheat oil**, which will keep the hair stiff & couched, so that the **sand** will not raise it by getting entangled in it to prevent coming out neatly. The **wheat oil** being dry, which will be quick, you will be able to pass a very thin

comb to divide it, in order that it appears in the cast. On a **small mouse**, you can even put some **common oil** to lower the hair. And before molding these animals (except **snakes** & **lizards**), let them **rest** remain dead one or two **days** to have them more handleable. For they stay rigid after their death & cannot be well fitted to their true shape until they are a little softened. However, if you mold it quickly after it is dead, or give it its shape before it stiffens, you will do well. *Att*^[641] And because the eyes die, **you in it en** if you do not mold it promptly, you will be able to^[642] substitute in the eyes the **halves of well-rounded peas**, stripped of their skin & shell. Some make the **rat** shed, others anoint it with **olive oil**, which is amiable, for **wheat oil** is thick & has too much body. This is why one scarcely uses it, only to give some feature to a **fly** foot or under a wing to keep them rigid. Others couch the hair with an **egg yolk**, which is quickly dry & amiable. Shape it, before **oiling** it, on the **clay** slab, and raise its head with an **iron point**, & secure also the feet with **points**, & the tail. Rub it with **eau-de-vie**, once dry from the **oil**. Then, cast your **sand**; next, uncover it like other animals, & make the second cast. One ought not to open the **mold** until it is reheated & the **rat** burned.

Margin Notes:

[LEFT-MIDDLE] +

The **rat**, because it is thick, comes out better being hollow if it is a **big rat**. A **mouse** molds better, because it has shorter hair. It is not possible to mold well an animal that has **biggish bones**, like a **bird** or **rat**, without opening the **mold** to clean it well, for **bones** do not calcine.

[LEFT-MIDDLE] All feathers & all hair is awkward to mold according to its nature.

[LEFT-MIDDLE] **Butter** for anointing hairy animals is better **e** than **wheat oil**, because it is more amiable.

[LEFT-MIDDLE] If the **rat** is big, it is good to remove its entrails, or, having molded it, to dry it in the **oven**, because the large amount of humidity that it has comes to boil in the **mold**, & spoils it & makes it lumpy.

[LEFT-MIDDLE] Do not put your mold **in the cold** until it has slowly cooled dry. Otherwise it imbibes the humidity, which makes it break.

mold, or from the cast, or from the **metal**. The fault in the mold comes from **plaster**, which is not hard & strong and does not withstand fire (which is corrected by mixing it with *crocum*). Usually as well, if there is an imperfection, it is from the cast. If there is also too much **tin** in a moderately thick thing, it does not come out well, because **tin** cast thick retracts & becomes porous. Also, things molded hollow are fanciful to cast. If, therefore, some flaw should happen, take a **leather** cushionet full of **fine sand**, & having placed it on the *bequet*^[643] of the **GOLDSMITH'S** table, where one files, place your work on it & secure it with a rope which passes under your **foot**. The **sand** in the bag obeys & arranges itself by and by, thick on one side & thin on the other. Then, forthwith, with a burin, make & trace roughly the fine lines which were omitted or which are not apparent enough, or with a file or a *chaple*, remove the flashing. And if there is some fault in the substance, which left some pit or too-hollow thing, rescrape this with a burin and notch around the edge, then imprint this with some **wax**. And place the imprint on a **delicate plate of lead**, & mark thus the appropriate measure of **lead** or of the alloy similar to your substance, then place the piece of the notched thing & attach it well with some **latten wire**, then rub the edge with **rosin** if it is **tin** or **lead** & place all around some small thin pieces of **solder** or **tin** or other things, then with a hot **iron** or in the fire of the forge, **solder**, and next repair this with the aforesaid tools & with the appropriate small chisels.

[Figure: fig_p152v_1]

[Figure: fig_p152v_2]

Margin Notes:

[LEFT-MIDDLE] For gold & small work, one needs to cement it on a ball of lead, which will be placed on the cushionet & will be held thus with the rope.

wax on a piece of **glass** or smooth **slate**. Next, mold it with our aforesaid **sand**, *t* having first anointed lightly with **oil**, as you know, & then rubbed with **eau-de-vie**, having and tempering your **sand** with **hot water**. Having the hollow form, cast it in **alloyed lead**, in the same form as other figures that you make very neatly. However, if it did not come out at all neatly, repair it. And then, ~~east some~~ **mold with some wax** on the relief of **lead**, & you will have a very neat hollow form in the **wax**, which comes out very neatly on the **lead**. Next, in the hollow form of **wax**, cast your **tempered sand**, which will make for you a relief, on which you will cast your hollow form in **silver** or another **metal** for seals. But note that you should not make your hollow form with **melted wax**, but rather, only heated in **warm water**, or, even better, in **warm urine**. Or else, if you have a relief of **gold** or **silver**, or other **metal**, very *fæo* neat & repaired, imprint on top your hollow form of **wax**, & then in the latter, cast your **sand**, which will come out in relief, on which you will next cast your hollow form for seals or other works. You could even cast a hollow form on the principal^[376] of **metal**^[159] relief, & even with **lead** & **tin**, which will not melt the principal^[644] if it is lightly anointed with **crushed chalk** with a paintbrush, or smoked with candle **smoke** or with **dried glair of egg**.

Margin Notes:

[LEFT-MIDDLE] [645] When you have imprinted your seal of **wax**, mold *en noyau* this piece of **wax**, which is hollow, like your seal, & your *noyau* will render it molded, similar to *te* the imprint & the seal.

[LEFT-MIDDLE] It is necessary that your **wax** be mixed with some color which hardly has body in order that you see the imprint better. **Lamp smoke** or **soot black** is good for this. **White wax**, for this effect, is *exe* better.

mold, mix [illegible]^[646] crocum or well-ground iron scales to firm it up. And having set & rendered your hollow form very neat, take some paste of fine

flour. And to flatten it, take a small stick of **boxwood**, very round & of the same thickness everywhere, which has, at the two ends, a little circle, more raised than the rest, to give the necessary thickness to the **paste**. And then, with this rolling pin, flatten it in such a way that it is delicate & thin enough. Then apply it on the hollow of your **mold** and press on it with some **cotton** & your figure will imprint itself in the **paste**, in relief on one side & in a hollow form on the other. This done, anoint with a paintbrush, wetted in a little **melted butter**, the part of the **paste** which is hollow. Then, cut the excess *r* **paste** which surpasses the hollow of the **mold H**. Anoint your **mold** also with **olive oil**, as you have done with others, place the **clay** contour & cast *s* your second **mold**. And you will have your medal as thin & hollow on one side as you will want. You can have diverse rolling pins, which will have ends, some more raised than others, to make various thicknesses, or use **sheets of lead & copper** of various thicknesses or of **carton**, cut with the rolling pin.

[Figure: fig_p153v_1]

Margin Notes:

[LEFT-MIDDLE] If you were to rub your **paste** with **oil**, it would drink the **oil** & penetrate up to the mold, which it would attack. But **butter** remains on the surface of the **paste** & is not imbibed at all. You should not, on these reverse sides, temper your **sand** with **hot water**, for it would melt

[Figure: fig_p153v_2]

the **butter**.

sand to be reheated

mold than in a small one, for the large one remains *long* in the fire & the small one is soon reheated.

[152] gold

gold so dry *it*^[502] that neither **cement** nor **antimony** can soften it. But only **verdet** can render it soft.

Gold not being fixed

Gold as gilding goes away once the piece is reheated & kept in high heat, especially if there is some **lead**, for **lead** will pierce in the fire a piece with **gold**, because it holds closely with ♀.

lead

knife or chisel, wet it & you will cut it like **glass**.

Margin Notes:

[LEFT-MIDDLE] [647] Sometimes gold & silver take on, through certain fumes, some color during the casting. But these are not at all scales & crust, but rather this color goes away with whitening & *bullitoire*.

[152] silver

goldsmiths who work large wares have forged their platters, it very often happens with their sheddings that it bursts & cracks for being too soured. To avoid this, throw in, when it is well melted, some dry mortar composed of sand & good lime which has been worked, & pulverize it & throw it in.

Margin Notes:

[LEFT-MIDDLE] GOLDSMITHS do not work at all with the silver from reals that is not alloyed, because it is leady & when forging it sours.

[LEFT-MIDDLE] Some solder, for small works & things which only go in the fire once, with some old sou & carolus, reheated & beaten. However, if the sou is not very good, the solder eats away & one needs to solder there twice, & one finds there too much copper. Others solder with half silver & half fine copper.

Iron scales

marble, & mixed with the aforesaid sand of *noyau*, and dried slowly without reheating, it endures several casts of lead & tin. Copper & latten^[648] come out well. But if it is not well ground, like *crocum*, it goes to the bottom, if the sand is not tempered thickly enough.

Metal filings

metal, melted to assemble them & put them in a bath, for they are sooner burned than melted. Tin and lead filings are made with tallow, the one of gold with salpeter, the one of silver with sandiver.

Latten

sal ammoniac to thin it. Alloy it as well with a little red copper and, when you want to cast, a little tin to make it run better. It always leaves a tail like melted glass. It does not require as long a gate as others.

of silver^[649]

Silver needs a longish gate. For gold it does not matter. Silver, when soldering, tolerates the water one throws on it. But gold would spatter, & needs that for that reason, one casts solder bran on the solder.

Margin Notes:

[LEFT-MIDDLE] Let the mold cool well after the casting before opening it.

delicate things & herbage, one does not use wheat oil but melted butter, of which one gives a light #^[250] coat on the back of the petals of the rose flower & the pansy & other flowers that need it. But one reinforces the ~~f~~little legs of flies & other small animals with wheat oil to strengthen them & make them hold up.

Margin Notes:

[LEFT-MIDDLE] with a small paintbrush

Strawberries

solder. And because the strawberry fruit is cast solid, & by that means is heavy, and the tin stem which is delicate will not be able to hold it up without soon breaking, one makes the stems with latten wire & then one solders & joins them.

rose

of the rose bush which are *aupart* around the flower are sometimes very spread out & would make too large a mold, one makes and molds them separately, and the rose & some e buds separately. And then one joins with solder the little branches & leaves of the rose bush to the stem of the rose on which one intentionally leaves the little tips of the small branches. Put your leaf or rose as low as you can in the mold because the sand always raises it up. You en can also mold several petals together, once arranged one on top of the other, separating them with threads, as is said. And regarding the rose, you can give a thin layer of melted butter on the back of the petal, of on the first petals on the outside, not on those on the inside be, to fortify it & give it the strength to withstand, in order that the tempered sand does not spread out & expand more than it should. You them can also mold well the leaves of rose bushes, strawberry plants, & similar things that are flat & can be flattened without spoiling them with two gates, for opening your mold when it is reheated, & cleaning the ashes from it, All and

making vents & several gates. And this is the easiest way, but the other can also be done. And with small veins of **wax** adapted & joined from leaf to leaf, you can make gates. You can even make a vein of **wax** from the back of the first petal ~~until~~, which will join to the gate. All of this facilitates the cast. *Auleu* The principal thing is to let your reheated molds cool down well rather than cleaning them & blowing inside them to make the **wax** come out, because when the mold is hot, the **ash** holds to it as if attached. But when it is cold, it wanders and leaves with the air or when one blows one's **breath** through the small opening. Wet the **rose** with **eau-de-vie** before putting it in the circle of **clay**. Do not forget to **oil** the **wax** gate. And when you have cast your **tempered sand**, blow thoroughly until it begins to set. The **rose** came out well. But because the **sand** finds itself mixed among the petals, make your work soak in **water** for a *long time* in order that, shaking it in the **water**, the **earth** is gone from it.

[Figure: fig_p155r_1]

Margin Notes:

[LEFT-MIDDLE] You can well give a bit of thickness at the ends of the stalks that support the leaves, anointing them lightly underneath with **melted butter**, because the leaves are large & weighty, and the stalk of **lead** & **tin** would not have enough strength.

[LEFT-MIDDLE] I would be of the opinion to mold the **rose** on its own with a little of its stem close to its bud, & then to join it to a longer one of **tinned latten**, because the **rose** in full bloom has great volume & weight.

Rose

or *for* that the stem of **tin**, which is brittle & delicate, would be unable to support. One molds the flower of the **rose** on its own & separately, making its gate largeish in order that it comes out *b* better. Then one cuts this gate down closest to the stem of the bud, on which one grafts next & **solders** a stalk of **latten wire** to which one also **solders** the leaves. But because **tin**, being thus thin, is troublesome to **solder**, and any leaf can be melted, and also because the cast flowers & especially the **rose** are not beautiful without being painted, one does not take pains to **solder**, but one *it* grafts the pieces to join them & one **glues** them with **fish glue** that has been a little tempered & thickly melted. And in order that it imprints better, one heats the

tin work gently & at a distance, for once cold, the **glue** would not take. After your flower is thus repaired, you follow the joints of the added parts with **modeling wax** *esb*, which is a **white wax** mixed with much **well-ground ceruse** or, even better, **lead white**, melting it & applying it on your work with a small hot point of **iron**. In this way you can repair these little barbs that are in the middle of the **rose** or the holes *of the* that may be in any petal. Next, you will paint your **rose** according to nature. If you cast your **rose** in **gold** or **silver**, you can join & **solder** well. And in these same **metals**, when you have something delicate to join to the flower, like a **fly** or something similar, **fish glue** is singular for it & holds very well, fixing it with a few small points which serve as **nails**. The leaves & buds can be molded in two **molds** that can be opened once reheated, but not before. Next, these said things are joined.

colored wax, & you will have a hollow form, in which you can cast en noyau a relief of your sand, on which you will make a hollow form of lead or tin, in which you will cast a wax relief. And then on that wax you will make your mold en noyau hollow, to cast there the relief of gold & silver or any other metal you like. But to hasten your work if you are in a hurry, make the first imprint & hollow form in bread pith, prepared as you know, which will mold very neatly. And into that, cast in melted wax, which will give you a beautiful relief on which you will make your noyau.

gold

lizard or any medal you like in **base silver**, like **billon**. Next, **gild** it lightly. And once the first **gilding** is done & dried by fire, brighten, rub with a scratch-brush, & make another layer of light **gilding** like the first time, & do thus three or four times or more, according to the thickness you want to give. And then, having made a small hole in the least visible place, put your work into **good aquafortis**, which penetrating to the **silver** through the hole will eat it all away without damaging the **gold**, so that you will have a **lizard** hollow to its nails, or any other work, so light that by blowing you will agitate it. But take heed not to make the layer of **amalgamated gold** all at once, or^[650] of hardly any thickness each time, because that would

block the small features, but proceeding therein as said, lightly & several times, and cleaning well, you will do well.

Margin Notes:

[LEFT-MIDDLE] In order for the **aquafortis** to eat away better, it is necessary to **east** cast in **base silver**.

Chasing

Lead is so fatty & soft that one cannot strike it boldly, & one needs to have a **very light hand**. The other **great metals** are easier. With a burin called the *onglet* you make & retrace the more delicate lines, with the ordinary engraving burin the broader ones, and with the *chaple* you remove the big flashing, and with the small chisels you soften the harshness of the lines, you smooth, you add relief to a line.

fly

largest *vo* flies that go into **pantries**, which are not hairy, if it is possible. If they are, anoint lightly their down & capricious hair with **olive oil** to lay it down. Also take them and use them as soon as you can after they are dead, because if you were to leave them to dry a lot, their *e* legs would break when you want to spread them out. One needs also, to make them come out better, to place them on something like a leaf, or similar thing, to help the casting of their little legs, which are so frangible that, by themselves, they would not come out well in the cast. They can be planted on a **sage** leaf or similar. They are cast well in **silver** & **gold**, but one usually makes the legs & wings separately & one reattaches them. I have molded one on a *e*^[651] **sage** leaf bouquet of **sage**, which had seven or eight leaves. And to make its stance *att*, I fixed its legs *to the* on the widest leaf with a little **wax**, **melted** & reattached with a hot **iron wire** point. And in order that the wings come out better, I anointed the underside of these with **melted butter** with a little paintbrush. And with the same hot **iron wire** point, I anointed the legs & feet with **wheat oil**. And to lay down & couch the **downy**^[652] hair that it had, I anointed it also *u*^[653] with a little **olive oil**.

wheat oil to dry a lot, because it is thick & has body, & the **eau-de-vie** does not take at all.

a^[654] tallow is too harsh, pork fat is too soft, and butter is the most excellent because it is soon dry & curdled & melted quickly & firmer. Take heed that the legs & feet are well set on the leaf & not outside it, for that which exceeds would not come out well, especially in silver because this ~~would exceed the~~, so fine, would be of no help in the casting. And, in truth, the feet which had been laid on the leaf came out well, but those which straddled from leaf to leaf & remained in the void did not come out in tin. The rest of the fly came out well, and especially the bouquet of sage, which is very beautiful molded.

Margin Notes:

[LEFT-TOP] One could even cast it in gold & silver, without the feet & without applying it on a flower, by making the gate under the belly & reattaching with solder the feet &, if need be, the wings with the same metal, & it could be enamelled by fortifying the wings a little, & the feet, as said.

[LEFT-MIDDLE] If your sage or branch has something to repair, do as said below. And then paint according to nature.

[Figure: fig_p156v_1]

[LEFT-MIDDLE]

Once cast in gold, one enamels the wings with window glass from Lorraine, which is verdesin and transparent.

[LEFT-MIDDLE] One needs to make the gate for the fly from the bottom ~~in order~~ with melted wax, adapted with the iron point, as you know, to which the fly attaches itself, & then the wax, while melting, serves as a gate for the fly.^[655]

[LEFT-MIDDLE] +

If some flaw happens to the wings of your **fly**, beat some **tin** very thin, & or^[608] some **gold** or **silver** if you have cast it in it, & **with** trim with some **scissors** what one needs to reattach there, & next, apply it with your small pincers & **glue** it with **fish glue**, prepared as put below. And before, heat lightly your work, in order that its coldness does not refuse the **glue**, which will be soon dry, heating it from afar.

[BOTTOM] Next, cover lightly the joints of the reattached thing with some **modeling wax**, which is **white wax** mixed with a lot of **ceruse** or **lead white**, melting it well with a hot **iron point**. You will also cut some small bits of **spinet strings** & **glue** with the said **glue**, & once dry, that is to say the feet, repair with this. You will thicken them with the same **melted wax**, to render them equal.

goldsmiths for molding hollow

cuttlefish bones their animal or other work that they have either already made or modelled in **wax** & cast in **lead**. Once it is well imprinted in the two **cuttlefish bones**, they place between these two **bones** a **paper**, & join the **bones** & cast. The work comes out split in half. And then, with **eh** a **chaple**, they hollow out as finely as they please the two halves cast in **gold** or **silver**, and then **solder** or braze them.

Flies

Margin Notes:

[LEFT-TOP] They mold better on a single leaf than **n** on a bouquet or a flower or the branch of a plant, because the single leaf molds in two halves, which, once reheated, can open and clean well, & the cast is made better. Take heed when taking the **fly** to not break the legs & to not let it dry too much, for then the legs

Rouge clair

goldsmiths assay it on **gold**, **thinly beaten esp** & **well burnished with a chaple**. But it is better to assay it on a **gold ingot**. And also assay your substances in large or fantastical work, since if

they appear good & extraordinary in large work, they will show excellently on a common work.

Margin Notes:

[LEFT-TOP] fall off. And if this happens to you, glue with fish
glue the same legs and with wax,
or fashion some out of swine bristle or
spinet string. Fix the leaf
on the clay slab with two

[LEFT-BOTTOM] points, and the fly with one point in the middle of the body, & the legs with some
wax.

tin and others

lye, carefully passed through good ashes, and since it is recent & not fatty, boil your molded work in it. And the tallow and fat leaves it.

at the top the principal side of the thing, because it comes out better and neater than the bottom. Make the gate wide & make it so that the *supraplus* (which is the *masselote*^[656] for FOUNDERS OF LARGE CASTINGS), And especially for silver, which wants the mold quite hot & to be cast very hot. Very thin things want to be cast very hot.

Margin Notes:

[LEFT-MIDDLE] When you know that the stem of a flower, burned in a mold which does not open, is quite reduced to ashes, it is a sign that the rest is well burned.

Ash in the molds

mold cool before blowing to make the ashes go out. For when the mold is hot, they adhere against it, & once cold, they separate from it more easily & go away in the blowing with the wind as vapor.

bird

clay slab, and hide & sink within it half the said bird, in order that it only shows one leg & one foot, then you will anoint it with butter to make it hold the feathers down, finally of oil eau-de-vie. And then cast. And being set, clean & uncover whatever needs it. Next, mold the other side in the same way. But because the feet, being of bone that is difficult to burn & which are not able to be cleaned neither by quicksilver If nor by any other means, if the mold would not open, uncover the bottom of the feet & the toe or the little finger of the claw, & mold as a separate piece. Reheat & open your mold & clean the bones. The feet usually remain too weak to support the mass of a solid bird. And for this reason, one adapts an iron wire in the mold of the feet which passes into the body before casting; thus, they are reinforced. Some mold the wings in a frame. Others mold the head & the said wings separately *en noyau*, then join & repair them to first model a form that will be stiff & withstand the tempered sand.

Margin Notes:

[LEFT-MIDDLE] They are skinned & filled with cotton cloth. & even better, one needs to dress them in the fashion that CURRIERS do, in order that they do not lose a feather, weight.^[657] The dressing is alum & paste of flour.

[658]For making h... wine f...rs^[659]

sock from the right α ^[660] foot that has been worn and make drink at it soak in water, and of the water that comes out, make that same person or someone else drink it, and you will see marvels.

[387]Mercury in the molds for cleaning

mold be quite cold before blowing to make the ash go out, and next put in the ♀ to achieve the cleaning. For if the mold is hot, the ♀ penetrates within &, in flight, seeks out conduits & leaves an *odor of itself*, which sours the tin or other metal that you will cast there so much that it will break if it touches it even slightly. The heat of the mold also retains small grains of ♀ that make lumps, & contracting to the edge of the molded leaves, are joined there & make the leaves frangible. The ♀ cleans the ash well, especially flat things where there are not delicate lineaments which could be broken by its weight. And thus, if you can cast neatly without putting it in, do not use it. But if it is necessary to use it, mix your sand with crocum in order that it withstands the fire well.

♀, evacuate it, turning the mouth of the mold downwards. Next, reheat the mold gently in order that the ♀ be gone from everywhere. In this way I have cast a branch of periwinkle, leaves & flowers, very neatly, having given to the flower a layer of melted butter on the back of the flower with a paintbrush.

Margin Notes:

[LEFT-MIDDLE] [661] Reheat the mold very red before *q* casting in it, in order that the *g* exhales well.

[568]

oil, because *distemper* colors have no hold. For *marigold flowers*, *lightly ground minium* for some, & for others which are more yellowish, a bit of *massicot* with it. For green, the *verdigris* has depth & is too dark. If it is a yellowish green, you can mix with the *verdigris* a little *yellow ocher* & *stil de grain yellow*. If the green is dark, put with it *charcoal of peach tree pits*, which makes a *v* greenish black, in the same way that black of *ox foot bone* looks bluish. And thus, by judgment & discretion, put the color on the *natural flower or leaf* to see whether it comes close. [662] But layer it transparently, so as not to cover the lines of the work.

molds

metal, they want to be put in a press^[663] in order that they do not open.

Candle smoke

a little thick, it does not hold to any place because it has no body. I have thus fumigated my *noyau* molds for *tin* & *lead*, and have cast in the cold mold, well dried beforehand, and it came out very neat. It is true that *lead* mixed with *half* of *tin* was very hot, because the medal was thick.

Even though If the medal is very thick, for this reason do not give it as thick a gate. It suffices for the gate to have half of its thickness. But if it is thin, give it a gate of its thickness. Do not forget to make vents in the gate where typically the material becomes porous.

Margin Notes:

[LEFT-MIDDLE] Never forget to oil the wax gate when you mold plants or flowers, otherwise it breaks & cannot be taken out.

Wax portraits

wax, & if the wax is not *en* tinted & mixed with color within, the color lifts off & is undone if you mold them *en noyau*, but the portrait is not spoiled. One needs to oil them lightly, bathing in *eau-de-vie* & tempering with *hot water*. If they are varnished, one needs to mold them two or three times to lift off the varnish, which sticks to the mold. After it is removed, you will be able to mold nealy. If they are on wood, one needs to saturate the wood with **very hot melted wax**, for otherwise the mold would be attached to it. **Lead white** is much better for mixing with **white wax** than **ceruse**, for **lead white** is firmer & whiter.

Chiseling

small chisel has passed through some part of a portrait, one needs to repair & retrace it all. Otherwise, it would look like a joined piece.

Fish glue

anvil, & next wet it with *eau-de-vie* over *eh* **hot ashes** & a low fire, & it will be quickly melted; & if it is not strong & thick enough, add some.^[664] And take heed *them* not to put it to melt in a fatty vessel, but in a new one, if you can. It is melted on the fire & is also dried quickly on the

fire, but it may be warmed from a distance once on the work. It holds strongly. With it one joins flowers & delicate things of gold, of silver, of tin & other materials, which are in danger of spoiling if soldered.

Tin and lead

without se. And the tin does not sour & crack as lead often does, *Ma* although it is more fatty, but one reheats it under hot ash. And it is necessary to beat them with several leaves together.

grease, the lead, which is fatty in itself, or other filings, attach to it. And you will be able to clean them either with hot charcoal or a scratch brush made of wires of latten.

Carnation

rose, marigold & all other flowers thus, as is said, namely, whole-mold flowers, & all the leaves, if you want, in two halves, joining them by solder for the most secure way, even if you could mold them together in a closed mold. I cast one that came out very well. But one needs very thin sand & to blow strongly.

Margin Notes:

[LEFT-MIDDLE]

[Figure: fig_p159v_1]

[665]

Molds

es if it is possible, one as thickness as the other, in order that they can be quite evenly reheated. When you mold some animal that should be burned *you*, like *crayfish*, you cannot open it to clean it, & make the cast so that it is not reheated. And when they are reheated one time, keep them scarcely at all without casting, for they are rendered musty & humid, & the mold is undone & loses its strength.

Margin Notes:

[LEFT-MIDDLE] The part where the back of the animal is is usually thicker.

Plaster alone

stone plaster fears is undone in *water*, but that which is *reheated* & first pulverized and then reheated does not fear it. But if it is good, it hardens in it, like *the one of Paris & Spain*, which is hard in *stone*, as is that which grows in *lean & dry earth* and which seems like *white salt*. *Germans* make statues for their *fountains* with it, which are not spoiled, especially once varnished, but it hardens in *water*. When it is alone & not mixed, it sets more quickly than otherwise. One needs to *oil* very lightly your molds that are of *metal* or *stone*, otherwise it would not release. And however you *oil*, you have to temper it with *hot water*. And when it has set & well cooled, one needs to wet it sometimes in *cold water*, but if it refuses to open, in *hot water* & sometimes in *boiling water*.

Margin Notes:

[LEFT-MIDDLE] Sometimes one even needs to make the mold boil in *hot water*, as when you have molded some *wax* that you fear would not be easily released from it.

[LEFT-MIDDLE] *Cold water* makes *oil* withdraw to the surface of the *plaster* that has sucked it in, & thus it releases.

Press for large molds

[Figure: fig_p16or_1]

[Figure: fig_p16or_2]

Margin Notes:

[LEFT-MIDDLE] The screw is riveted to this stirrup,^[666] which is nailed onto the upper plate, & by this means, raises it & presses it.

sheets of iron attached by four small iron pillars, in such a way, however, that *hes* the upper is *nt* able to have play & run freely the length of the pillars, & that the lower one is fixed. At the end of the pillars is affixed an iron St. Andrew's cross,^[667] in the middle of which is a screw which tightens the sheets against the molds which are between the two.

molds, one makes a frame, & having put the molds between two plates of iron, one sets tightens them in the frame with wedges.

large wooden presses made with screws, besides being heavy to put near to the forge for casting, one cannot know when they tighten too much, & very often, they break the mold.

Sand for flowers

mold. And tempering the sand, one ought not only to turn the spatula but to beat the sand in water as if you were beating glair of egg.

foot or hand

resin among the wax, & having incorporated it well, soften them in hot water or urine, & then make an imprint by pressing, & next cast in plaster, & it will come out quite neat & will release well.

gold and of silver

flies from it by hand without casting, & the wings & feet can be joined by **solder**, which cannot be done with delicate works of **lead** & **tin** because they would melt. And the work of **gold** can be **enameled**.

crayfish

stick some **liver or lung of a cow or sheep**, & with a small string you make a **basket** hang from the tip of the said stick. Put in **water where crayfish eat**, & they will quickly come to accumulate on the **flesh**. Extract gently from the **water**, & those who want to go back into the **water** will fall into the basket.

passerines

in **straw**, like they usually do, **close to the house**, leave the closest window open & put in a lighted candle, but so that the candle is hidden & that its light only appears throughout the **room** & through the window, and all will enclose themselves in the **room**. But it is necessary that the **night be dark & without ☼**.

birds

In winter, when the **birds** have molted, skin them & fill them with **stuffing cloth** &, or else dry them in an oven #^[668]. Then arrange them on the trees, & have **SOMEONE WHO SINGS**, & you will gather them & catch many.

Margin Notes:

[LEFT-MIDDLE] in an oven that is scarcely hot *In winter*. And^[669] *in summer* this is done because, before they

[BOTTOM] would be dried, the **fly** would get into their eyes and make **worms**. *In winter* they are prepared better & dry by themselves

[670] Preparation of sand for frames

sand *de noyau dahu* of *gip of lateribus*^[671] & *alume jameni*^[672] was used *en noyau*, gather the pieces of molds, break them on a long table with a large billet in order to pulverizes^[673] them well, and, better yet, sieve it finely. Put them in some pots into the TILER's oven or bread oven, several times when it is well lit, in order that they become very red. Once cooled, pestle them, if need be, and sieve. Next, put it in a neat, adequate dish or *semal* or vessel, and wet it with clear water, and grind it & stir with a thick stick until it is well wetted & washed & the filth goes to the surface of the water, & continue to stir it thus, like the *gip mat* that one prepares to gild with burnished gold, five or six days, until it is not at all lumpy. # *nota* And, each time that you stir it again, leave it to rest & empty the clear water which will be on top by tilting or with a bowl or sponge, and put some clear water back in, & thus wash & stir it until it is well fine & purged of all filth. *Nota #*^[674] Next, leave it a little to drain and dry, and make from it some little balls tempered in sal ammoniac water, and once thus dried, put them to reheat at great heat in a reverberatory furnace, where they should be quite red, *a good space of time*. Once they are reheated in this way, pulverize them & try to mold something in a frame, having moistened your powder with sal ammoniac water. And reheat & redder the frame, & if your sand retracts, one needs to pulverize again & wet it in sal ammoniac water, reduce into little balls & reheat it & redder & continue so many times that it

frame when you redder it. The main thing is that it is well reheated, for otherwise the sal ammoniac would not calcine well & render the sand coarse, & for this reason, one does not need too much sal ammoniac in it.

Margin Notes:

[LEFT-TOP] [675] #

Nota that one needs, *fillegible* before drying it, to wet it all and it empty the liquid in another common vessel, leaving the litharge, in order that the stones & earth remain at the bottom afterward. One needs to let it rest & empty the water by tilting, & leave it dry.

[LEFT-MIDDLE] nota

[387]Crocum ferri

filings, well cleaned & washed, in an iron case, two fingers high & covered, & redden it thus in a reverberatory furnace, having washed it in good vinegar for the space of a day. And it will be well burnt p & clean, mixed and ground finely on marble. Being well ground & once it is quite fine, the the vinegar will bite it quite easily & will soon give it redness & bonding, wetting it with the strongest you can find & next setting it aflame. And in three or 4 ignitions wettings^[676] & ignitions, it will be ready. This one is columbine color & is found firmer for casting than that which is redder & the color of minium bole, made of rusty filings eoe, & has more tincture. Others burn the filings several times on a reddened iron shovel, showering it each time with vinegar.

workshop

Herodotus^[72] that the navigation of the Portuguese was not newly invented by them, as they brag. At the beginning of the first book entitled *Clio*,^[677] he says that the Phoenicians would come from the Red Sea by continuous navigation to the coast of Greece, mainly to Argos, to which they would carry merchandise from Egypt & from Assyria, which they usually sold out of within 6 days.^[678]

Margin Notes:

[LEFT-MIDDLE] *Navigation,*
trade

Herodotus, on the first page of *Clio*, says that the Greeks were on a long ship on the coast of Colchis & to the river Phasis, whence they carried off Medea.^[679]

Margin Notes:

[LEFT-MIDDLE] *Galleys*

Herodotus, on the third page, says that **Gyges**^[680] presented to the temple of **Delphi**^[681] *pateras aureas sex pondo 30 talentorum.*^[682]

Margin Notes:

[LEFT-MIDDLE] **Gold** vases

Herodotus. **Halyattes**,^[683] the father of **Croesus**,^[684] *pateram ex ferro compactilem apud Delphos dedicavit spectatu dignam inter omnia quæ sunt Delphis donaria, opus Glauci Chii*^[685] *qui solus omnium compactionem ferri excogitavit.*^[686] **Compactile ferrum**,^[687] which is made by assembly & things joined.

small peddlers lay open small wares in order to buy richer ones & to profit more and more, so I, from a desire to learn, am exposing what little is in my **workshop** to **have in** receive, through a common commerce of letters, much rarer secrets from my benevolent **READERS**.

Margin Notes:

[LEFT-MIDDLE] **Iron** vase
joined and **soldered**

Aes ustum

| more than *crocum*, & I believe that it would not be inappropriate for a cast.

Rotten wood

The one which is white, light like a sponge, once burned in a closed fire, can be used for a frame for **lead** and molds very neatly. But such things do not endure the fire.

Peach tree

ch frost, one lays them bare at the roots *during winter* in order that ~~the winter~~ the *cold* slows them and that, *le* blossoming later, the flowers come to profit.

Olive trees

Spain, one lays them bare at the roots *during winter, & in summer* one plants them well with *earth*.

Bittern foot

days, because, in drying, the scales appear coarser & the nerves & tendons become more apparent, and thus the molded foot will be more artistic.

Molds of things that do not release

molds, which should not be opened until after they are well reheated & the enclosed animal is well burned. Animals that have bones or scales, which do not reduce into powder but rather remain as calcined lumps, will never leave through the gate, whatever blowing one does or whatever *quicksilver* one puts there, or a *feather* quill during molding to use as a gate. This is why one molds in two halves, in order that, the *mold* being opened after having been reheated, the burned thing can be cleaned out well. But take heed to let it cool well, in order that, when removing the *clamps*, being hot, and when it is most frangible, something does not break. The *crust & ashes* that it leaves & which adhere to the *mold* while it is hot are removed better once cold. Note also that on the bottom side of the *mold*, when you reheat, the animal which boils leaves some *filth*. And, on this occasion, one always marks the *mold* where the back of the animal is, in order that, when reheating, it is above & on top & that through this means it is neater.

Perfumer

half of *amber* & half of *musk* & very little *civet*, because *amber* always overtakes the principal *scent of musk*.

amber, they readily put a little **musk** in the white layers, & ~~for~~^l which gives a more forceful **scent**. But to remove ~~the~~ or hide the blackness of the **musk**, they put in a bit of **wheat starch from England**, which is perfectly white.

When the amber

To perfume with **white amber** in the **Portuguese** fashion, take a *huchau* of **amber**, well broken up. And having put in a small **silver** bowl a **silver** spoonful of **flower oil**, or lacking that, **ben oil**, that is to say, a **silver** spoon **that one uses at the table**, put in your **ambergris** & place all on a low fire, and it will melt quickly if your **amber** is good, & it will remain there without lumps. Once all melted, put in the size of a pine nut^[688] of **civet**, & make it melt, & mix it well together. Next, take your **gloves**, well-cleaned & well-dried, & dipping the tip of your **finger** very lightly ~~on~~ on the edge of the **oil**, spread it on the **glove**, little by little & with patience, & rub the **glove** between your **hands**, & trace the fingers & the stitches, one after the other. And leave it to dry. Next, trace again as before until the **amber** is all laid down.

Eau-de-vie

sand will usually attach to the figure. But it needs to be in three passes. And because it does not take easily on **oiled** things, I believe that it would be good to put some amongst the **water** in which you temper your **sand**.

Crayfish

coe tend to come out lumpy & not neat because, being burnt, it is difficult to remove them & clean their **ash**, which, staying in the mold, ~~it~~ prevents the **metal** from running well therein, & for that reason, one makes a small gate of **wax** thread at the tips of them, both to hold them up and to blow out the **ash** that hinders.

Margin Notes:

[LEFT-MIDDLE] Spare no pins, placing them not only in the middle of the body but also on the big legs, and two or three at the tail, according to the stance that you want to give it.

Crocum

salt water or vinegar or urine and then very dried out and reddened^[138] in the fire, is very red ground on porphyry and is of the color of Levant bole, & approaching minium. But that which is showered with urine & dried out acquires a deeper tincture & approaches crushed æs ustum or vermillion. But the first one, finely ground, acquires a bright red color, in the like cinnabar, in eau-de-vie. And the ones and the others, prepared as said, and finely ground & rendered very hot, give off red fumes like a volatile spirit if, being thus hot and fine, one throws on top vinegar, urine, or eau-de-vie. Urine gives much tincture, and eau-de-vie also.

[Figure: fig_p163v_1]

burin called *onglet*, or with that which one calls *chaple*, or some small file. But above all, avoid touching your work, but only the flashing or the lump that will have occurred during the cast. And while repairing, wet & rub with your very small **hog bristle** brushes.

snake, make it come from the side of the belly & under the tail, for from the side, there are only straight lines, which are a lot easier to repair than the back, which is more visible & more marked.

point of a *chaple* or burin, scrape it with the side of the burin, or gently with a small file, & rub with **willow charcoal** & little brushes. Make continuous the lines disturbed by the flashing.

Leady silver

lead which is mixed in works it like in the *cupel*, and makes it jump in little balls at the edges of the crucible & on the **charcoal** which covers it. It is also fatty, and thus it is good to melt all **coined silver**, like **reals** & others, & to put it in ingots before melting it for casting **lizards** & animals, for it comes out better. I molded some as neat as the principal,^[376] such as a **little viper of silver**, and I made the alloy out of 4 **reals**, of 20 **sous from Spain**, & a coin of xx **sous from France**.

silver & gold, do not blow strongly & with violence, because with the charcoal consolidating, the crucible would lower & *targ* could fall over. But when your mold is ready, at that moment, blow strongly to heat well the silver or gold. Both, once melted, want to be blown from above with small bellows, especially gold, for this removes their fumes & softens them.

[152]

Molds

which in which one needs to burn something and which do not open before being reheated, one does not make any casts before it is reheated. For large molds in which the gate is big and ample, it is necessary that the gate be well notched & scratched, in order that the weight of the metal does not go with much force. They make hardly any flashing if they are pressed. But before pressing them, put between them and the press some pieces of *plump*^[689] & *thick felt*, which is hardly yet crushed, for it fills the concavities & keeps the mold from cracking. The clamps should be placed before reheating or drying it.

Margin Notes:

[LEFT-MIDDLE] When the earth from which you make the earthen slab to arrange your animal is too soft, the points that you put in it come out easily & come undone when you cast in the sand, & thus the mold spoils and the shape comes undone. Therefore, when you recognize that your slab will be too tender & soft, spread on top some hot ashes & blow with the bellows.

Sand

feather alum or *crocum*, it will easily crack in the fire. But if it is mixed with it, as it should be, it withstands it. It is recognized to be good when, being hot after the cast, it quickly imbibes water when one quenches it & *rends* breaks easily because the alum & the *crocum* render it

spongy. On the contrary, **bad sand**, which is only of **plaster & brick**, & little mixed with **alum**, breaks easily in the fire & hardens in **water**. Cast, if possible, all in one go.

Molds

lead, the **molds** want to be well dried, especially when they are large, and one needs to redder them on the outside & keep them in continuous heat until they no longer **smoke** from inside. Do not place them to reheat at *different times, but continue once you have started*. And do not place them to cool **in the cold**, **With** for they would crack, but leave them to become lukewarm near the fire, & *when they are still of such a heat as you have noticed before by putting your finger in the hole, cast*. And when the **mold** is large, it needs more time to reheat & dry, & one needs to cast hotter.

gummed modeling wax that is black or gray.

Lake

water, it will dry out & you will have as much trouble grinding it as before. **La**

canvas picture

wet sponge, & you will stretch it very evenly without spoiling it.

Plaster for molding

lean soil is the best. Molds of **fatty plaster** ought not to be kept for a *long time*, for they act like **fatty earth**, which when drying by itself, cracks. It is best to reheat them soon after they are made, & to cast. **Good plaster** keeps a *long time* in molds.

Margin Notes:

[LEFT-MIDDLE] It needs to be well oiled, for it is more difficult to separate the two halves of the molds than when it is mixed.

Dragon's blood

lake, which surpasses the dragon's blood in beauty if, tempered in oil, you glaze on gold or silver. Tempered in varnish, it dies.

snakes and lizards

puncheons according to the form of their scales, & making some bigger & some smaller, according to the shape of the neck, the body, & the tail. If there is something broken, you can graft it on with small pieees points of iron or steel wire, & glue with fish glue, & then cover it all with gray or black wax. But it is necessary to let the glue dry for one day without touching it.

iron points but with melted wax, animals are secured on the earthen slab. Wash them first in clear water, once they have died in the mixture

Margin Notes:

[RIGHT-MIDDLE] of vinegar & urine,
& with a sponge
purge their mouth,
eyes,
and the
head of
the slaver
which
comes out,
for
the sand
would never
set well
there and
would become
lumpy. [690]

[LEFT-MIDDLE] If you want to make them keep their mouths open, put in a little bit of spinet string, which will not take up space.

urine, vinegar & eau-de-vie where you killed the others, and they will keep for a *long time* without spoiling.^[691] If you have a **cut on your hand, take care that this mixture does not touch it.**

Molds

long time, but rather use them *as soon as you can*, because when kept a *long time*, they are subject to corrupting.

Margin Notes:

[LEFT-MIDDLE] When they are reheated, the thing comes out better.

Lute

common lute. But when you want to cast, strip the mold of it^[692] & promptly, with a brush, layer the lute **of plaster that has been used for** molds, for it will be dry when it is placed, & cast. One needs to mainly put this lute on the joints.

Silver

When it quivers once melted, it is a sign that it is quite hot, & because usually it is **lead**y, it is good to throw in it some **lime mortar**, for this attracts & gathers the **lead**.

Fly wing

veins of wax. Make sure also that under the belly there is enough **wax**, for this is what makes the gate.

[Figure: fig_p165v_1]

fly wing, or similar

fish glue mixed with **eau-de-vie** over slow fire, heating also the work. Then, this is covered with **modeling wax**, which is grey.

workshop

harvester is not reproached for leaving some ears of wheat.^[693]

artisans complain that one discovers their craft secrets, and if the **goddesses of Eleusis**^[8] complain, as they did to **N. the Pythagorean**,^[694] that one has divulged their mysteries,
^[695] excuse yourself based on the words of the ancient **Hebrews** quoted by **Josephus**.^[696]

hen carefully searches the garbage thrown out of a **house** for a crumb or a grain that she divides among her **chicks**, thus one distributes to **orphans** that which has been sought among the arts considered vile & abject.

Cebes,^[697] idle, but the **workshop** represents all things active.

^[698] disapprove that these things are picked up & taken from others, reply that since *nullum est jam dictum quod non dictum aut factum sit prius*,^[699] & that one holds that all arts were invented *in the space of a thousand years*, so that you do not think that you are able to invent anything new but rather rediscover anew the books of **Numa**,^[700] buried **by** & **long** unknown & forgotten, in order to publish them for those who do not know them; so that as the *preceding day* is teacher for the *subsequent*, thus you needed to learn from those who *preceded* you in order to teach to those who come *after*. The **Latins** took from the **Greeks**, as **Cicero**^[701] from **Plato**^[702] & **Vergil**^[703] from **Homer**.^[704] **Aulus Gellius**,^[49] **Valerius Maximus**^[60] only made a collection from various **AUTHORS** who had already written. **Livy**^[705] made his xxiii book^[229] from the 2nd or 3rd of **Polybius**.^[706] **Serapis**^[707] was deemed the **INVENTOR** of agriculture among the **Egyptians** & nevertheless, so was **Ceres**^[708] among the **Sicilians**. **Pythagoras**^[709] & others from **Tyana** learned by their travels the disciplines of which they called themselves **INVENTORS** in their country, &c. Will one not say the **WEAVER** has made a cloth or precious stuff, even though he did not dye & twist *& præ*, wind & prepare the

bobbins and balls of thread? Will one say the **MASON** has not made a **house**, but only piled up ready-made stones? **Apollo**^[710] a **Chirone**^[711] **MEDICARI** didicit & tamen deus medicinæ habitus.^[712] **Homerus Orphei**^[713] poema imitatus est, nam cum **Orpheus** sic prius exorsus esset: Iram cane, **dea** **dea**, **Cereris** frugiferentis, ita reddit **Homerus**: Iram cane, **dea**, **Pelidae**^[714] **Achillis**.^[715] In **Justino martire**,^[716] circa principium.^[717]

Greek examples, there can be added a psalm of **David**^[718] of which **St. Athanasius**^[719] makes mention *en in Sinopsi*.^[720] It begins *Parvus eram*^[721] & in the second versicle the royal prophet says, *Manus meae Manus meae fecerunt organum et digitæ mei aptarunt psalterium.*^[722]

chestnuts

[723] leave them in a **humid place** or the **gutter** of some roof.

Scented candle from Le Mans

wax & candle they melt **rosin** that in **France** is called of **Burgundy**, which is white & not as brittle & dry as the other **rosin**. They also perfume the tip and the wick.

[152] gold

caput mortuum^[724] in **distilled vinegar**, filter & congeal in **salt**, & cement ◎ with this, and it softens it marvellously.

gold

aquafortis of vitriol on **hot ashes**. Cover the bottle, that is to say, the mouth, with a tile, then unstop it & thick fumes will come out; put the **gold** on this and it will take on a high color.

Petards^[121]

[Figure: *fig_p167r_1*]

Petards are made of the best alloy of *metal* & *fine rosette* that one can, in order that they do not burst, namely one part of *metal* & two of *fine rosette* or *old cauldron*, which is even better. Some are of fifteen or seventeen 1b & *eh* are loaded with two & a half 1b of *good grain powder*, & they are for applying on windows & common doors. Others are of the weight of 25 to 27 1b and are loaded with 4 1b of *powder*. Others weigh 45 1b & are loaded with eight 1b of *powder*. And thus they are formed according to the effort they have to make. On the outside, they are *e*^[488] of a regular shape, but on the inside, they are made like a *crucible*,

[Figure: fig_p167r_2]

narrower on the inside of the breech & becoming wider toward the mouth. And this is to give force to the breech, because of the quantity of *powder* they hold, & so that they do not burst. ~~At the breech one gives them~~ Those of 45 1b have a thickness of eight lines at the breech & become thinner on the inside toward the muzzle, which is of 4 lines. They are xii *thumbs breadth* long & seven in diameter at the muzzle & opening.

lb or thereabouts are ix inches long & six in diameter at the muzzle. At the breech, they are vi lines thick, & 3 at the muzzle. The ones weighing 17 1b are 8 inches long & five at the muzzle. One covers them all together, all the forks & pegs & tools which one uses, with a thick canvas or thick cloth in order that they do not make any noise. It *s* is good that they should sit loaded for some time. After one has put the *powder* in, one tamps it down quite thoroughly, and then one puts in *pressed paper*, then a *cake of wax* well tamped down, & on the *wax* another *plate of cork* that goes in quite precisely & with force. In this way, the *powder* remains well sealed & gives much greater violence, & if you wish, you can put on the *plate of cork* one of *wood* pierced in the middle, if the *petard*^[121] is pierced at the breech, which one holds to be the easiest, & which makes for greater penetration because it cannot recoil. And for those that have a pierced breech, one must have a good *gimlet* to first make the hole in order that the *peg*, which is made *in* with a *gimlet-like point*, may attach the *petard* faster & without noise. And *to* for these, one must cover the button, which is quite evenly filed, *p* with *waxed canvas*, or add *wax* to it in order that it precisely plugs the hole of the breech. But because the doors are sometimes iron-clad & the *iron* pegs cannot pierce it, one uses an *iron* fork made like pincers & another *iron* rod *q* made with three claws at the end, as you see depicted. And in this way, the *petard* holds itself well & is quickly placed. The *iron* pegs must extend from the *petard* with the entire point that is made like a *gimlet*, namely by three or 4 *fingers*, which goes entirely *l*^[166] into the door. When the *petards* are placed, one fills the touch-hole with

good *pulverin*^[726] and *s* one puts in it a *feather quill* filled with *powder* tightly pressed & moistened with *vinegar*, or, if needed, one *presses* the *powder* in the hollow of the hand & having wetted it with *saliva*, one makes from it something like a cocoon or

[Figure: fig_p168r_1]

peg which one puts into the touch-hole, & then, with a rope wrapped around the end of a stick, one gives fire & promptly retreats to take cover. The small *petards*^[121] of 16 or 17 1b are attached promptly with a short hooked peg made like a wimble,^[185] & if the *petard* is of a good alloy, one can give fire by *hand* just as one does with *petards* of 27 1b, but then one only puts in three 1b of *powder*. It must certainly be a strong door if the seventeen 1b *petard* does not blow it up. Some use little bells worn by *oxen* or *mules* on a *PEASANT* door. Others load two *pistol* barrels &, with a gimlet & a string, attach them with the muzzle against the door. If the *petards* are good & do not explode, they only recoil and cannot do harm if one is next to them.

small peg, hooked like the hinge of a door & made like a *gimlet*^[367] on one end, for quickly attaching a small *petard* with ear^[727] of fifteen or xvii 1b for a common door or window.

petard with ears.

gro common *petard* of 27 or 30 1b pierced at the breech, through which a large *iron* peg passes, button-like on one end & made like a *gimlet* at the point, for quickly attaching the *petard* against a door that ~~does not have~~ is not covered with *iron plates*.

plates of wax, cork & wood for loading the *petard* & sealing the *powder* well.

This *Iron* fork made in the form of pincers of the height of a man, to quickly place the mortar without a peg. It must be of *soft iron* in order that its branches bend easily, if need be, to fit to the height or width of the door.

iron fork of the same height that props up the fork made like pincers & also supports the *petard*, and with its claw at the bottom prevents the pincers from recoiling.

Petard^[121] with ear,^[727] placed with its peg.

Knife-like saws to cut a portcullis, if needed.

large *iron* pegs which traverse & attach the *petard*.

common iron pegs, very round & covered with canvas, like all the rest, to turn the large iron pegs pierced close to the head.

Axes that one must always carry to finish breaking down, if by chance the petard has left anything whole.

large mallet of wood for knocking down what was begun & weakened by the saws or *gimlets*.
[367]

large augers & *gimlets* of WHEELWRIGHTS for smoothly cutting a door or window by making large holes close to one another.

Crutches of the height of a man, which it is necessary to carry to quickly put under a portcullis after the petard has gone off & to prevent the portcullis from falling.

small iron pincers for putting some petard low on the straight part of the bolt or *strap hinge* of the door.

List of processes

Very hard wax

Molding a *pring p*^[394] and that which is engraved

Molding pieces of carcanets

Things that are not released

Fountains

Grottos

Diverse mosses applied

Molding in three frames

Softening iron to engrave it

Engraving^[103] with aquafortis on silver

and copper

Stamping

White enamel, making it tender

with calcined black river

pebbles

Margin Notes:

[LEFT-MIDDLE]

Molding turtles

Furry animals

Birds

Leaf of a vine - put

Of strawberries

Molding diverse pieces

Molding a vessel in a frame

Molding *capilli veneris* [222]

& plants that need

threads for their support

Molding a bouquet

Rose carnations

Molding hollow

Hollow gilded silver

Molding crab - put

+ Crayfish put and seen

Grasshoppers

Barbels

Butterflies

Flies

Bats

Enameling very thin gold

Molding in sugar

Molding fish

Casting in sulfur - put

Carton

+ P Wax put

Modeling

Stamped medals full of lead

Molding large pieces carved in wood

Molding and making hollow forms of animals from metal

+ Wheat oil put and seen

Stag beetle

Foot of a bittern molded

Thickness of a medal

bimbalotiers do

paper & *carton*, for neither earth, sand, nor metal would mold as neatly & would not receive. Or else they engrave in stone from Istre^[728] the principal side, & the reverse is of paper or *carton*.

plaster, as said before, & in the **plaster** cast in **wax**, from which will come out a relief that you will repair very neatly, and *b*^[729] model it as you fancy. And then you will model this relief of **wax** again in **plaster**, or better yet, with your **wetted sand** #^[134] like for **noyau**, & in the latter, cast in some **lead**, & from this you will have a very neat relief, & if it is not, repair on the cement or otherwise, & take heed that it is always of good release. And this one will always serve you well for making as many hollow forms as you please, in this way. Place half of your figure of **lead, oiled** & wetted with **eau-de-vie** according to the above, in the **clay** slab, then mold this half with some **white plaster**. Having set Next and having well smoothed & flattened the **plaster**, take your **black wax mixed with sulfur**, as is said, because it leaves nothing in the mold & melts quicker. Wet it in **warm urine**, & once softened enough, make an imprint with it on the half of the **lead** figure, and *it* you will have a very neat hollow form. Shape next the hollow **wax** form in a square shape, as you please, with sufficient thickness & smooth it well on all sides, & thus next, mold this hollowed **wax**, imprinted on one part & flat & smooth on the other, in the same fashion that you mold flat medals of **wax** or **other metal en noyau**. And the mold **en noyau** will render in **silver** or such **metal** as pleases you ~~the m~~ a similar figure to the **wax**, that is to say flat & smooth on one side & hollow on the other. And having cleaned & put this hollow form to be whitened, if it is **silver**, you will be able to mix there some works of **sugar**,

[Figure: fig_p169v_3]

Margin Notes:

[LEFT-MIDDLE] #^[135]

having made a hole in your **clay** slab & having **en** packed in it half of the figure of **wax**, a little **oiled**, to pull it out better.

[LEFT-MIDDLE] **Transparent wax** is not good, but rather the one which has body, to make an imprint well.

[LEFT-MIDDLE] As you have molded with **plaster** & **wax** one half, you can mold the other the same.

perfume & suchlike. But take heed that it is necessary that the **black wax** with which you mold be hard, in order that, quickly & ~~du~~ more dryly, it retracts, in order to see if it is well imprinted. It is rendered harder by adding into the already melted one more **melted sulfur** & a little **rosin**.

Margin Notes:

[LEFT-BOTTOM]

[Figure: fig_p17or_1]

[730] & join & **solder** a tail of **latten wire** with **solder**. The lumps on a flower are a small matter, for this can be removed with the **chaple**, but let the leaves come out well, then the **paint** covers everything.

relief puncheons of untempered steel, [731] then one tempers them, & with these one strikes on matrices, not reddened in fire, as some think, but on steeled iron, reheated & softened, [152] which one quenches afterward.

metal is regurgitated, & in & the metal gets cold before it goes down. But cast bit by bit & taking your time.

Clamps

mold does not shift.

Molds

noyau, in being reheated, want to be set on charcoals a little spent, without the air touching them, like the frame molds want to be *reeu* dried in the open & uncovered.

tin

lead or red tin like thin & delicate things. It is enough if it is *f* well melted & hot. Thin things want to be quite hot & of red tin.

molds

ash. When cold, they are cleaned better. Take a thin wire of latten or a delicate straw to clean the tail completely, for this is what makes the gate. Blow into it & suck, drawing it to you. Before molding, thicken the tail with wax, then cut it,

[Figure: fig_p17or_2]

Original first page (1578–1579)

[733] In the *year* fifteen hundred seventy-eight, the second of *July*, the heirs of the *e*^[156] late **Sieur Ouvryer**^[734] received ~~two hundred and five~~ *éous* the rent of **Saint-Frajou**,^[735] amounting to twelve hundred and thirty *livres*.

year fifteen hundred seventy nine, ~~two~~ three hundred forty three and one third *écus* *en qu.*

livres and fifteen

[Figure: fig_p17ov_2]

[736] remain to them, and for the second settlement, they have not yet received anything.

Against plague

against pestilential fever or *poison* or *plague*, an *écu*'s weight of your *opiate* soaked in *scabious*^[737] or *bugloss* *water* or *thoroughly tempered wine*, if one is afflicted. After taking it, one needs to make oneself sweat.

Margin Notes:

[LEFT-MIDDLE] **Othonis episcopi**
Frisigensis^[738]
ab orbe condito^[739]

For preserving

Acetum paratum ex *ruta baccis juniperi* simul *tusis*. Eo *aceto* extinguantur lateres igniti et vapor excipiatur *ore* & *naribus*.^[740] This is to preserve oneself when one goes into infected air.^[741] a garment can be thus perfumed & removing its infection, the room, house, &c. If you

find yourself in a place where you do not have this preparation, carry **rue** & **seeds**^[742] pestled together, then, according to your need, boil them in **vinegar** and use as above.

Margin Notes:

[LEFT-MIDDLE] ***Abbatis***

Urspergensis^[743]

Chronicon^[744]

[LEFT-MIDDLE] ***Hyeronimus***

Mercurialis,^[745]

Variarum^[746]

List of books

[747] *Rerum scoticarum historia*,^[748] **Georgio Bucanano**^[749] authore

Rembertus Dodonæus, *Mechliniensis MEDICUS*,^[750]

De stirpium historia^[751]

Des Ormes,^[752] *De l'invention de bien bastir*, and other works^[753]

Tilesius,^[754] *De coloribus, Vascosan*^[755]

Marmodæus,^[756] *ge De lapillis præciosis*^[757]

Albertus Magnus,^[758] *De mineralibus*^[759]

Endnotes

[1] c_001r_01

Nicolas Costé (also Cousté): armorer and son of Sens painter Nicolas Cousté, and possibly the grandson of Jacques Cousté, a "master painter and bourgeois of Paris" taught by his celebrated brother-in-law, Jean Cousin the Elder. Nicolas the armorer was recorded in 1587 as a journeyman in the workshop of Jean Dauusonne (also a family relation of the Cousin family). See Debuiche and Muñoz, "Le Ms. Fr. 640 et le contexte toulousain," https://edition640.makingandknowing.org/#/essays/ann_312_ie_19.

◀

[2] c_001r_02

Street in Paris near the Rue des Écrivains, mentioned below.

◀

[3] c_001r_03

Jean Cousin the Younger (ca. 1522–ca. 1594): painter and author of *Livre de pourtraicture*, an illustrated handbook on bodily proportion, perspective, and anatomy. He worked together with painter Nicolas Cousté (father of Nicolas Cousté the armorer, mentioned above) on the decorations for the entry of Charles IX into Sens in 1563. See Debuiche and Muñoz, "Le Ms. Fr. 640 et le contexte toulousain," https://edition640.makingandknowing.org/#/essays/ann_312_ie_19.

◀

[4] c_001r_76

A historic district of Paris located in what is today the 7th Arrondissement.

◀

[5] c_001r_80

Jehan Garnier (d. before 1588): currier working in Paris. See Debuiche and Muñoz, "Le Ms. Fr. 640 et le contexte toulousain," https://edition640.makingandknowing.org/#/essays/ann_312_ie_19.

◀

[6] c_001r_77

Rue des Écrivains, a former street in Paris, ran alongside the former Church of Saint-Jacques-de-la-Boucherie. Of the latter, only the tower (*Tour Saint-Jacques*) remains, located in what is today the 4th Arrondissement.

«

[7] c_001r_04

This aphorism recurs, slightly rephrased, on fol. 166r in the entry *Pour la boutique* (For the workshop).

«

[8] c_001r_05

A series of female deities in Graeco-Roman and Egyptian antiquity associated with agriculture, including Demeter/Ceres, Persephone/Proserpina, and Isis.

«

[9] c_001r_07

Latin: "It is a sin to reveal the mysteries of the goddess of Eleusis." See also fol. 166r for an expanded French paraphrase in the entry *Pour la boutique* (For the workshop). Cf. Cornelius Agrippa von Nettesheim, *De Occulta Philosophia* (Cologne: J. Soter, 1533), 213 as a potential source: "*Numenius etiam quidam, occultorum curiosior, offensam numinum contraxit, quod Eleusinae deae sacra interpretando evulgavisset.*"

«

[10] c_001r_08

Claude Guichard, *Funérailles et Diverses Manières d'ensevelir Des Romains, Grecs, et Autres Nations* (Lyon: Jean de Tournes, 1581). See p. 48–52 for a detailed discussion of trumpets in ancient funerals. Guichard also mentions many of the authors listed below.

«

[11] c_001r_09

Wolfgang Laz (1514–1565): Austrian physician and humanist.

«

[12] c_001r_10

Petrus Apianus, also known as Peter Apian (1495–1552): German mathematician at the University of Ingolstadt and tutor to Charles V.

«

[13] c_001r_11

Most likely an abbreviation of *Commentaria Urbis Romae*, which is not a work by Petrus Apianus. The closest known title is *Commentariorum Urbanorum Raphaelis Volaterrani*, a

widely known encyclopedia by Raffaello Maffei (1455–1522). See Raffaele Maffaei, *Commentariorum Urbanorum Octo et Triginta Libri* (Basel: Johannes Frobenius, 1559). NB: Several recipes on fol. 46v are referenced with "Urb.," though they do not appear in Maffei's volume.

«

[14] c_001r_12

Girolamo Ruscelli (ca. 1518–1566): humanist and prolific writer on a variety of subjects. He is thought to have published under the pseudonym Alessio Piemontese one of the most reprinted books of secrets, and a reference in the genre: Girolamo Ruscelli, *Secreti Del Reverendo Donno Alessio Piemontese* (Venice: Sigismondo Bordogna, 1555), translated in French as *Les Secrets de Reverend Signeur Alexis Piémontois Contemans Excellens Remèdes Contre Plusieurs Maladies Vec La Manière de Faire Distillation Tr. De L'italien En François* (Anvers: Christophe Plantin, 1557).

«

[15] c_001r_13

Ermolao Barbaro (1454–1493): prolific Venetian humanist, renowned for his edition of Pliny's Natural History, Ermolao Barbaro, *Castigationes Plinianae et Pomponii Melae* (Rome: Eucharius Silber, 1493). See also Iunior Barbaro Hermolao and Hieronymus Wildenberg, *Naturalis Scientiae Totius Compendium : Ex Aristotele, & Alijs Philosophis* (Basel: Oporinus, 1548).

«

[16] c_001r_35

Pietro Angelo Bargeo (1517–1596): Tuscan poet and humanist.

«

[17] c_001r_14

Bargeo wrote two poems on hunting: Pietro Angelo Bargeo, *Petri Angelii|... Cynegetica. Item Carminum Libri Ii, Eglogae Iii* (Lyon: haeredes S. Gryphii, 1561) and *De Aucupio Liber Primus* (Florence: Giunti, 1566). Here it is likely that the Latin venatione refers to *De cynegetica*, a poem on hunting with dogs. Another possibility is that the *De aucupium*, a short unfinished poem on catching birds, was bound with other texts about hunting entitled *De venatione*.

«

[18] c_001r_15

Nicolaus of Damascus (1st c. BCE): Jewish historian and philosopher. *Nicolaus Damascenus* and *Johannes Stobaeus*, *Ex nicolai damasceni universali historia sev de moribus gentium libris excerpta iohannis stobaei*, ed. *Nicolaus Cragius* (Geneva: Santandreas, 1593).

«

[19] c_001r_34

Sic. Correct author is Procopius Caesariensis (ca. 500–ca. 570): Byzantine historian.

»

[20] c_001r_16

Procopius Caesariensis, De Rebus Gothorum, Persarum Ac Vandalorum Libri VII (Basel: Johannes Hervagius, 1531).

«

[21] c_001r_17

Isidore of Seville (ca. 560–636): Archbishop of Seville and scholar.

»

[22] c_001r_18

*Sic. Correct author is likely Paulus Orosius (ca. 375–ca. 418): theologian and historian. He is cited here presumably for Paulus Orosius, Historiae Adversus Paganos (Augsburg: Johannes Schüssler, 1471), published in many editions, mainly under the title *Adversus paganos historiarum libri septem*. Context makes this misspelling more plausible than a reference to the Portuguese theologian and historian Jerónimo Osório (1506–1580), whose *Histoire de Portugal* was printed in Paris and Geneva in 1581.*

«

[23] c_001r_19

Eupolemus (2nd c. BCE): Greek Jewish historian.

»

[24] c_001r_20

Latin: "a pagan historian who wrote the history of David and Solomon." This is likely quoted from Andreas Masius, Josuae Imperatoris Historia Illustrata Atq. Explicata Ab Andrea Masio (Antwerp: Christophorus Plantinus, 1574), the index of which (p. 635) indicates that Eupolemus scripsit acta Davidis & Salomonis.

«

[25] c_001r_69

A common type of essai de plume (pen trial) with no specific meaning.

»

[26] c_001r_21

Gilles Corrozet, Le Catalogue Des Villes et Citez Assises Es Troys Gaulles, Avecq Ung Traicté Des Fleuves et Fontaines, Illustré de Nouvelles Figures (Paris: Denis Janot, 1538).

«

[27] c_001r_22

The illustrated calendar, Kompost et Kalendrier Des Bergiers (Paris: Guy Marchant, 1491).

»

[28] c_001r_23

Jean-Pierre de Mesmes, La Grammaire Italienne, Composée En Françoy (Paris: Gilles Corrozet; Étienne Groulleau, 1548).

«

[29] c_001r_24

Pierre de Savonne, Nouvelle Instruction d'Arithmétique Abrégée Propre à Tous Les Marchands et Banquiers (Paris: Nicolas du Chemin, 1563).

»

[30] c_001r_65

Pierre de Savonne, also known as Pierre de Talon (d. before 1592): French arithmetician living in Toulouse, best known for published works on bookkeeping.

«

[31] c_001r_25

Philibert Boyer, Instruction Pour Le Faict Des Finances (Paris: Ambroise Drouart; Guillaume Le Noir, 1581).

»

[32] c_001r_26

Antoine Du Verdier, Questions Enigmatiques, Recreatives et Propres Pour Deviner et Y Passer Le Temps Aux Veillees Des Longues Nuicts, Avec Les Responses Subtiles, et Autres Propos Joyeux (Lyon: Benoît Rigaud, 1568).

«

[33] c_001r_27

*Latin and French editions of this text exist. The author-practitioner likely refers to the Latin edition, as the 1550 French translations from Paris and Lyon have *enseignemens* and not *praeceptes* in their title. Cassianus Bassus, Constantini Caesaris Selectarum Praeceptionum, de Agricultura Libri Viginti, Iano Cornario Medico Physico Interprete (Basel: Hyeronimus Frobenius, 1538).*

»

[34] c_001r_28

Nicolas Froumenteau, Le Secret Des Finances de France (n.p., 1581).

«

[35] c_001r_29

Synesius of Cyrene (ca. 370–ca. 413): bishop of Cyrene. Many of his writings circulate in print from 1497 onwards.

»

[36] c_001r_30

Olaus Magnus, also known as Olof Måansson (1490–1557): Swedish ecclesiastic and author of *Magnus Olaus, Historiae de Gentibus Septentrionalibus Libri Xxii* (Antwerp: Jean Bellère, 1552).

«

[37] c_001r_31

Bernard Palissy (ca. 1510–ca. 1590): French Huguenot potter and craftsman, widely known for his lifecast rusticware and his writings on artistic practice and theory. *Bernard Palissy, Recepte Veritable Par Laquelle Tous Les Hommes de La France Pourront Apprendre a Multiplier et Augmenter Leurs Thresors* (La Rochelle: Barthélémy Berton, 1564); *Discours Admirables de La Nature Des Eaux et Fontaines, Tant Naturelles Qu'artificielles, Des Métaux, Des Sels et Salines, Des Pierres, Des Terres, Du Feu et Des émaux* (Paris: Martin le jeune, 1580).

«

[38] c_001r_32

This is how Palissy is usually referred to (with a minor variant: ...royne sa mere) on the title page of *Bernard Palissy, Discours Admirables de La Nature Des Eaux et Fontaines, Tant Naturelles Qu'artificielles, Des Métaux, Des Sels et Salines, Des Pierres, Des Terres, Du Feu et Des émaux* (Paris: Martin le jeune, 1580). The queen mother refers here to Catherine de' Medici.

«

[39] c_001r_40

Alexander of Aphrodisias (2nd c. CE): peripatetic philosopher renowned for his moral Problemata, which are printed as early as 1488 in an edition of Giorgio Valla. See *Alexander Aphrodisiensis, Problemata* (Venice: Antonius de Strata, n.d.). Subsequent editions, including a Latin translation by Angelo Poliziano, proliferate throughout the 16th century in eponymous books, Aristotelian compilations, commentaries, but also as additions to the editions of Theophrastus, Plutarch, and Averroes.

«

[40] c_001r_41

Polydorus Vergilius, also known as *Polydore Vergil* (1477–1555): Italian humanist and historian. Presumably mentioned here for his most popular work, *Polydorus Vergilius, De Inventoribus Rerum* (Venice: Christophorus de Pensis, 1499). This work was re-edited multiple times throughout the sixteenth century. He also composed dialogues, a compilation of proverbs, and a history of England, *Anglicae Historiae Libri Vigintisex* (Basel: Isengrin, Michael, 1546).

«

[41] c_001r_42

Appianus of Alexandria (ca. 95–ca. 165 CE): Greek historian based in Rome under the reigns of Hadrian, Marcus Aurelius, and Lucius Verus. He wrote several histories of Rome, some of which were printed in Venice as early as 1477; *Appianus Alexandrinus, Historia Romana* (Venice: Maler, Bernhard; Ratdolt, Erhard; Löslein, Peter, 1477). Sixteenth-century editions of his histories include translations into Spanish, Italian, English, and French.

«

[42] c_001r_43

Athenaeus of Naucratis (2nd c.–3rd c. CE): Greek erudite who lived in Egypt and known for his *Deipnosophistae*, an example of symposium literature in which famous characters discuss Greek literature and antiquities. The book was first released in Greek by the Aldine press: *Athenaeus Naucratites, Deipnosophistou Ten Polumathestaten Pragmateian Nun Exesti Soi Es Gnosis Elthein* (Venice: Manuzio, Aldo; Torresano, Andrea, 1514). The Latin edition followed forty years later: *Dipnosophistarum Sive Coenae Sapientum Libri Xv*, ed. Natale Conti (Venice: Andrea Arrivabene, 1556).

«

[43] c_001r_33

Pausanias (ca. 110–ca. 180 CE): Greek traveler and geographer who lived under the reigns of Hadrian, Antoninus Pius, and Marcus Aurelius. *Pausanias, Veteris Graeciae Descriptio. Romulus Amasaeus Vertit.* (Florence: Torrentino, Lorenzo, 1551); *Paysaniu Tes Hellados Periegesis. Hoc Est, Pausaniae Accurata Graeciae Descriptio* (Frankfurt: Claude de Marne; Johann Aubry; Andreas Wechel, 1583).

«

[44] c_001r_36

Publius Papinius Statius (ca. 45–ca. 96 CE): Latin poet known for his epic, the *Thebaid*, and for his collection of occasional poetry, the *Silvae*.

«

[45] c_001r_44

The epic poem Thebaid was often published in compilations of Statius's poetry. See, for instance, Publius Papinius Statius, Opera (Venice: Zanis, Bartholomaeus de, 1494); Sylvarum Libri V Achilleidos Libri Xii Thebaidos Libri Ii Orthographia et Flexus Dictionum Graecarum Omnium Apud Statium Cum Accentib. Et Generib. Ex Variis Utriusque Linguae Authoribus (Venice: Aldo I Manuzio; Andrea I Torresano, 1519); Sylvarum Libri V, Thebaidos Libri Xii, Achilleidos Libri Ii (Lyon: Gryphe, Sébastien, 1547).

«

[46] c_001r_45

Maurus Servius Honoratus (4th c.–5th c. CE): Latin grammarian. His name is inseparable from that of Vergil, as early modern editions of the Latin poet rarely come without his commentaries. Regarded as an authority in Latin grammar, rhetoric, and prosody, many books on these topics have been attributed to him.

«

[47] c_001r_37

Publius Vergilius Maro, Vergilius cum commentariis et figuris P. Vergilii Maronis, Bucolica, Georgica, Aeneis cum Servii commentariis accuratissime emendatis in quibus multa quae adhuc deerant sunt adiecta et Graecae dictiones ac verius ubique restituti (Venice: Gregorio de Gregori; Lucantonio Giunta, 1522).

«

[48] c_001r_46

Ambrosius Macrobius Theodosius (4th c.–5th c. CE): Latin grammarian and philosopher. His Commentarii in somnium Scipionis enjoyed a wide diffusion in the middle ages, and was subsequently printed in numerous editions. His Saturnalia, a compendium of ancient Roman religion and antiquarian lore, became a major reference for Renaissance antiquarians. From 1475 to 1600, more than 45 editions of his' works were printed.

«

[49] c_166r_18

Aulus Gellius (ca. 125–ca. 180 CE): Latin writer and grammarian based in Rome. See Aulus Gellius, Noctes Atticae (Paris: Henri Estienne, 1585).

«

[50] c_001r_81

Alexander ab Alexandria, also known as Alessandro Alessandri (1461–1523): lawyer and humanist from Naples. Alessandro Alessandri, Genialium Dierum Libri Sex, Varia Ac Recondita Eruditione Referti, Accuratius et Majore Fide Quam Antehac Usquam Impressi Cum Duplici Indice (Paris: Jean de Roigny, 1549).

«

[51] c_001r_47

Sextus Pompeius Festus (late 2nd c. CE): Latin grammarian who produced an abridgment of *Marcus Verrius Flaccus' De significatu verborum* in 20 volumes. *Sextus Pompeius Festus and Marcus Verrius Flaccus, Quae Extant. Et Sex. Pompei Festi de Verborum Significatione, Libri Xx. In Eundem Festum Annotationes. Index Rerum Obiter Dictarum. Ex Bibliotheca Antonii Augustini* (Venice: Giovanni Maria Bonelli; Giordano Ziletti, 1560).

«

[52] c_001r_48

Nonius Marcellus (4th or 5th c. CE): Latin grammarian. His sole extant work is the *De compendiosa doctrina*, a vocabulary comparable to that of Festus which contains valuable information about Roman antiquities. *Nonius Marcellus, De Proprietate Sermonum: Jam Demum Innumeris Locis Restitutus, Multis Locupletatus, Ope Vetustissimorum Codicum, & Industria. Additus Est in Calce Libellus de Prisco Sermone Repurgatus: Index Vocabulorum* (Antwerp: Christophe Plantin, 1565).

«

[53] c_001r_78

Girolamo Maggi (ca. 1523–1572): Tuscan lawyer, engineer, and poet. He wrote books on a wide variety of topics, including military engineering, jurisprudence, and philosophy.

«

[54] c_001r_49

Girolamo Maggi, Variarum Lectionum, Seu Miscellanorum Libri Iiii. In Quibus Multa Auctorum Loca Emendantur, Atque Explicantur, & Quae Ad Antiquitatem Cognoscendam Pertinent, Non Pauca Afferuntur (Venice: Ziletti, Giordano, 1564), of particular interest for its numerous references to Roman antiquities.

«

[55] c_001r_79

Julius Pollux (180–238 CE): Greek orator, grammarian, and lexicographer whose sole surviving book is the *Onomasticon*.

«

[56] c_001r_50

The *Onomasticon* is one of the oldest specimens of ancient encyclopaedism. It contains abundant information about Greek antiquities. Most sixteenth-century editions are in Greek, such as *Iulius Pollux, Onomasticon. Iulii Pollucis Vocabularium* (Venice: Aldo Manuzio, 1502) and *Iulius Pollux, Vocabularium* (Florence: Bernardo Giunta, 1520). A Latin translation was eventually produced in Basel: *Iulius Pollux, Onomasticon* (Basel: Robert Winter, 1541).

[57] c_001r_51

Gaius Julius Hyginus (ca. 64 BCE–17 CE): Latin author. He is thought to have written the *Genealogiae*, a handbook of mythology, the abbreviated version of which was published in 1535 under the title *Fabulae*. Hyginus is also thought to have composed the *Poeticon Astronomicon*, a manual of astronomy based on Greek sources. *Gaius Julius Hyginus, Fabularum Liber Eiusdem Poeticon Astronomicon, Libri Quatuor* (Basel: Johannes Herwagen, 1535).

[58] c_001r_52

Berosus (active early 3rd c. BCE): Babylonian scholar and priest. He wrote the *Babylonica*, a Babylonian history of which only a few fragments remain. The author-practitioner most likely refers to a well-known forgery from Annus (Giovanni Nanni) of Viterbo, *I cinque libri de le antichita* (Venice: Baldassare Constantini, 1550).

[59] c_001r_68

Gaius Suetonius Tranquillus (ca. 69–after 122 CE): Roman historian best known for his *De vita Caesarum*, biographies of twelve Roman rulers, from Julius Caesar to Domitian.

[60] c_166r_19

Valerius Maximus (1st c. CE): Latin writer and historian. See *Valerius Maximus, Facta et Dicta Memorabilia*, ed. Oliviero d'Arzignano (Venice: Cereto, Guglielmus de, 1491).

[61] c_001r_66

Publius (or Gaius) Cornelius Tacitus (ca. 56–ca. 120 CE): Roman senator, orator, and historian best known for his *Annals* and *Histories*, which chronicle the Roman empire from the death of Augustus to the death of Domitian.

[62] c_001r_72

Xenophon of Athens (ca. 431–354 BCE): Greek philosopher, soldier, and historian.

[63] c_001r_73

Lucius Annaeus Seneca, also known as *Seneca the Younger* (ca. 4 BCE–65 CE): Roman dramatist, Stoic philosopher and son of the Roman rhetorician and historian *Lucius (or Marcus) Annaeus Seneca*, also known as *Seneca the Elder* (54 BCE–ca. 39 CE). Though

Seneca the Younger's works survive in greater numbers and were widely published in the sixteenth century, it is uncertain which Seneca is meant here.

«

[64] c_001r_53

Dionysos of Halicarnassus (ca. 60–after 7 BCE): Greek orator and historian based in Rome. While he wrote important treatises of rhetoric, he is best known for his history of Rome, Roman Antiquities. It was translated into Latin in 1480 and widely diffused thereafter in Greek, Latin, and Italian editions, including compilations. Dionysius Halicarnassensis, Antiquitates Romanae (Treviso: Bernardinus Celerius, 1480).

«

[65] c_001r_54

Marcus Antonius Coccius Sabellicus, also known as Marcantonio Coccio (1436–1506): Italian humanist and historian. His history of Venice is particularly renowned, not least for the elegance of his Latin prose, Marcus Antonius Sabellicus, Historiae Rerum Venetarum Ab Urbe Condita, Libri XXXIII. Eiusdem in Singulos Libros Epitomae. Additus in Fine Est Index Rerum Memorabilium Copiosus. (Basel: Episcopius, Nikolaus, 1556). Lodovico Dolce translated the work into Italian in 1544, Le Historie Vinitiane Divise in Tre Deche Con Tre Libri Della Quarta Deca, trans. Lodovico Dolce (Venice: Curzio Troiano Navò, 1544). Sabellicus also composed a number of poems, including one on the arts, De Rerum et Artium Inventoribus Poema (Vienna: Hieronymus Vietor, 1521).

«

[66] c_001r_67

Latin: "along with very many others." This note appears immediately to the left of the list, modifying "Iulius Capitollin{us}."

«

[67] c_001r_55

Julius Capitolinus (4th c. CE): one of the six Roman Scriptores, the presumed authors of the Historia Augusta, a collection of biographies of Roman emperors. Capitolinus reportedly wrote the lives of Antoninus, Marcus, Lucius Verus, Pertinax, Albinus, Macrinus, the Maximini, the Gordiani, and Maximus and Balbinus. Gaius Suetonius Tranquillus et al., Caius suetonius tranquillus: Vitae XII caesarum. Aelius spartianus: De vita hadriani; julius capitolinus, vulcatius gallicanus, aelius lampridius, trabellius pollio and flavius vopiscus: De regum ac imperatorum romanorum (Venice: Johannes Rubeus Vercellensis, 1490).

«

[68] c_001r_56

*Guilielmus Budaeus, also known as Guillaume Budé (1467–1540): French humanist and diplomat particularly known for his expertise in Greek and jurisprudence. See Guillaume Budé, *Commentarii linguae graecae*. Accurate recogniti, atque amplius tertia parte aucti* (Paris: Robert Estienne, 1548); *Epistolai hellēnikai. Epistolae graecae*, ed. Guillaume Plançon, trans. Antonius Pichonius (Paris: Jean Bienné, 1574); *Annotationes in xxiiii pandectarum libros* (Lyon: Sébastien Gryphe, 1551). The author-practitioner may also have been interested in Budé's work on ancient measurements, indispensable for the study of antiquities: *Libri v de asse, et partib. Eius post duas parisienses impressiones ab eodem ipso budaeo castigati, idque authore io. Grolierio lugdunensi christianissimi gallorum copiarum quaestore, cui etiam ob nostram in eum observantiam a nobis illi dicantur* (Venice: Torresano, Andrea; Aldo Manuzio, 1522).

«

[69] c_001r_57

Aelius Spartianus (4th c. CE): one of the Scriptores historiae Augustae like Julius Capitolinus. He wrote the lives of Hadrian, Aelius, Didius Julianus, Severus, Niger, Caracalla, and Geta.

«

[70] c_001r_58

*Flavio Biondo (ca. 1392–1463): statesman and humanist from Forlì, who served the Papacy as a secretary and diplomat. He wrote several histories of Rome and Italy, such as *Roma instaurata*, *Italia illustra* and *Historiarum ab inclinatione Romanorum imperii decades*, and established himself as a major source for the study of antiquity. His manuscripts were subsequently published in many editions and compilations, including Flavio Biondo, *Italia Illustrata* (Rome: Johannes Philippus de Lignamine, 1474); *Roma Triumphans* (Brescia: Bartholomaeus Vercellensis, 1482); *Historiarum Ab Inclinatione Romanorum Imperii Decades* (Venice: Thomas de Blavis, 1484); *Roma Instaurata* (Turin, 1527).*

«

[71] c_001r_59

*Raphael Volaterranus, also known as Raffaello Maffei (1451–1522): humanist, historian, and theologian who lived between Rome and Volterra. Like Biondo and Sabellio, Maffei wrote influential histories of Rome and of Italy. Of particular interest is his major encyclopaedic work, the *Commentariorum rerum urbanorum*, which enjoyed a wide circulation in Europe. Raffaele Maffei, *Commentariorum Urbanorum Octo et Triginta Libri, Cum Duplici Eorumdem Indice Secundum Tomos Collecto* (Lyon: Sébastien Gryphe, 1552); *Commentariorum Urbanorum Octo et Triginta Libri* (Basel: Johannes Frobenius, 1559); *Commentariorum Urbanorum Raphaelis Volaterrani, Octo et Triginta Libri, Accuratius Quam Antehac Excusi, Praemissis Eorundem Indicibus Secundum Tomos Ut Ab Autore Conscripti Fuerunt: Quibus Accessit Novus, Res Ac Voces in Philologia Explicatas**

Demonstrans, Quo Superiores Editiones Carebant Hactenus. Item Oeconomicus Xenophontis, Ab Eodem Latio Donatus (Basel: Hieronymus Froben; Nikolaus Episcopius, 1559).

◀ [72] c_001r_71

Herodotus (ca. 484–ca. 425 BCE): Greek author whose work *Histories* is the foundational text for the Western genre and discipline of history.

◀ [73] c_001r_60

Paolo Manuzio (1512–1574), also known as *Paulus Manutius*: Venetian printer, son of the famous publisher and humanist *Aldo Manuzio*, and inheritor of the declining Aldine press. Most of the books he edited are about moral philosophy, literature, and rhetoric. In 1561 he moved to Rome to launch a new publishing house for the Papacy. While *Paolo Manuzio* is mostly remembered for his editorial activity, he also composed some works, including a book on antiquarianism and his own correspondences. *Paolo Manuzio, Lettere Volgari Di M. Paolo Manutio Divise in Quattro Libri* (Venice: Paolo, Manuzio, 1560); *Antiquitatum Romanarum Paulli Mannuccii Liber de Senatu* (Venice: Paolo Manuzio, 1581).

◀ [74] c_001r_74

Strabo (64/63 BCE–ca. 24 CE): Greek geographer and historian. *Strabo, Peri Geographias. Strabo de Situ Orbis* (Venice: Andrea Torresano; Aldo Manuzio, 1516).

◀ [75] c_001r_61

Julius Firmicus Maternus (4th c. CE): Latin writer and astrologer best known for his *Matheseos*, a treatise on astrology. *Julius Firmicus, Astronomicon Lib. VIII* (Basel: Johannes Herwagen, 1533).

◀ [76] c_001r_62

Quintus Curtius Rufus (1st c. CE): Latin historian, known for *Quintus Curtius Rufus, Historiae Alexandri Magni* (Venice: Johannes Tacuinus, 1496).

◀ [77] c_001r_63

Cassius Dio, also known as *Lucius Cassius Dio Cocceianus* (ca. 155–ca. 230): Greek historian based in Rome, known for his *Historiae Romanae*, the fragments of which, particularly the

histories of Nerva, Trajanus, and Hadrian, have been published in numerous editions and compilations.

«

[78] c_001r_75

Cornelius Nepos (ca. 110–ca. 25 BCE): Roman biographer.

«

[79] c_001r_64

Flavius Vopiscus (4th c. CE): one of the Scriptores historiae Augustae, like Julius Capitolinus and Aelius Spartianus, mentioned above. Vopiscus wrote the lives of Aurelian, Tacitus, Probus, Quadrigae Tyrannorum and Carus, and Carinus and Numerian.

«

[80] c_001r_70

This may have been the first line written on this page, following what is now the last page of the manuscript, fol. 170v. Thus the list of six titles on fol. 170v probably continues with this title.

«

[81] c_001r_06

Hippolito Salviani (1514–1572): Italian physician and natural historian.

«

[82] c_001r_38

Ippolito Salviani, Aquatilium Animalium Historiae Liber Primus: Cum Eorundem Formis, Aere Excusis (Rome: Salviani, Ippolito, 1554).

«

[83] c_001r_39

This may be a reference to Jean Nagerel, L'histoire et Cronique de Normandie (Rouen: Martin Le Mégissier, 1581). No printed history of Normandy bears the title Annales. However, a document titled Annales de Normandie appears among the sources of François de Belleforest, Les Grandes Annales, et Histoire Générale de France, de La Venue Des Francs En Gaule, Iusques Au Regne Du Roy Très-Chrétien Henry III (Paris: Gabriel Bon, 1579). The author-practitioner may have known of the manuscript source of Belleforest.

«

[84] c_002r_01

Sigebert de Gembloux (ca. 1028–1112): chronicler and monk. The chronique de Sigebert was popular not only in the Holy Roman Empire but also in France, with 35 manuscripts and the Paris editions of 1513, 1575, 1583, and 1608. See Sigebert de Gembloux, Chronicon Ab Anno

381 Ad 1113, Cum Insertionibus Ex Historia Galfridi et Additionibus Roberti, Abbatis Montis, Centum et Tres Sequentes Annos Complectentibus, Promovente Egregio Patre d. G. Parvo, |... Nunc Primum in Lucem Emissum (Paris: Henri Estienne; Jean Petit, 1513).

«

[85] c_002r_02

Tyrannius Rufinus Aquileiensis (ca. 345–ca. 411): translator of Greek patristic works. Eusebius Caesariensis, Historia Ecclesiastica, trans. Tyrannius Rufinus (Mantua: Schallus, Johannes, 1479).

«

[86] c_002r_03

Irenaeus (ca. 130–ca. 202): second bishop of Lyon. Irenaeus Lugdunensis and Nikolaus Episcopius, Opus in Quinque Libros Digestum, in Quibus Mire Retegit & Confutat Veterum Haereseon Impias Ac Por Tentosas Opiniones, Ex Vetustissimorum Codicum Collatione Quantum Licuit Emendatum Opera Des.erasmi Roterodami, Ac Nunc Eiusdem Opera Denuo Recognitum, Correctis Iis Quae Prius Suffugerant. Additus Est Index Rerum Scitu Dignarum, ed. Erasmus Roterodamus (Basel: Hieronymus Froben, 1534).

«

[87] c_002r_04

It is unclear what in exgesi refers to Exgesi may have been conflated with haeresis, possibly referencing Irenaeus Lugdunensis and Nikolaus Episcopius, Opus in Quinque Libros Digestum, in Quibus Mire Retegit & Confutat Veterum Haereseon Impias Ac Por Tentosas Opiniones, Ex Vetustissimorum Codicum Collatione Quantum Licuit Emendatum Opera Des.erasmi Roterodami, Ac Nunc Eiusdem Opera Denuo Recognitum, Correctis Iis Quae Prius Suffugerant. Additus Est Index Rerum Scitu Dignarum, ed. Erasmus Roterodamus (Basel: Hieronymus Froben, 1534), which is known to have been titled contra haereses in some editions.

«

[88] c_002r_05

Paolo Emili (1460–1529): Veronese historian and humanist based in Paris. Commissioned by King Louis XII of France to write a history of the French monarchy. See Paolo Emili, De Rebus Gestis Gallorum Libri Ix Ad Historiam Pauli Aemylii Additi, Perducta Historia Usque Ad Tempora Henrici II, Francorum Regis, trans. Arnoul Le Ferron (Paris: Michel de Vascosan, 1555).

«

[89] c_002r_06

Paolo Giovio, also known as Paulus Jovius (1483–1552): physician and humanist active at the court of the Medici in Florence and Rome. See Paolo Giovio, De Romanis Piscibus Libellus Ad Ludovicum Borbonium Cardinalem Amplissimum (Rome: Calvo, Francesco Minizio, 1524); Descriptio Britanniae, Scotiae, Hyberniae, et Orchadum, Ex Libro Pauli Iouii, Episcopi Nucer. De Imperiis, et Gentibus Cogniti Orbis, Cum Eius Operis Prohoemio (Venice: Michele Tramezzino, 1548); Elogia Virorum Bellica Virtute Illustrum Veris Imaginibus Supposita, Quae Apud Musaeum Spectantur. Volumen Digestum Est in Septem Libros (Florence: Lorenzo Torrentino, 1551).

«

[90] c_002r_08

Giacomo Filippo Foresti (1434–1520): Bergamasque monk and chronicler. Presumably mentioned for his historical work. See Jacopo Filippo Foresti, Supplementum Chronicarum (Venice: Bernardinus Rizus, 1493); Novissime Hystoriarum Omnium Repercussiones Noviter a Reverendissimo Patre Iacobophilippo Bergomense Ordinis Heremitarum Edite: Que Supplementum Supplementi Chronicarum Nuncupantur. Incipiendo Ab Exordio Mundi Usque in Annum Salutis Nostre Mccccii (Venice: Albertino da Lessona, 1503).

«

[91] c_002r_09

Philippe de Commynes (1447–1511): Franco-Burgundian diplomat, renowned for his memoirs, which served as a model of the genre. Philippe de Commynes, Cronicque et Histoyre (Paris: François Regnault; Pierre Gadoul, 1529).

«

[92] c_002v_03

First known edition Brescia, 1589. The book is exceedingly rare and earlier editions might have disappeared entirely. Prattica, Cioe, Nova Invenzione Di Conteggiare : Ridotta à Modo Tanto Facile, Che Ogn'uno Potrà Far Ogni Gran Conto, Si in Vender, Come in Comperare, Sia à Misura, ò a Peso, ò a Qual Si Voglia Altro Modo, Ad Ogni Sorte Di Precio, & Moneta, Per Tutte Le Parti Del Mondo : Serve Anchora a Commutar Scudi, & Ogni Altra Sorte Di Ori in Lire, in Grossi, in Soldi, E in Qual Altro Modo Si Vole, & Così Per Il Contrario : Serve Di Piu à Partir Ogni Sorte Di Cosa in Piu Parti, a Far Compartite Di Compagnie, et in Somma à Far Ogni Conto Che L'huomo, Si Possa Imaginare (Brescia: Vincenzo Sabbio, 1589).

«

[93] c_002v_01

Vincenzo Sabio (ca.1530s–1603?): Italian printer active mainly in Brescia.

«

[94] c_002v_07

The remaining two entries on this folio are in a super-cursive hand, likely the author-practitioner's own in speed-writing mode (hand A'. See also fol. 157v).

«

[95] c_002v_04

{christ}al (crystal) abbreviated in the manuscript as "xpal," from "XPS" for Christus

«

[96] c_002v_05

{crois}et (crucible) abbreviated as "+et"

«

[97] c_002v_06

number uncertain

«

[98] c_003r_02

In this period, counterfeit does not necessarily connote a deceptive practice of imitation. See Lores-Chavez, "Imitating Raw Nature," https://edition640.makingandknowing.org/#/essays/ann_045_fa_16.

«

[99] c_039v_02

Laque platte is likely dried lake pigment that is formed into a flat shape for storage and sale.

«

[100] c_003v_01

Latin: "Greek pitch"

«

[101] c_004v_01

See the entry beginning on fol. 94r, Fourbisseur (Furbisher).

«

[102] c_004v_03

This entry describes a method for blackening metal components of larger items (such as harnesses for armor or trunk bands) without disassembling them. Such items might include leather components, for instance, which risk being damaged by the blackening technique requiring heat described in the entry above.

«

[103] c_004v_02

Engraving here involves a process now known in English as "etching."

«

[104] c_084v_02

Similar "X" marks, which appear to be hastily drawn, occur on fol. 5r, 33r, 34r, 84v, and 85v. Their meaning, or any relationship between them, is unclear.

«

[105] c_005v_01

Ptolemy (ca. 100–ca. 170): Greek mathematician and geographer.

«

[106] c_005v_02

Archimedes (ca. 287–ca. 212 BCE): Greek mathematician and inventor.

«

[107] c_006r_01

Latin: "Armenian bole"

«

[108] c_006r_02

Laque ronde is likely dried lake pigment that is shaped into round beads for storage and sale.

«

[109] c_006v_01

Hesitation in spelling. Possible confusion with caches, or gages (as in Italian, gabbie).

«

[110] c_006v_03

The outcome of the process described in this entry is used as the starting point in the following entry, found on fol. 7r.

«

[111] c_007r_01

The process for creating the stampings is described in the previous entry, found on fol. 6r.

«

[112] c_007r_04

Possibly lead ore, or a variety of minium

«

[113] c_007r_05

See fol. 75v for a description of using the smoke of a burning partridge feather to improve the color of gilding.

«

[114] c_007r_02

Of the species Sorbus domestica

«

[115] c_007r_06

An imitation gemstone made from two pieces of crystal separated by a layer of color.

«

[116] c_007v_01

Pain is a defining characteristic of gout, and thus the identification of "G." with gout is more likely than with the gonorrhea discussed in the next entry. Cf. fol. 16v, where the heading of another medical recipe is abbreviated: Contre Go. (Against Go.).

«

[117] c_007v_02

In this period, gonorrhea was understood as an involuntary and pleasureless loss of semen, different from gonorrhea in the modern sense. Hence the catheter-like injection of a liquid medicine into the male urethra. Cf. fol. 16v, Contre Go. (Against Go.) for another possible remedy for gonorrhea.

«

[118] c_007v_03

*Latin: "Old smiths' water, i lb, Armenian bole reduced to the finest powder, i ȝ, common honey, iii ȝ, shall be boiled to clarify the honey. Once cooled, it shall be strained with great pressure & the filtrate shall be used by injection." NB: Aqua fabrorum, or "smiths' water," (i.e., water in which smiths have quenched hot metal) was an ingredient in surgical remedies. See Juhani Norri, *Dictionary of medical vocabulary in english, 1375-1550: Body parts, sicknesses, instruments, and medicinal preparations* (London: Routledge, 2016).*

«

[119] c_008r_02

It was common practice at this time for an armorer to test (or proof) armor by shooting a test shot at it with an arquebus or pistol.

«

[120] c_008r_03

Here, the verb tremper means to quench.

«

[121] c_008r_04

Here the word mortier (mortar) is used to denote a new explosive device which was known at the time as a "petard" in both French and English. The petard is considered to have been used for the first time at the siege of Cahors in 1580, and was widely used from 1588 during the wars of religion.

«

[122] c_008v_01

i.e., without the amalgamation and "calcining" step for gilding with gold. Silver can be dissolved "as is" with aqua fortis, whereas gold cannot.

«

[123] c_008v_02

According to Renaissance lexicographer Randle Cotgrave, grais/grès means either 1) a kind of stone used for paving and (in powder form) for polishing; or 2) a particular type of potters' clay or earth for making stoneware vessels as well as the stoneware vessels themselves. See A Dictionarie of the French and English Tongues (London: Adam Islip, 1611), <http://www.pbm.com/~lindahl/cotgrave>. In the context of the manuscript, this material is used to make crucibles and molds for tin casting, and so it is more likely a stone (perhaps similar to schist or sandstone) which was used by pewterers for casting dishes. See Dieter Nadolski, Les étains Anciens Usuels: Leur Aspect et Leur Fonction Pendant Six Siècles (Paris: Nouvelles Editions Latines, 1986).

«

[124] c_009r_01

a kind of barley

«

[125] c_009r_02

As opposed to Gascogne. "France" was often used to mean the central and northern parts of modern France now limited to what is known as the "Île-de-France" region.

«

[126] c_009v_03

While the heading of this entry is in the Italic script of the author-practitioner's main hand (hand A), the remainder of this page is in a different hand (hand B, a formal Italic script).

«

[127] c_009v_02

The identity of François du Cros is uncertain, though two candidates seem likely: 1) François Ducros de Bérail, Baron of Belcastel and Guitalens (d. 1600), who led twenty men on horseback to Toulouse for the king's service and the city's defense in 1577, or 2) François Ducros, Seigneur of Guitalens and son of François Ducros de Bérail. No other "François Ducros" is recorded in Toulouse, though Ducros was the surname of a prominent merchant family in the city. See fol. 170v for connections between the merchant Ducros and the Ouvrier family. See also Debuiche and Muñoz, "Le Ms. Fr. 640 et le contexte toulousain," https://edition640.makingandknowing.org/#/essays/ann_312_ie_19.

«

[128] c_009v_01

i.e., livres Tournois (Tours pounds)

«

[129] c_009v_06

Likely an abbreviation for colonne (column), with the number referring to a specific column in an accounting book.

«

[130] c_009v_04

St. Andrew (1st c. CE): Christian saint and Apostle of Jesus. The Feast of St. Andrew is celebrated on November 30.

«

[131] c_009v_05

Reading "c." as "t." to mean livres Tournois (Tours pounds), as above

«

[132] c_011r_01

Cendre (ash), fleur (flower), and le plus subtil (the subtlest part) are grades of a blue pigment such as azurite or, as is most likely here, smalt. See Spring and Kirby, "Ms. Fr. 640 in the World of Pigments in Sixteenth-Century Europe," https://edition640.makingandknowing.org/#/essays/ann_321_ie_19.

«

[133] c_012r_01

Possibly used for heating towels.

«

[134] c_112r_02

See corresponding mark in the margin.

«

[135] c_112r_03

See corresponding mark in the main body text.

«

[136] c_104r_01

Bouteure could refer either to boiling liquid or to goldsmiths' or silversmiths' pickle for removing tarnish. See glossary.

«

[137] c_012v_02

Written backwards: cornaline (cornaline). According to Renaissance lexicographer Randle Cotgrave, "cornaline" was used in contemporary English to denote a flesh-colored stone, likely carnelian. See A Dictionarie of the French and English Tongues (London: Adam Islip, 1611), <http://www.pbm.com/~lindahl/cotgrave>.

«

[138] c_012v_01

added in the left margin

«

[139] c_013r_01

Latin: "Not good"

«

[140] c_013v_04

Here, cendrée refers to a poor grade of blue pigment. Elsewhere in the manuscript, it may refer to 1) crucible material and furnace sweepings, 2) the method of purifying metals in ashes as per Renaissance lexicographer Randle Cotgrave, or 3) the product of that process. See A Dictionarie of the French and English Tongues (London: Adam Islip, 1611), <http://www.pbm.com/~lindahl/cotgrave>.

«

[141] c_013v_02

Cf., the modern Greek ὄφις, meaning snake.

«

[142] c_013v_01

Greek: "the swine." The word ion appears to be a transliteration of the Greek ὥον or ὥν, perhaps reflecting sixteenth-century pronunciation and the author-practitioner's understanding of Greek.

«

[143] c_013v_03

Haultan is a Gallicised spelling of *autan*, the Occitan term for a SW/SSW wind.

«

[144] c_014r_01

*On earth fortifications at this time, see Daniela Lamberini, *Il Sanmarino. Giovan Battista Belluzzi architetto militare e trattatista del cinquecento* (Florence: Leo S. Olschki, 2007), which discusses a manuscript treatise from ca. 1550 by architect Giovanni Battista Belluzzi (1506–1554).*

«

[145] c_014r_05

Abbreviation for stratum super stratum (Latin: "layer upon layer") used in alchemical writings, among others.

«

[146] c_014r_02

Word omitted (no blank space). The author-practitioner seems to have forgotten to name this tool. Presumably, he is referring to the middle instrument in the marginal drawing, which he may have intended to label "B."

«

[147] c_014r_03

Though none of the instruments in the margin is marked "C," the author-practitioner is presumably referring to the bottom drawing.

«

[148] c_014v_01

This page is blank in the original.

«

[149] c_015r_02

Correction in original: -ou written over -us

«

[150] c_015r_03

The looped descender of the "s" in moresque (moresque) is hatched.

«

[151] c_128r_03

Correction in original: -a written over -e

«

[152] c_015r_01

*Adouleir can mean to soften, sweeten, and smooth, meanings that converge within a worldview in which all things have a natural balance. Sour and brittle (*aigre*) materials can be rendered sweet and soft (*doulx*) with the right tempering substance, thus while we have translated *adouleir* as "to soften" here, the author-practitioner's understanding was simultaneously of "sweetening," which involved a process of "tempering" and "mollifying" (as Cotgrave's 1611 *Dictionarie* also gives) or of bringing a material or process toward a new, more desirable or useful balance among its qualities, or in its outcome. See Wang and Smith, "Fat, Lean, Sweet, Sour," https://edition640.makingandknowing.org/#/essays/ann_012_fa_14.*

«

[153] c_015v_04

Wax discs imprinted with the image of a lamb and blessed by the Pope, used as devotional objects.

«

[154] c_015v_01

In the sixteenth century, diseases were commonly understood in terms of "fluxes," i.e., movements of liquids or vapors in the body.

«

[155] c_015v_02

Cf. the aphorism: "Don't put anything smaller than your elbow in your ear."

«

[156] c_170v_29

Correction in original: -u written over -e

«

[157] c_015v_03

*Contraction of *vitis alba*, referring to white briony. See glossary.*

«

[158] c_016r_01

The figure partially intersects the text block, suggesting that it was drawn in advance of at least the end of the main text.

«

[159] c_016v_05

Here metal means not metal in general, but an alloy of copper and tin.

◦

[160] c_016v_01

"Go." may be an abbreviation for gonorrhea. In this period, gonorrhea was understood as an involuntary and pleasureless loss of semen, different from gonorrhea in the modern sense. Hence the catheter-like injection of a liquid medicine into the male urethra. Cf. fol. 7v, *Contre gonhorrea (Against gonorrhea)* for an explicit remedy for gonorrhea.

◦

[161] c_016v_03

Here, the author-practitioner may be referring to the cotton plant. Elsewhere in the manuscript, cotton is understood as a generic wadding.

◦

[162] c_016v_02

The meaning of the verb charger (to charge) is unclear, perhaps meaning to add weight to the cloth. The writer may also be noting the way silk can absorb an excess of crimson dyestuff rather quickly, while black dyestuff can only be absorbed to a deep saturation with multiple dips in the dye bath. Cf. fol. 38v "Black color for dyeing."

◦

[163] c_017r_01

Correction in original: -a written over -e

◦

[164] c_017v_02

= 80 (4 x 20)

◦

[165] c_017v_01

Platforms for or formations of pieces of artillery. The largest pieces, used for long-range shots, were commonly arranged on rear platforms.

◦

[166] c_017v_04

Correction in original: d- written over l-

◦

[167] c_017v_03

The syntax is unclear in the original, but ceulx (those) seems to refer to artillery founders, and specifically to the Poncet, a family of artillery and bell founders active at the Toulouse

arsenal between 1560 and 1640. Both father and son were called Pierre, and they originated from Mirepoix, in Ariège.

«

[168] c_049r_01

The Poncelet were a family of artillery and bell founders active at the Toulouse arsenal between 1560 and 1640. They are mentioned on fol. 17v and 49r.

«

[169] c_018r_02

Correction in original: -a written over -es

«

[170] c_018r_01

Moyenne was presumably crossed out by mistake; the remaining sentence makes no sense otherwise.

«

[171] c_018v_02

Escusson (escutcheon), meaning a shield or lozenge shape, is used to denote two different things: on a sword, it denotes the quillon block; on a cannon, it denotes a mark near the breech, which in some cases would seem to indicate the ideal level of the powder charge.

«

[172] c_019r_01

Meaning uncertain, could refer to the cascabel (cascabel), the protrusion behind the breech of a muzzle-loading cannon.

«

[173] c_019r_02

The subject (orgues) resumes on fol. 22v with a corresponding symbol in the top left margin. Fol. 22v is the fourth folio from fol. 19r when one counts it as the first.

«

[174] c_019v_02

Appears to the left and in line with the heading. This abandoned "P" seems to be taken up again to begin the heading.

«

[175] c_019v_01

This level of detail about how to make and administer an enema is very unusual, even in the casebooks of physicians.

«

[176] c_020r_01

This entry is written in a different hand (hand C, a calligraphic French script) from the author-practitioner's main hand (hand A).

»

[177] c_020r_04

*Lien (bundle) was used to refer to bundles of three or six panes of glass as units of sale. See Michel Hérold, "Le verre des vitraux (xve-xvie siècles). Approche méthodologique," in *Verre et fenêtre de l'Antiquité au xviiie siècle, Actes du premier colloque international de l'association Verre & Histoire* (Paris, Association Verre & Histoire, 2009), http://www.verre-histoire.org/colloques/verrefenetre/pages/p307_02_herold.html.*

«

[178] c_020v_02

*According to the *Histoire de l'église de Montauban*, this bell was given in 1531 to the Cathedral of Saint-Etienne in Toulouse by Jean III de Cardaillac, the abbot of Montauban and Aurillac. See Camille Daux, *Histoire de L'Eglise de Montauban* (Paris: Bray et Retaux, 1881), 4.*

»

[179] c_021v_03

Correction in original: de written over et

«

[180] c_022v_01

With the corresponding symbol at the bottom right of fol. 19r, the author-practitioner indicates that his discussion of this subject (orgues) will resume four folios later. Fol. 22v is the fourth folio from fol. 19r when one counts it as the first.

«

[181] c_022v_08

Correction in original: -e written over -g

«

[182] c_022v_02

Ligne (line), also known as "grain of barley," is usually a twelfth part of the king's thumb. Here, the author-practitioner specifies that it is a twelfth part of the ball of the cannon.

«

[183] c_022v_06

Reading appelle (call) instead of apporte (carry).

«

[184] c_054v_01

This entry does not have a heading.

«

[185] c_168r_01

A boring tool similar to a gimlet.

«

[186] c_023r_01

A long slender tube made from buckram fabric; see illustration in the margin on the next page, fol. 23v.

«

[187] c_023r_02

Correction in original: o- written over l-

«

[188] c_024r_05

Correction in original: -e written over -un

«

[189] c_024r_02

Here this probably means brass because one can solder it. Elsewhere in the manuscript, the meaning of fer blanc (white latten) is unclear.

«

[190] c_024r_03

Likely a piece of cord soaked in saltpeter solution.

«

[191] c_024r_04

i.e., the shell of the grenade.

«

[192] c_024v_01

artiglierie (artillery): an Italianism in the French spelling.

«

[193] c_027v_01

Given the weight and size, this was not a handheld musket but what was known as a wall gun.

«

[194] c_028v_04

Saulmon refers to a large ingot or mass of unprocessed metal straight from the furnace. See “Dictionnaire Du Moyen Français.” Paris, 2015. <http://www.atilf.fr/dmf>. Jacques Savary des Brûlons and Philémon-Louis Savary, Dictionnaire Universel de Commerce, d’histoire Naturelle, et Des Arts et Metiers: Tome I, Partie II : Contenant Les Articles Du Commerce & Des Compagnies (Paris: Veuve Estienne, 1741) notes they were commonly used by merchants as ballast, taking their name from their shape which resemble the salmon fish. Cf. latte and grille, which are smaller more processed ingots of lead and tin, respectively.

«

[195] c_028v_05

A grille is a type of tin ingot. In this manuscript, it is described as smaller, more processed, and more convenient to sell than the saulmon.

«

[196] c_028v_02

A status conferred by the French king in the Ancien Régime, from the late medieval period onward, granting privileges and financial aid in exchange for military manpower and taxes. Bonne ville thus usually referred to a city of a certain size and degree of fortification.

«

[197] c_028v_01

The subject (pewterer) resumes on fol. 30r with the same heading. Although the author-practitioner directs the reader ahead to the fifth foillet (folio), the topic resumes sooner.

«

[198] c_029v_01

i.e., distilled

«

[199] c_030r_03

A latte is a type of lead ingot. In this manuscript, it is appears to be smaller, more processed, and more convenient to sell than the saulmon.

«

[200] c_030r_02

At the bottom of fol. 28v, the author-practitioner indicates that his discussion of the subject (pewterer) will resume on the fifth folio from there. However, the topic resumes here.

«

[201] c_030r_01

Pinte (pint) is likely a small pewter vessel. More specifically, it could designate a vessel with the volume known in English as the French or Parisian pint, which, according to Randle Cotgrave, *A Dictionarie of the French and English Tongues* (London: Adam Islip, 1611), <http://www.pbm.com/~lindahl/cotgrave>, was "somewhat less then a sixt part short of our Quart (for in weight it is about 27 ounces, our Quart 32)."

»

[202] c_031r_01

For more on *huile de noix blanche* (white walnut oil), see the entry on *Huile (Oil)* on fol. 60r.

«

[203] c_031v_01

Paintre d'aprest is a technique for painting on glass.

»

[204] c_031v_02

Here, *rocaille* (*rocaille*) likely refers to small beads of glass, which may or may not be colored.

«

[205] c_032r_01

A process known as *raising*.

»

[206] c_032r_02

Likely refers to the process of *planishing*.

»

[207] c_032r_03

At this time, Milan was exporting large quantities of morions to France, where morions were usually made of two pieces.

«

[208] c_032v_01

The rest of this entry wraps around the heading of the next entry and was probably added at a later time.

»

[209] c_033r_01

Correction in original: -e written over -a

«

[210] c_034r_05

Correction in original: -un written over -e

«

[211] c_034r_04

Correction in original: -e written over -a

«

[212] c_034r_01

The joke relies on a play on words, faire tenir quelque chose ("to make something hold" or "to have something held"), which does not translate well into English.

«

[213] c_034r_02

The joke relies on a play on words, de ("by means of" or "from"), which does not translate well into English.

«

[214] c_034r_03

i.e., the messenger will know nothing of the secret message he carried.

«

[215] c_034v_01

i.e., abracadabra. While this trick appears in Jean Prevost (54v-56v), he does not use this word. The term is used in literature, essentially meaning "dishonourableness." A similar word, "honorificabilitudinitatibus," is used in Shakespeare's Love's Labour's Lost (Act V, Scene I) and other sources, including late 15th- and 16th-century dictionaries.

«

[216] c_035r_01

In Codex Atlanticus, fol. 207r, Leonardo da Vinci (1452–1519) attributes this joke to Maestro Giovanni da Lodi. Leonardo's version was "How to teach what you do not know: If you want to teach something to someone that you do not know, have him measure the length of something that you do not know and he will know the measure, which previously, you did not know." Luca Pacioli (ca. 1447–1517), Franciscan friar, mathematician, and Leonardo's collaborator, also quotes this joke, which he includes in the section of "vernacular problemata meant to stimulate intelligence and mirth" of his De viribus quantitatis, a manuscript available at the Biblioteca Universitaria di Bologna (codice 250). On Leonardo's relations with Pacioli, see also Edmondo Solmi and Sergio Solmi, Scritti Vinciani: Le Fonti

Dei Manoscritti Di Leonardo Da Vinci E Altri Studi, Strumenti 37 (Firenze: La nuova Italia, 1976), 219–24.

«

[217] c_035v_01

Pietro Andrea Gregorio Mattioli, also known as Matthiolus (1501–1577): Sienese physician and naturalist. A likely source for this entry is Mattioli's 1579 French edition of his commentaries on *De materia medica* by Dioscorides (ca. 40–90 CE), as both it and the author-practitioner provide the Arabic name *iarus/jarus (arum)* as an alternative name for the plant *pied de veau* (calf's foot). See Pietro Andrea Mattioli and Jean des Moulins, *Commentaires de M. Pierre André Matthiole Médecin Sennois, Sur Les Six Livres de Ped. Dioscoride Anazarbeen de La Matière Médicinale* (Lyon: Guillaume Rouille, 1579), 366–68. See also earlier editions.

«

[218] c_035v_02

Latin: "the invisible"

«

[219] c_036r_02

According to Renaissance lexicographer Randle Cotgrave, *pouldre d'oribus* (*oribus powder*) refers to a form of the philosophers' stone, i.e., an alchemical powder projected over metal to transmute it into a nobler metal (such as gold). Cotgrave notes that it was used as a term of derision because of its association with futile or fraudulent pursuits by charlatans. See *A Dictionarie of the French and English Tongues* (London: Adam Islip, 1611), <http://www.pbm.com/~lindahl/cotgrave>.

«

[220] c_036r_01

sic: referring to the sheath

«

[221] c_036v_01

This kind of glass, made from flattened hand-blown glass bubbles, is known as crown glass.

«

[222] c_037r_01

Latin: "hair of Venus." Probably *Adiantum capillus-veneris*, the maidenhair fern.

«

[223] c_054r_01

Text breaks off in mid-sentence.

«

[224] c_037v_02

Unclear how wood would be used here. "Verre" (glass) rather than "bois" (wood) may have been intended.

»

[225] c_038r_02

The so-called "Screen of Charlemagne," associated with the Holy Roman Emperor Charlemagne (748–815), is a gem-studded altarpiece, formerly in the Treasury of Saint-Denis. For an 18th-century aquarelle of the screen, see <https://images.bnf.fr/detail/710639>

«

[226] c_038v_03

A plant, possibly a sorrel.

»

[227] c_038v_04

St. Paul (ca. 5–ca. 64/67 CE): Christian saint, Apostle of Jesus, and author of several texts in the New Testament. The Feast of the Conversion of Saint Paul is celebrated on January 25.

«

[228] c_038v_02

The letters "arc" in the heading Marchant (Merchant) are in Italic script written over French script, indicating a later correction.

»

[229] c_038v_01

lb is the abbreviation for livre, usually meaning "pound," but here it clearly means "book," the other meaning of livre.

«

[230] c_039r_01

St. Anthony, also known as Anthony the Great (ca. 251–356 CE): Christian saint. The Feast of Saint Anthony is celebrated on January 17.

«

[231] c_039v_01

A coin. See glossary.

«

[232] c_040v_02

The author-practitioner appears to have made corrections in this entry later on in a lighter ink, and perhaps forgot to cross out vent in this second instance.

«

[233] c_040v_01

Here cendrée likely refers to a process of separating metals in ashes. For additional meanings, see glossary.

«

[234] c_041v_01

This text block is in a different ink.

«

[235] c_041v_02

Likely a variant of the old Occitan vistornar, meaning 'to castrate.'

«

[236] c_043r_01

Italian: Take soft tin, half an ounce, melt it in a spoon. Once melted, throw in an ȝ of ȝ, mix together. Once cold, grind on porphyry. Next take an ȝ of sal ammoniac, an ȝ of sulfur, the yellowest that may be found, grind both of them. And then mix very well all the aforementioned materials. Next put all together into a [deleted: a pot] glass sublimatorium, hold this over a small fire for an hour & a slightly stronger one for an hour, & a very good fire for an hour, and it will be done. Next, to use it, apply soot black with the glue that painters use to paint, & two or three times, until it is quite black. Next apply a little varnish. Once dry, apply the purpurine a secco with a finger where you want. The more of it you apply, the more beautiful it will be. Next, if you want, apply varnish on top.

«

[237] c_070r_03

Correction in original: -u written over -e

«

[238] c_043v_04

This entry appears to describe a kind of lampworking technique for making imitation pearls of blown glass, perhaps by blowing talcum powder into a glass bubble as it is blown.

«

[239] c_043v_01

Possibly a breech-loading arquebus, which has a chamber.

«

[240] c_043v_02

Known as a swamped barre.

«

[241] c_043v_03

Known as a "wadding" or a "patch."

«

[242] c_043v_05

Correction in original: s- written over a-

«

[243] c_044r_01

Hackbut: used interchangeably with "arquebus" in the period. Randle Cotgrave, A Dictionarie of the French and English Tongues (London: Adam Islip, 1611), <http://www.pbm.com/~lindahl/cotgrave>, also has "caliver," which refers to a small musket.

«

[244] c_044r_02

Likely suggesting an alternative wadding that will keep the barrel cleaner.

«

[245] c_044v_01

17 x 100 (i.e., 1700)

«

[246] c_044v_03

Monsieur de Montorsin almost certainly refers to César de Montourcin, who was Master of the Toulouse Mint, 1590–1591.

«

[247] c_044v_02

Likely refers to the decoction rather than the residue.

«

[248] c_045r_01

Paper case containing shot (but no powder charge) that is placed into the barrel as a whole.

«

[249] c_045r_03

Likely refers to pieces of shot of a particular shape.

«

[250] c_154v_03

This mark appears to indicate that the text of the marginal note should be inserted here.

«

[251] c_045r_04

i.e., the breastplate

«

[252] c_046r_01

NB: gout was not considered a discrete disease, but rather a concentration of morbid humors and materials in various parts of the body.

«

[253] c_046r_02

Correction in original: -s written over -es

«

[254] c_046v_03

*This abbreviation occurs in six of the seven entries on this page, perhaps indicating a common source. The only other occurrence of "Urb." in the manuscript appears on fol. 1r, in the book title *Comment. urb. rom.*. This work is most plausibly identified as *Commentariorum Urbanorum Raphaelis Volaterrani*, though it does not include any of the six entries from fol. 46v. See Raffaele Maffaei, *Commentariorum Urbanorum Octo et Triginta Libri* (Basel: Johannes Frobenius, 1559).*

«

[255] c_046v_02

Likely refers to leather from the neck of the animal.

«

[256] c_046v_01

i.e., oil of sulfur, which is discussed in the preceding entries

«

[257] c_047r_01

NB: this word is followed by an incomplete letter, probably the "d" of d'huile in the following line.

«

[258] c_047r_03

Laveure: residue specifically of gold or silver recovered from ashes, sweepings, and crucibles in a goldsmith's workshop.

«

[259] c_048r_01

According to Renaissance lexicographer Randle Cotgrave, this could denote either an unspecified "precipitate" or "the red, poisonous, corroding powder of burned quicksilver." The latter could refer to vermillion, i.e., precipitated mercuric sulfide, also used as a red pigment. See *A Dictionarie of the French and English Tongues* (London: Adam Islip, 1611), <http://www.pbm.com/~lindahl/cotgrave>.

«

[260] c_048v_01

This marginal text is oriented 90 degrees clockwise to the main text.

«

[261] c_049r_04

The rest of the entry shows a shift in the handwriting and may have been added at a later time.

«

[262] c_049v_09

St. Michael: an archangel in the Abrahamic religious traditions. The Feast of the St. Michael, or Michaelmas, is celebrated on September 29.

«

[263] c_049v_06

Gaillardise usually connotes joy, vigorous health, and sensuality; here the term may relate to the Middle French galle (f.) and its association with parasitic growths and skin conditions.

«

[264] c_049v_08

Likely referring to the use of the lead grains as shot.

«

[265] c_049v_05

Awkward syntax in the original, perhaps suggesting an unfinished thought.

«

[266] c_050v_01

Passe solitaire: owsell or similar bird. See Paul J. Smith, "Solitudo: Spaces, Places, and Times of Solitude in Late Medieval and Early Modern Cultures," ed. Enenkel K. A. E. and Christine Göttler, vol. 56, *Intersections* (Leiden: Brill, 2018), 531–60.

«

[267] c_052v_01

St. John the Baptist (1st c. CE): itinerant preacher and first cousin and precursor to Jesus of Nazareth. The Feast of St. John the Baptist is celebrated on June 24.

«

[268] c_052r_03

This unusual sequence of parentheses seems to indicate an uncertainty, and the author-practitioner may have intended to return to this point at a later time.

«

[269] c_052r_01

Correction in original: -t written over -x. Here chaulx, which could be read as referring to "chalk" or "lime," was then corrected to change the x to a t, changing the meaning to "hot." Chaulx vive (quickslime) was sometimes added to horse dung to make it hotter.

«

[270] c_052r_02

Correction in original: l- written over d-

«

[271] c_052v_02

Correction in original: l- written over b-

«

[272] c_053r_01

Read: eschaufier (heat)

«

[273] c_053v_01

*Latin: "Girolamo Vida of Cremona, Bishop of Alba, wrote a poem on the nature of silkworms." Marco Girolamo Vida (ca. 1485–1566): Italian humanist who became bishop of Alba in 1533. Marco Girolamo Vida, *Bucolica de Bombyce Ad Isabellam Estensem Marchionissam Libri Ii, Etc.* (Basel: Walder, Johann, 1534).*

«

[274] c_055r_04

Italian: a gun without noise.

«

[275] c_055r_01

i.e., the barrel

«

[276] c_055r_02

Likely the iron tip of the ramrod, known today as a cleaning jag.

«

[277] c_055r_05

semperfivva: Latin name for plants known as houseleeks or liveforevers.

«

[278] c_055r_03

Veneno orrible (horrible venom), though close to Spanish, is more likely written in a poor Italian.

«

[279] c_055r_06

Written backwards: veneno orrible tuant si on marche sur une table ou extrieu (horrible venom which kills if one steps on a board or a stirrup).

«

[280] c_055r_07

Correction in original: t- written over b-

«

[281] c_055v_01

Written backwards: Crapaut dan un pot (Toad in a pot)

«

[282] c_055v_03

This recipe for a quenching/tempering liquid for steel appears in medieval books of secrets.

«

[283] c_055v_04

NB: this word is followed by what may be an incomplete letter, perhaps the "d" of d'huile in the following line.

«

[284] c_056v_01

Correction in original: s- written over d-

«

[285] c_056v_02

The marginal notes on this page are in a different ink and were likely added at a later time.

«

[286] c_057r_02

The following four paragraphs are in a different hand (hand D, a semi-calligraphic French script).

«

[287] c_057r_01

From this point on, the writing is once more the author-practitioner's main hand (hand A).

«

[288] c_057v_01

The entire page is written in a different hand (hand D, a semi-calligraphic French script, see also fols. 57r and 58r) from the author-practitioner's main hand (hand A), with the exception of the title of the second entry, Painctre, and the final sentence on the page.

«

[289] c_057v_03

Meaning uncertain, as, according to Cotrave and Dictionnaire historique de l'ancien langage françois (La Curne, vol. 6 p. 96, after Monet), estoffer can more specifically mean to engrave (ciser, graver); estofferie can mean engraving (gravure), and estoffeur can mean engraver (graveur).

«

[290] c_057v_04

This heading is written in the author-practitioner's main hand (hand A) and was likely added at a later time.

«

[291] c_057v_02

This final sentence is in the author-practitioner's main hand (hand A).

«

[292] c_058r_01

This paragraph is in a different hand (hand D, a semi-calligraphic French script, see fol. 57r-v) from the author-practitioner's main hand (hand A).

«

[293] c_058r_04

From this point, the text is in the author-practitioner's main hand (hand A).

◦

[294] c_058r_02

Correction in original: n- written over d-

◦

[295] c_058v_03

Uncertain transcription due to strikethrough.

◦

[296] c_058v_04

Correction in original: -aul- written over -on-

◦

[297] c_059r_02

It is likely that "Acre" qualifies both "ash" (cendre) and "azur" and may refer to the modern-day city of Acre.

◦

[298] c_059r_01

This final sentence wraps tightly around the heading of the next entry.

◦

[299] c_060r_01

The author-practitioner (hand A) used a darker, brown ink to reinforce this heading, which was originally written in a lighter and greyish ink.

◦

[300] c_061r_01

Correction in original: vi- written over re-

◦

[301] c_061r_03

Added to the beginning of the line, slightly in the margin.

◦

[302] c_061v_01

*For more on vine water, see Marjolijn Bol, "The Emerald and the Eye: On Sight and Light in the Artisan's Workshop and the Scholar's Study," in *Perspective as Practice: Renaissance Cultures of Optics*, ed. Sven Dupré (Turnhout: Brepols, 2019), 71–101.*

◦

[303] c_061v_02

Chassis (frames): here, the term does not refer to casting frames, as it does in most other cases in this manuscript.

«

[304] c_062r_01

This entry and the one below it are written in a different ink and were likely added at a later time.

«

[305] c_062r_02

The last lines of this entry are compressed into the right margin of the entry below.

«

[306] c_062v_01

*demenée suggests unquiet motion. See Randle Cotgrave, *A Dictionarie of the French and English Tongues* (London: Adam Islip, 1611), <http://www.pbm.com/~lindahl/cotgrave>.*

«

[307] c_063r_01

The latter part of the clause, presumably describing the behavior or properties of red wine produced in this way, seems to be missing.

«

[308] c_063v_01

Correction in original: -a written over -e

«

[309] c_063v_03

Correction in original: f- written over d-

«

[310] c_063v_02

Correction in original: -e written over -u

«

[311] c_064r_01

This entry in the left margin and the two below it are written in a different ink and were likely added at a later time.

«

[312] c_064v_06

Correction in original: L- written over C-

«

[313] c_064v_01

plant is used elsewhere to mean position. Here, it seems to refer to a full human figure, as opposed to curled-up bodies or single body parts.

«

[314] c_065r_01

Drawing perhaps indicates a palette knife or spatula.

«

[315] c_065v_05

Correction in original: -e- written over -a-

«

[316] c_065v_01

*The three first marginal blocks appear to belong together under the heading *Au naturel* (From nature) in spite of the relative distance between them.*

«

[317] c_065v_06

Correction in original: t- written over l-

«

[318] c_065v_03

Perhaps an idiomatic expression meaning that they carry their security with them everywhere they go.

«

[319] c_065v_02

This entry begins in the margin and, following the insertion line, ends in the main body of the page underneath the last entry.

«

[320] c_065v_04

This text continues the entry begun in the margin, as indicated by an insertion line.

«

[321] c_066r_03

This mark appears to separate the main text from the the marginal note.

«

[322] c_066r_04

The entry Or mat seems to have been written around this block.

«

[323] c_066r_01

This asterisk refers to the continuation of this entry in the left margin on fol. 66v, also indicated with an asterisk.

«

[324] c_066r_02

This asterisk refers to the note in the upper left margin of the page, also indicated with an asterisk.

«

[325] c_066v_03

Second part of title likely added at a later point.

«

[326] c_066v_01

This asterisk refers to prior text in this entry, which began on fol. 66r and concluded with a corresponding asterisk.

«

[327] c_066v_05

Correction in original: -or written over -es

«

[328] c_067r_01

A squirrel

«

[329] c_068r_04

Correction in original: d- written over t-

«

[330] c_068r_03

Uncertain transcription

«

[331] c_068v_01

Correction in original: c- written over p-

«

[332] c_069r_04

The blank space between entries here may give clues to authorial intent and composition of the text.

«

[333] c_069r_05

Correction in original: fœu (fire) written over illegible

«

[334] c_069r_02

Latin: "turn" [the page]

«

[335] c_070r_02

Final word of the sentence is fit in immediately below the end of the previous line.

«

[336] c_070v_01

The blank space after this entry may give clues to authorial intent and composition of the text.

«

[337] c_071r_01

Vin doux nouveau: a young, barely fermented wine, traditionally drunk in the weeks following harvest season. It is cloudy, sweet, and slightly bubbly. Also known in Southern France as vin bourru, in Italy as novello, and in Germany as Federweißer.

«

[338] c_071v_01

The word could not be traced. It appears to refer to a kind of whetstone.

«

[339] c_071v_02

i.e., those who sharpen shears smooth them with filing stones

«

[340] c_072r_01

The word in the original is canton, meaning corner or angle, interpreted here as the edge of the medal.

«

[341] c_073r_01

From this entry through fol. 76v, the hand is different (hand D, a semi-calligraphic French script, likely the hand of a scribe) from the author-practitioner's main hand (hand A). See also fol. 57r–58r and 77r–79v.

«

[342] c_073r_02

This addition is in the author-practitioner's main hand (hand A), glossing the word fleurs (flowers) written by the scribe (hand D); however, the author-practitioner seems unsure whether it should read fleuree (floreys) or Flandres (Flanders).

«

[343] c_073r_03

Moullée is added in a different hand, likely the author-practitioner's main hand (hand A), to fill in a blank left by the scribe (hand D) who wrote the rest of the page.

«

[344] c_073r_04

Meaning unclear.

«

[345] c_073v_02

This page is part of a longer stretch (fol. 73r–76v) written in a different hand (hand D, a semi-calligraphic French script, likely the hand of a scribe) from the author-practitioner's main hand (hand A). See also fol. 57r–58r and 77r–79v.

«

[346] c_074r_03

Correction in original: -i- written over -e-

«

[347] c_074v_02

Correction in original: d- written over tr-

«

[348] c_074v_01

Correction in original: & written over de

«

[349] c_075r_02

Correction in original: -f written over -t

«

[350] c_075v_03

Likely synonymous with rock alum (alun de roche)

«

[351] c_075v_05

Correction in original: -a written over -am

«

[352] c_075v_04

Correction in original: -n written over -ie

«

[353] c_075v_02

*i.e., a shell full of or moulu. See the entry *Or moulu* on fol. 75r, which instructs to store the prepared material in a shell.*

«

[354] c_076v_01

There is a black smudge across this word.

«

[355] c_077r_02

This is the first of three consecutive entries on this page written in the author-practitioner's main hand (hand A).

«

[356] c_077r_01

From this entry through fol. 79v, the hand is different (hand D, a semi-calligraphic French script, likely the hand of a scribe) from the author-practitioner's main one (hand A). See also fol. 57r–58r and 73r–76v.

«

[357] c_077v_04

This page is part of a longer stretch (fol. 77r–79v) in a different hand (hand D, a semi-calligraphic French script, likely the hand of a scribe) from the author-practitioner's main hand (hand A); see also fol. 57r–58r and 73r–76v.

«

[358] c_077v_02

Correction in original: -y written over -ie

«

[359] c_077v_03

In context, this is clearly sandarac. Variants of this issue occur on fols. 77v, 78r, and 79v. The scribe (hand D, a semi-calligraphic French script) had difficulty understanding the word "sandarac," writing homophones and perhaps interpreting the term as sang (blood) de Drac (of the dragon) or da Rac (the devil's shout). This may indicate that dictation was used in the composition of this manuscript.

◦

[360] c_078r_01

Correction in original: -c written over -ie

◦

[361] c_078r_03

Correction in original: b- written over tr-

◦

[362] c_078r_02

This heading repeats the same phrase pour faire bois verd (for making green wood) that concludes the previous entry. This might indicate that the scribe (hand D, a semi-calligraphic French script), perhaps taking dictation, did not realize these words were meant to begin a new entry. Moreover, in each instance, the scribe writes trois (three) for bois (wood). Might this indicate a noisy workshop environment as the scribe took dictation?

◦

[363] c_079r_01

Three horizontal strokes may indicate the scribe (hand D, a semi-calligraphic French script) experienced difficulty while taking dictation. They likely occupy a space for materials initially misunderstood or omitted. It is unclear whether those materials are still missing or if the strokes now fill the gap to continue the sentence.

◦

[364] c_079r_02

God: the deity of the Abrahamic religious traditions.

◦

[365] c_079v_03

This entry and the next are part of a longer stretch (fols. 77r–79v) in a different hand (hand D, a semi-calligraphic French script, likely the hand of a scribe) from the author-practitioner's main hand (hand A); see also fols. 57r–58r and 73r–76v.

◦

[366] c_079v_02

This entry, written in the author-practitioner's main hand (hand A), marks the conclusion of the longer stretch on fol. 77r–79v written in hand D (a semi-calligraphic French script, likely the hand of a scribe); see also fol. 57r–58r and 73r–76v.

«

[367] c_080r_01

Viron (also biron, reflecting Gascon pronunciation) is an Occitan term, referring to a gimlet, i.e., a small boring tool for which the French term guimbelet is used elsewhere.

«

[368] c_081r_01

A hill now known as Pech David, a district in the south of Toulouse (now sector 5). Puy is the French form of the Occitan pech and Latin podium, meaning "hill."

«

[369] c_081r_02

Fousseret: A commune in the Haute-Garonne in the southwest of France, about 50 km southwest of Toulouse.

«

[370] c_081r_03

Ox: A small village in the Haute-Garonne in the southwest of France, about 20 km southwest of Toulouse.

«

[371] c_081v_02

Distinctly paler ink for the two words est excellent (is excellent), as if an addition.

«

[372] c_082r_02

Correction in original: e- written over d-

«

[373] c_082v_01

Smudged but legible

«

[374] c_083r_04

i.e., recipe. Latin: "take"

«

[375] c_083r_03

Latin: "in equal quantity." See <http://logeion.uchicago.edu/ana>

«

[376] c_137r_03

i.e., the pattern or model

«

[377] c_084r_02

This hashmark may indicate a continuation of an entry, likely the last entry on the page, Sable de mine de Th{ou}l{ous}e (Sand from a mine in Thoulouse).

«

[378] c_084r_05

advents de Noel (Advent) refers to the liturgical season leading up to the Christian holiday of Christmas and begins the fourth Sunday before December 25.

«

[379] c_084r_01

Correction in original: -a- written over -e-

«

[380] c_084r_04

Correction in original: -s written over -l

«

[381] c_084r_03

This entry may continue above at the hashmark.

«

[382] c_085v_01

Jesus of Nazareth: central figure in Christianity.

«

[383] c_086v_01

Appears to the left and in line with the heading. This abandoned "D" seems to be taken up again directly below, to begin the main text.

«

[384] c_086v_03

vieulx K occurs twice in the manuscript (fols. 86v and 147v). Both instances are associated with a silver-copper alloy, which was used in minting coins, where it was known as billon. The abbreviation "K" might thus indicate a coin, such as the Carolus, a base silver coin

marked with a letter K, or the German Kreuzer which was abbreviated K and made of silver-copper alloy up until the seventeenth century. See Denis Diderot and Jean le Rond d'Alembert, Encyclopédie, Ou Dictionnaire Raisonné Des Sciences, Des Arts et Des Métiers, vol. 7 (Paris: Briasson, 1770), vol. 7, 587.

«

[385] c_087v_01

The expressions tenir de and participe de (here translated as "to be kin of") may refer to a kind of analogical thinking through which the author-practitioner distinguishes different properties of earth. Etienne Gilson, L'esprit de la philosophie médiévale (Paris: Vrin, 1969), 98.

«

[386] c_088v_01

Correction in original: -r written over -s

«

[387] c_158r_01

The blank space before this entry may give clues to authorial intent and composition of the text.

«

[388] c_089v_01

The end of the entry continues in the left margin and runs up against the next heading.

«

[389] c_089v_02

Continuation of the previous entry

«

[390] c_089v_03

Correction in original: -s written over -f

«

[391] c_090r_01

Correction in original: -s written over -ur

«

[392] c_090r_02

Precise technical meaning unclear.

«

[393] c_091r_02

The darker ink of this final sentence may give clues about authorial intent and composition of text.

«

[394] c_091v_01

Correction in original: b- written over p-

«

[395] c_092r_03

Likely verdigris

«

[396] c_093r_01

le jour des rameaux (Palm Sunday) is a Christian holiday celebrated on the Sunday preceding the first full moon on or after March 21.

«

[397] c_093r_02

Appears to the left and in line with the heading. This abandoned "I" seems to be taken up again directly below, to begin the main text.

«

[398] c_093v_01

Correction in original: d- written over u-

«

[399] c_094r_02

Correction in original: l- written over c-

«

[400] c_094r_03

Correction in original: -e- written over -r-

«

[401] c_094r_05

Likely a diamond cross-section.

«

[402] c_094r_06

Likely a flattened diamond cross-section.

«

[403] c_094r_07

The middle notch is called a fuller.

«

[404] c_094r_08

Meaning hilt

«

[405] c_094r_11

Likely what is now called the port ring or side ring.

«

[406] c_094r_10

Known today as the "arms" of the guard.

«

[407] c_094r_13

i.e., the tang

«

[408] c_094r_04

Awkward syntax in the original. There appears to be no mention of an alternative adhesive to gummed wax until two sentences later, when the author-practitioner writes of glue.

«

[409] c_094r_14

Likely meaning dogfish skin (i.e., the skin of a common sand shark), which was used for sword handles.

«

[410] c_094r_15

Likely what is now known as Turk's head binding.

«

[411] c_094r_09

This figure depicts the inner guard, the side that faces the body (i.e., the back) when one holds the sword. The pontet (likely the port ring or side ring) referenced in the main text would appear on the front and is thus not visible in the figure.

«

[412] c_094v_05

European mountain ash, Sorbus acuparia.

•

[413] c_094v_04

Correction in original: s- written over l-

•

[414] c_094v_06

Likely vessels containing oil and emery powder, which are used to furbish the sword with the fustée.

•

[415] c_094v_07

A polishing and sharpening tool.

•

[416] c_094v_08

Likely brunisson, i.e., a burnisher.

•

[417] c_094v_09

Often used to burnish.

•

[418] c_095r_05

Perhaps a grindstone worked by a foot pedal.

•

[419] c_095r_07

i.e., to sharpen it

•

[420] c_095r_03

Correction in original: bien written over po-

•

[421] c_095r_09

i.e., the quillon block, through which the tang passes

•

[422] c_095r_12

Here, ribeure (rivet) refers to the tip of the tang, which is passed through the handle and then worked into a rivet. On this process, see Tavares, "Arms and Armor in Ms. Fr. 640," https://edition640.makingandknowing.org/#/essays/ann_308_ie_19.

«

[423] c_095r_11

Most tangs are rounded or flattened at the button end, though many rapiers and daggers produced for the court and bodyguard unit of the Dukes of Saxony in Dresden ca. 1590–1600 have tangs filed into a diamond shape on top of the button. An example from this Dresden group can be found in the Art Institute of Chicago (2014.1063.1).

«

[424] c_095v_03

The lower end of the scabbard, known as the chape.

«

[425] c_095v_04

Likely chased or chiselled.

«

[426] c_095v_05

Likely referring to the pommel rather than the guard.

«

[427] c_095v_06

Thin laths, usually of beech wood, used to make sword sheaths.

«

[428] c_095v_01

Correction in original: -g written over -e

«

[429] c_095v_07

i.e., a draw-knife

«

[430] c_096r_02

talan: the mouth end of the scabbard. Cf., talon (heel).

«

[431] c_096r_03

i.e., the aperture of the scabbard (known as the throat), which is the same shape as the cross-section of the blade.

«

[432] c_096r_04

i.e., the cross-section of the blade at the mouth of the scabbard.

«

[433] c_096r_01

A comparison is given in the margin for the yield of sheep skin.

«

[434] c_096v_01

A technical term for heating by "passing" the metal from one color to another.

«

[435] c_096v_02

Correction in original: c- written over d-

«

[436] c_097r_02

See fol. 4v

«

[437] c_097r_03

The technique described in this entry was known as false damascening in the sixteenth century.

«

[438] c_097r_04

This refers to metal that is rough from the forge.

«

[439] c_097r_05

See fol. 96v. A technical term for heating by "passing" the metal from one color to another.

«

[440] c_110v_04

Correction in original: E- written over L-

«

[441] c_097v_01

Here, Travailler d'aprest (Working on glass) seems to refer to the same technique described on fol. 31v, Paindre d'aprest (Painting on glass).

«

[442] c_098v_04

Barbets is translated here as "water-dogs." Randle Cotgrave, *A Dictionarie of the French and English Tongues* (London: Adam Islip, 1611), <http://www.pbm.com/~lindahl/cotgrave>, gives "water-spaniel." It is unclear whether barbets are the modern barbets, a French dog breed used for retrieving birds and known in the 18th century as poodles, from the German *pudeln* or *puddeln*, "to paddle"; see *Deutsches Wörterbuch* (Leipzig, 1961), s.v. "pudeln," <http://www.woerterbuchnetz.de/DWB?.lemma=pudeln>.

«

[443] c_099r_03

Latin: "which I do not believe"

«

[444] c_099r_01

Correction in original: de written over qui

«

[445] c_099r_02

The ink of this marginal note looks significantly different from the rest of marginal comment and from the main text, perhaps indicating an addition.

«

[446] c_100v_01

The marginal note was written around this word.

«

[447] c_101v_02

This sentence appears to be unfinished.

«

[448] c_102r_01

This appears to be an inverted mercury symbol (☿), deleted by the author-practitioner.

«

[449] c_102r_02

According to Renaissance lexicographer Randle Cotgrave, ciment royal is "An excellent Cement, or Solder, used by Goldsmiths; (heretofore Mintmen compounded a Cement for the

tryall of gold, and tearmed it so.)" See A Dictionarie of the French and English Tongues (London: Adam Islip, 1611), <http://www.pbm.com/~lindahl/cotgrave>.

«

[450] c_102v_05

Obsolete term for the flower of rosemary. "Ce mot est Grec, et veut dire Fleur en general. Cependant tous les Apothicaires entendent par là la Fleur de Rosmarin, comme estant la plus considerable de toutes les fleurs, et meritant d'estre appellée Fleur par excellence;" Thomas Corneille, Le Dictionnaire Des Arts et Des Sciences (Paris: Vve J. B. Coignard, 1694) <https://gallica.bnf.fr/ark:/12148/bpt6k50507s>.

«

[451] c_102v_06

Meaning is unclear. It could refer to the first sediment of wine, or products from early in the wine-making season.

«

[452] c_102v_03

Pope Paul III, born Alessandro Farnese (1468–1549), head of the Catholic Church from 1534 to his death.

«

[453] c_102v_01

Correction in original: f- written over a-

«

[454] c_114r_05

i.e., the Lord's Prayer

«

[455] c_103r_01

Correction in original: t- written over p-

«

[456] c_104v_04

This could refer to a garment such as a brigandine or coat of plates, also known as a jack.

«

[457] c_105r_01

Referring to the drawings in the left margin, marked "B"

«

[458] c_105v_06

A grafting technique, possibly in which cuts are made in the shape of the blade of a small axe (piolet).

«

[459] p120r_3 «

[460] c_105v_05

*Armol is a plant in the amaranth family (*Atriplex hortensis*), close to the Spanish armuelle, and usually known in English as "orache."*

«

[461] c_105v_04

Nightingales are indeed discussed again in an entry fifteen folios further on from this one, beginning on fol. 120r.

«

[462] c_106r_03

May be synonymous with spalt and spat used elsewhere in the manuscript.

«

[463] c_106r_02

A mass of iron from the smelting furnace in a pasty condition, also known as a bloom.

«

[464] c_106r_01

It is unclear whether the + symbol is associated with the titular insertion or the beginning of the marginal note.

«

[465] c_106v_07

This may be a continuation of the discussion of plaster of Paris in the last paragraph of fol. 106r.

«

[466] c_106v_02

Continuation of an entry from fol. 106v that ended with this same symbol.

«

[467] c_106v_01

Correction in original: E- written over A-

«

[468] c_106v_03

Insertion in the left margin continues down and across the bottom of the page, underneath the main body of the last entry.

«

[469] c_106v_06

See corresponding symbol in the upper left margin on fol. 107r for continuation of this entry.

«

[470] c_107r_03

It appears the author-practitioner confounded aseures and azures, striking out his first attempt to write the word, then writing aseures before subsequently adding azures.

«

[471] c_107r_06

Reading pinon here as pilon

«

[472] c_107v_03

Defined as ardille (clay) on fol. 112v.

«

[473] c_107v_05

Correction in original: v over ut

«

[474] c_107v_06

Hesitation over choice of Latin word.

«

[475] c_107v_11

Latin: "A secret unknown to almost everyone in the art of foundry: the thing that needs to be molded, whether a plant or an animal such as a lizard, should be first immersed in previously rectified wine spirit, then sprinkled with compound powder, or else rubbed (if the powder has turned into a pulpy state, as often happens)."

«

[476] c_107v_12

Correction in original: d- written over l-

«

[477] c_108r_02

Spat or spalt is likely a German word referring to an earth used to make molds, which the author-practitioner reports is found mainly in Augsburg.

«

[478] c_108r_01

Correction in original: d- written over p-

«

[479] c_108r_03

Correction in original: E- written over M-

«

[480] c_108v_02

This superscript addition continues in the left margin before the next line.

«

[481] c_109r_01

i.e., the bottom or floor

«

[482] c_109v_02

Satan: the devil in the Abrahamic religious traditions.

«

[483] c_109v_01

What appear to be multiple additions around this entry may give clues to authorial intent and composition of the text.

«

[484] c_110r_03

presumably days

«

[485] c_110v_03

Reading Mays (But) as mects (put)

«

[486] c_111r_01

Correction in original: -elle written over -il

«

[487] c_111v_04

Compare this recipe for sal ammoniac water to that on fol. 118v.

«

[488] c_111v_02

Correction in original: -o- written over -e-

«

[489] c_111v_03

An insertion line from the main text indicates where the marginal comment is relevant.

«

[490] c_111v_01

An insertion line above Si ton plastre indicates where in the main text the marginal comment is relevant.

«

[491] c_111v_05

Correction in original: A- written over &

«

[492] c_112r_01

It is unclear to which entry (or entries) this refers.

«

[493] c_112r_04

Correction in original: en written over de

«

[494] c_112r_05

Correction in original: a- written over d-

«

[495] c_112r_06

Correction in original: -es written over -aulx

«

[496] c_112v_04

Correction in original: -uy written over -es

«

[497] c_112v_05

Correction in original: h- written over q-

«

[498] c_112v_01

May illustrate the wire point being discussed.

«

[499] c_112v_02

Vertical lines on either side of this marginal note separate it from both the previous note and the main text.

«

[500] c_112v_03

See the corresponding symbol in the upper left margin on fol. 113r for continuation of this entry.

«

[501] c_113r_01

Correction in original: en written over t-

«

[502] c_128r_02

Correction in original: -e written over -il

«

[503] c_113r_04

Correction in original: le written over ce

«

[504] c_113r_02

Refers to the figure three lines up, marked "b"

«

[505] c_113r_05

Correction in original: s- written over v-

«

[506] c_113r_03

Continuation of an entry from fol. 112v that ended with this same symbol.

«

[507] c_113v_03

Correction in original: -en written over -il

«

[508] c_113v_04

Correction in original: te written over de

«

[509] c_113v_01

Meaning of marks here is uncertain.

«

[510] c_113v_02

Meaning unclear: ne laissera pas (will not let) likely intended instead of ne sera pas (will not be)

«

[511] c_114r_03

These two marks seem to indicate that the text of a corresponding marginal note (which begins with the first mark and ends with the second mark) should be inserted here.

«

[512] c_114r_04

This marginal note is bracketed by two marks (one that precedes the text and one that follows it) which appear consecutively in the body text, indicating that the text of this note should be inserted in the main text where the two marks appear.

«

[513] c_114v_01

See the corresponding symbol in the upper left margin on fol. 115r for continuation of this entry.

«

[514] c_115r_01

Continuation of an entry from fol. 114v that ended with this same symbol.

«

[515] c_115r_05

Correction in original: sable (sand) written over moule (mold)

«

[516] c_115r_03

Correction in original: Et written over N-

«

[517] c_115r_02

Correction in original: co- written over something illegible

«

[518] c_115r_04

Correction in original: l- written over t-

«

[519] c_115v_01

See the corresponding symbol in the upper left margin on fol. 116r for continuation of this entry.

«

[520] c_116r_05

Correction in original: -e written over -ont

«

[521] c_116r_01

Correction in original: -ansts written over -s-

«

[522] c_116r_03

Continuation of an entry from fol. 115v that ended with this same symbol.

«

[523] c_116r_02

Correction in original: -u written over -e

«

[524] c_116r_04

Correction in original: -ou written over -ail

«

[525] c_116r_06

Correction in original: -e written over -or

«

[526] c_116r_07

Correction in original: -eu- written over -uy

«

[527] c_116r_08

Correction in original: -f- written over -d-

«

[528] c_116v_02

i.e., the sal ammoniac

«

[529] c_116v_01

The fragment erem of the word particulierem[ent] (particularly) was written below the end of the previous line.

«

[530] c_117r_02

presumably plain water

«

[531] c_118r_01

Likely a variant of the German stüf, a kind of granular limestone or tufa.

«

[532] c_118v_02

Correction in original: -s- written over -l-

«

[533] c_118v_01

Compare this recipe for sal ammoniac water to that on fol. 111v.

«

[534] c_118v_03

Correction in original: A- written over Ja

«

[535] c_119r_01

Latin: "Note"

«

[536] c_119v_04

Correction in original: le spat is written over la spalt

«

[537] c_119v_02

Conrad Gessner, also known as Conradus Gesnerus (1516–1565): Swiss physician, natural historian, and bibliographer.

«

[538] c_119v_03

Conrad Gessner, De Omni Rerum Fossilium Genere, Gemmis, Lapidibus, Metallis, et Huiusmodi, Libri Aliquot, Plerique Nunc Primum Editi (Zürich: Hans Jakob Geßner, 1566).

«

[539] c_120r_01

Correction in original: tr- written over 4

«

[540] c_120r_03

Correction in original: R- written over Il

«

[541] c_120r_02

Correction in original: -e written over -uy

«

[542] c_120v_08

*This entire entry and its marginal note in Latin (*Siscitatio dubia*) has been struck out with faint diagonal lines. A second marginal note may be an alternative set of instructions for this substance that will "make silver run."*

«

[543] c_120v_01

Correction in original: -e written over -u

«

[544] c_120v_02

The possible change in ink color here and above (at cuivre menué (thin copper)) may be additions or corrections by the main hand at a different time.

«

[545] c_120v_04

The subject (casting in silver) resumes on fol. 121v which is two pages ahead.

«

[546] c_120v_07

Latin: "Doubtful question"

«

[547] c_120v_03

Correction in original: d- written over v-

«

[548] c_121r_03

A genus of flowering plant, comprising buttercups, spearworts, and crowfoots.

«

[549] c_121r_02

*A variety of buttercup (*Caltha palustris*) in the ranunculus family.*

«

[550] c_121r_01

Word uncertain. It may be partially obscured by the paper strip. It may be cos, coin, or otherwise. Context suggests it may refer to a vessel.

«

[551] c_121v_01

This mark likely indicates the insertion point for the marginal comment about the proper mixing order of water and sand.

«

[552] c_122r_02

i.e., roll the wax out on the table

«

[553] c_123r_01

Italian: to make silver run [with the word argento (silver) written in reverse]

«

[554] c_123v_01

Correction in original: -i written over -l

«

[555] c_124r_01

The plant dandelion is written here as dent de Lyon (literally, tooth of the lion), as if referring to the city (Lyon) instead of the animal (lion).

«

[556] c_124v_02

The alignment of esmail and the possible change in ink may indicate a later addition.

«

[557] c_124v_03

Correction in original: -i written over -u

«

[558] c_124v_04

See the corresponding symbol in the upper left margin on fol. 125r for continuation of this entry.

«

[559] c_125r_01

Continuation of an entry from fol. 124v that ended with this same symbol.

«

[560] c_125r_03

Scimitars were not made in the way described here, but were instead made from steel and iron bars forge-welded in a pattern. The author-practitioner misunderstands what he sees as the traces of a sand casting process.

«

[561] c_125r_04

The note is circled to offset it from the surrounding marginal text about plaster, and its placement suggests that it refers to the entry on scimitars.

«

[562] c_125r_05

This is in the same script and centered location on the page as the headings, but has no entry content below it. It is unclear what it is referring to. It could be referring to other text blocks on the page, whether "Hearing from afar," "Scimitars," "Plaster," the marginal note about plaster/casting, or the entry on the next page "Vipers and snakes." It might also be a heading for an entry that was never written.

«

[563] c_125r_06

i.e., molds for casting in sugar are made without a gate.

«

[564] c_126v_01

Correction in original: -u written over -es

«

[565] c_127v_02

Reading chaulx (quicklime) as chaults (hot)

«

[566] c_128r_04

Correction in original: t- written over d-

«

[567] c_128r_01

This likely refers to the silver flux discussed on fol. 123r-v, also described in terms of "grain."

«

[568] c_158v_02

This entry describes a process for coloring lifecast plants and thus is a recipe for painting on metal.

«

[569] c_129r_01

Nature (nature) likely refers here to genitals.

«

[570] c_129r_02

The last two letters "-lx" are missing in the original. They appear to have been cut off when the original choirs of the manuscript were cut apart during rebinding. See Smith, "Making Ms. Fr. 640," https://edition640.makingandknowing.org/#/essays/ann_326_ie_19.

«

[571] c_129v_02

The note is framed to offset it from the heading and body text.

«

[572] c_130r_02

This addition is expanded upon in the left margin, where the author-practitioner illustrates the iron wire.

«

[573] c_130r_03

This expands upon the addition about iron wire in the body text.

«

[574] c_130v_02

Correction in original: br- written over mo-

«

[575] c_130v_01

Feroit rien (would do nothing) is written in the left margin but only make sense as a continuation of the interlinear addition on the previous line.

«

[576] c_130v_03

Correction in original: A written over la

«

[577] c_131r_01

Correction in original: -ie- written over -ei-

«

[578] c_131r_02

Correction in original: -on- written over -ir

«

[579] c_131v_01

Correction in original: est written over ch-

«

[580] c_132v_02

Correction in original: p- written over d-

«

[581] c_132v_01

Correction in original: -uy written over -a

«

[582] c_133r_01

Correction in original: -e- written over -s

«

[583] c_133r_02

Correction in original: p- written over g-

«

[584] c_133r_03

Correction in original: A- written over L-

«

[585] c_133v_01

Correction in original: -e written over -s

◦

[586] c_133v_02

Correction in original: -e written over -se

◦

[587] c_134v_01

This sun symbol (curved rays) is slightly different from a similar sun symbol (straight rays) used to indicate "gold" throughout the manuscript.

◦

[588] c_135r_01

Couleur here refers not to "color" but to a flux or liquefying agent which makes molten metals flow more easily. From the verb couler (to flow).

◦

[589] c_135r_02

Correction in original: -une written over -e l

◦

[590] c_135v_01

This sun symbol (curved rays) is slightly different from a similar sun symbol (straight rays) used to indicate "gold" throughout the manuscript, including in the main text of this entry.

◦

[591] c_135v_03

Correction in original: -ge- written over -ch-

◦

[592] c_135v_02

i.e., form a skin on its surface

◦

[593] c_135v_04

Correction in original: -u- written over -n-

◦

[594] c_136r_01

Original word is obscured by ink stain.

◦

[595] c_136r_03

The word could not be traced. It appears to refer to some kind of device to hold molds in place.

«

[596] c_136r_02

Latin: "sun" [i.e., gold]

«

[597] c_136r_04

Correction in original: Esm written over D

«

[598] c_137r_02

A word seems to have been begun, then partially crossed out, leaving an unexplained "d"

«

[599] c_137r_04

Unidentified substance that is added to molten metals to make them run more fluidly through a mold, and also causes them to change color (hence perhaps its name, literally "tinting oil")

«

[600] c_137v_01

Correction in original: v- written over p-

«

[601] c_139r_01

A seemingly accidental vertical stroke is drawn immediately after this word.

«

[602] c_139r_02

A seemingly accidental vertical stroke is drawn through the last letter. It is not a deletion.

«

[603] c_139r_03

Correction in original: C- written over l-

«

[604] c_139r_04

Correction in original: -il written over -e

«

[605] c_139r_05

Correction in original: -e written over -i

«

[606] c_141r_01

The final word, which is under the paper strip, remains slightly uncertain.

«

[607] c_141r_02

The last two letters "-bs" are missing in the original. They appear to have been cut off when the original choirs of the manuscript were cut apart during rebinding. See Smith, "Making Ms. Fr. 640," https://edition640.makingandknowing.org/#/essays/ann_326_ie_19.

«

[608] c_156v_06

Correction in original: o- written over &

«

[609] c_142r_03

Correction in original: -n written over -ut

«

[610] c_142r_01

Smudged, but most likely cest (it is)

«

[611] c_142r_02

Correction in original: -imes over something illegible

«

[612] c_142v_02

This marginal note is squeezed in between the main text and the other marginal notes, and appears to be in a different ink.

«

[613] c_142v_07

a type of mold

«

[614] c_144v_02

The subject (molding turtles) resumes two folios later on fol. 146v.

«

[615] c_145r_04

Correction in original: -e written over -un

◦

[616] c_145r_05

Latin: "Investigate"

◦

[617] c_145v_01

Correction in original: E- written over &

◦

[618] c_145v_02

Correction in original: S- written over &

◦

[619] c_146r_01

Correction in original: p- written over b-

◦

[620] c_146r_02

Correction in original: -scuelle written over -au en

◦

[621] c_146v_02

Two folios earlier (fol. 144v), the author-practitioner indicates that his discussion of this subject (molding turtles) resumes here.

◦

[622] c_147r_02

The subject (molding turtles), begun on fol. 144r and continued here, resumes again two folios later on fol. 148v.

◦

[623] c_147v_01

An unknown superscript abbreviation renders the meaning unclear.

◦

[624] c_147v_02

Correction in original: L- written over I-

◦

[625] c_148r_01

Appears to be an unfinished sentence.

«

[626] c_148r_02

From this word on, the heading is written in the script of main text (i.e., not the Italic script used for headings), which may indicate a later addition.

«

[627] c_148r_03

Change of ink here may give clues to authorial intent and composition of the text.

«

[628] c_148v_01

Two folios earlier (fol. 147r), the author-practitioner indicates that his discussion of this subject (molding turtles), begun on fol. 144r and continued on 146v, resumes again here.

«

[629] c_149v_02

Correction in original: f- written over g-

«

[630] c_149v_01

This final sentence and the marginal note appear to be in a different ink, which may give clues to authorial intent and composition of the text.

«

[631] c_150r_01

What appears to be a smudged capital letter to the left of this heading may indicate that the author-practitioner first began this entry there and then began the heading anew in the center.

«

[632] c_150v_04

Correction in original: -s written over -r

«

[633] c_150v_03

i.e., the first mold made directly from the turtle (see fol. 146v) and therefore the one closest to its natural appearance.

«

[634] c_150v_05

Correction in original: -i- written over -a-

◦

[635] c_150v_02

This note continues on the next page (fol. 151r) in the bottom left margin at the letter "A"

◦

[636] c_151r_02

Master Alexander, an unidentified artisan

◦

[637] c_151r_01

This note begins on the previous page (fol. 150v) in the bottom left corner and ends in the bottom right with the letter "A"

◦

[638] c_151v_02

The first "r" in grommeleures is followed by a seemingly accidental vertical stroke. Meaning unclear.

◦

[639] c_151v_01

Likely the same as gouges (gouges). See glossary.

◦

[640] c_152r_01

Dionysius I of Syracuse (ca. 432–367 BCE): Greek tyrant who burned off his beard rather than trust a barber to trim it for fear the barber would cut his throat.

◦

[641] c_152r_02

This and surrounding words smudged but legible

◦

[642] c_152r_03

The final letter "-s" is missing in the original. It appears to have been cut off when the original choirs of the manuscript were cut apart during rebinding. See Smith, "Making Ms. Fr. 640," https://edition640.makingandknowing.org/#/essays/ann_326_ie_19.

◦

[643] c_152v_02

bequet: literally "a small beak." A tool used in metalworking, likely a type of vise attached to a goldsmith's table.

«

[644] c_153r_03

The principal will not melt if used with molten tin or lead because it is made of metal, a copper alloy with a higher melting point.

«

[645] c_153r_01

The marginal note appears to be in a darker ink, which may give clues to authorial intent and composition of the text.

«

[646] c_153r_02

Word obscured by inkblot

«

[647] c_154r_01

All notes in the left margin appear to be in a darker ink, which may give clues to authorial intent and composition of the text.

«

[648] c_154r_02

& letton (latten) partially obscured by inkblot but legible

«

[649] c_154v_01

Both additions in this entry, the one here in the heading and the other in the main text, appear to be in a darker ink, perhaps suggesting they were written together at a later time.

«

[650] c_156r_01

This sentence makes more sense for the process being described by reading the "or" (ou) as an "and" (et).

«

[651] c_156v_03

Correction in original: -g written over -e

«

[652] c_156v_07

lanugineux (*downy*) is written in two parts at the right margin, *lanugi* above and *neux* below

«

[653] c_156v_04

Correction in original: d- written over u-

«

[654] c_156v_05

Correction in original: -e written over -a

«

[655] c_156v_02

See figure on fol. 165v, which illustrates these instructions.

«

[656] c_157r_04

Masselote (mod. *machelotte*), from *machelote*, an "excess reserve of liquid metal for filling the mold," according to TLFi: *Trésor de la Langue Française informatisé* (Nancy: ATILF - CNRS & Université de Lorraine, 1994), <http://www.atilf.fr/tlfii>. By 1704, the word is used to designate "superfluous metal that remains in the mold after casting a cannon."

«

[657] c_157v_04

lester (*weighting*) here seems to mean weighing down the feathers, likely with the *adoub* (*dressing*) mentioned in the next sentence, to prevent them from falling out or being disturbed in the molding process.

«

[658] c_157v_02

This entry is added across the entire bottom of the page in a different, super-cursive hand (hand A', see also fol. 2v).

«

[659] c_157v_01

This heading includes multiple words with abbreviation marks. The expanded content for two words remains unclear.

«

[660] c_157v_03

Correction in original: -t written over -d

«

[661] c_158r_02

The darker ink of this marginal note may give clues about authorial intent and composition of text.

«

[662] c_158v_01

In three places on this folio (here, in the margin, and at the end of the last entry), there are changes in ink color and letter size. This may indicate later additions and provide clues to authorial intent and composition of text.

«

[663] c_158v_03

Such a press is illustrated on fol. 160r.

«

[664] c_159r_01

Likely adding eau-de-vie

«

[665] c_159v_02

This partial drawing may have been a first attempt to draw the large press illustrated on the facing page, fol. 160r.

«

[666] c_160r_01

Etrier (stirrup) refers to the metal bracket which is attached to the bottom of the screw and fixed to the upper plate of the press.

«

[667] c_160r_02

i.e., the X-shaped cross named after the instrument of martyrdom of St. Andrew, a Christian Apostle.

«

[668] c_160v_03

This mark appears to indicate that the text of the marginal note should be inserted here. This mark and the corresponding marginal note appear to be in a lighter ink, which may indicate a later addition.

«

[669] c_160v_04

Correction in original: Et written over il

«

[670] c_161r_03

This entry was written in various inks and hands. This may indicate later additions and provide clues to authorial intent and composition of text.

«

[671] c_161r_01

Latin: "bricks." Gip de lateribus likely refers to a kind of brick mortar.

«

[672] c_161r_02

The Latin nominative is alumenum. A type of alum.

«

[673] p088v_1 «

[674] c_161r_04

Latin: "Note." See corresponding marginal note that begins with the same mark and word, which are both written in a super-cursive hand, likely the author-practitioner's own in speed-writing mode (A', less cursive here than on fols. 2v and 157v). He seems to have initially placed this intervention in the previous sentence, then changed his mind.

«

[675] c_161r_05

Latin: "Note." See corresponding addition in the main text that begins with the same mark and word.

«

[676] c_161v_02

Roration (wettings) is a Latinism used to mean moisten.

«

[677] c_162r_08

Clio is also the name of Book I of the Histories of Herodotus. In Greek mythology, Clio was the muse of history.

«

[678] c_162r_01

A likely source is the 1566 Latin edition of Herodotus's Histories. See Herodotus, Herodoti Halicarnassei Historiae Lib. IX. Et de Vita Homeri Libellus, ed. Lorenzo Valla and Henri Estienne (Paris: Henri Estienne; Ulrich Fugger, 1566), 1.

[679] c_162r_02

Page references suggest a likely source is the 1566 Latin edition of Herodotus's Histories. See Herodotus, Herodoti Halicarnassei Historiæ Lib. IX. Et de Vita Homeri Libellus, ed. Lorenzo Valla and Henri Estienne (Paris: Henri Estienne; Ulrich Fugger, 1566), 1. Medea: in Greek mythology, daughter of King Aeëtes of Colchis.

[680] c_162r_11

Gyges of Lydia (7th c. BCE): King of Lydia and founder of the Mermnad dynasty.

[681] c_162r_04

Page references suggest a likely source is the 1566 Latin edition of Herodotus's Histories. See Herodotus, Herodoti Halicarnassei Historiæ Lib. IX. Et de Vita Homeri Libellus, ed. Lorenzo Valla and Henri Estienne (Paris: Henri Estienne; Ulrich Fugger, 1566), 3.

[682] c_162r_03

Latin: "Six gold bowls weighing 30 talents."

[683] c_162r_07

Alyattes of Lydia (ca. 610–560 BCE): King of Lydia and father of Croesus.

[684] c_162r_09

Croesus (595–ca. 546 BCE): King of Lydia and son of Alyattes.

[685] c_162r_10

Glaucus of Chios (8th c. BCE): Greek sculptor, often referred to as the inventor of the arts of soldering metals.

[686] c_162r_05

Latin: "Bowl of welded iron at Delphi, a notable sight among all the offerings that are at Delphi, the work of Glaucus of Chios, who alone among all discovered iron welding."

[687] c_162r_06

Latin: "welded iron"

«

[688] c_163r_03

Reading pinon as pignon (pine nut)

«

[689] c_164v_03

i.e., like a mitten

«

[690] c_165v_02

This addition appears to be in a darker ink and begins as the last line of the main text before continuing into the right margin. This may indicate that it was added at a later time.

«

[691] c_165v_03

This appears to be in a darker ink, which may indicate a later addition.

«

[692] c_165v_04

i.e., the common lute

«

[693] c_166r_01

This aphorism also appears, slightly rephrased, on fol. 1r.

«

[694] c_166r_03

Numenius Numenius (2nd c. CE): platonist philosopher; see Ambrosius Aurelius Theodosius Macrobius and Arnoldus Haldrenius Vesaliensis, In Somnium Scipionis, Libri II. Saturnaliorum, Libri VII. Ex Variis, Ac Vetustissimis Codicibus Recogniti et Aucti (Lyon: Gryphe, Sébastien, 1556), 1.2.19. Mentioned by various sixteenth-century authors, such as Juan Luis Vives, Los Comentarios de Juan Luis Vives a "La Ciudad de Dios" de San Agustín, ed. Rafael Cabrera Petit, vol. 6, Colección J.l. Vives (Ajuntament de Valencia, 2000); Vincenzo Cartari, Les Images Des Dieux, ed. Antoine du Verdier (Lyon: Guichard Julliéron, 1584), 276. The author-practitioner's knowledge that Numenius was a Pythagorean comes from elsewhere.

«

[695] c_166r_02

A similar note appears in Latin on fol. 1r. Here, the author-practitioner offers an expanded French paraphrase.

«

[696] c_166r_04

*Titus Flavius Josephus, also known as Yosef ben Matityahu (1st c. CE): Jewish priest, soldier, and historian based in Rome. The quotation in Josephus has not been identified. See Flavius Josephus, *De Antiquitate Judaica. De Bello Judaico*, ed. Rufinus Aquileiensis and Girolamo Squarciafico (Venice: Vercellensis, Johannes Rubeus, 1486).*

«

[697] c_166r_12

Cebes of Thebes (ca. 430–350 BCE): Greek philosopher, disciple of Socrates, and author of the Table of Cebes.

«

[698] c_166r_10

*The word zelotype rarely occurs in French texts, although it does appear in Randle Cotgrave, *A Dictionarie of the French and English Tongues* (London: Adam Islip, 1611), <http://www.pbm.com/~lindahl/cotgrave> and “Dictionnaire Du Moyen Français.” Paris, 2015. <http://www.atilf.fr/dmf>.*

«

[699] c_166r_06

*Latin: "Nothing is said now that has not been said or done before." This would seem to be glossing Terence (second century BCE), *Eunuchus*, Prologue: "Nothing is said now that has not been said before." The author here adds aut factum (or done), perhaps because his book is of deeds not words.*

«

[700] c_166r_13

Numa Pompilius (753–673 BCE): second King of Rome and religious founder.

«

[701] c_166r_14

Marcus Tullius Cicero (106–43 BCE): Roman statesman, philosopher, and orator.

«

[702] c_166r_15

Plato (ca. 428–ca. 347 BCE): Greek philosopher.

«

[703] c_166r_16

Publius Vergilius Maro, also known as Virgil (70–19 BCE): Roman poet under the reign of Augustus.

«

[704] c_166r_17

Homer (8th c. BCE): Greek poet.

«

[705] c_166r_20

Titus Livius (64 or 59 BCE–12 or 17 CE): Roman historian. See Titus Livius, Historiae Romanae Ab Urbe Condita, Libri 15. Quotquot Ad Nostram Aetatem Peruenerunt, Cum Commentariis Omnium Interpretum Ad Explicationem Locorum Difficilium, E Regione Insertis (Paris: Jean Charron; Michel Sonnius, 1573) and Les Decades, ed. Blaise de Vigenère, Jean Hamelin, and Antoine de La Faye (Paris: Jacques du Puys, 1583).

«

[706] c_166r_21

Polybius (208–126 BCE): statesman and historian from the Hellenistic period. See Polybius, Eklogai peri tōn presveiōn. Ex libris Polybii selecta de legationibus et alia quae sequenti pagina indicantur nunc primum in lucem edita, (Antwerp: Christophe Plantin, 1582).

«

[707] c_166r_22

Serapis: Graeco-Egyptian sun god associated with healing and fertility.

«

[708] c_166r_23

Ceres, also known as Demeter: Graeco-Roman goddess of harvest and agriculture.

«

[709] c_166r_05

Pythagoras of Samos (ca. 570–ca. 495 BCE): Greek philosopher.

«

[710] c_166r_24

Apollo: Graeco-Roman god associated with the sun, healing, knowledge, and various arts.

«

[711] c_166r_25

Chirone: in Greek mythology, a Centaur famous for his wisdom and knowledge of medicine.

«

[712] c_166r_08

Latin: "Apollo learned to medicate from Chiron, yet he is considered the god of medicine."
Source unknown. This may be common knowledge of mythology written in the author-practitioner's own Latin. NB: Apollo put Chiron in charge of Asclepius's medical education.

«

[713] c_166r_26

Orpheus: in Greek mythology, a hero endowed with superhuman musical skills.

«

[714] c_166r_28

Peleus: in Greek mythology, hero and King of Phthia, and father of Achilles.

«

[715] c_166r_29

Achilles: in Greek mythology, hero of the Trojan War and protagonist of Homer's Iliad.

«

[716] c_166r_30

*Justin Martyr (ca. 100–165 CE): Christian apologist and philosopher. On the editions of Justin Martyr, cf. André Wartelle, *Bibliographie Historique et Critique de Saint Justin, Philosophe et Martyr, 1494-1994 (Avec Un Supplément)* (Paris: Editions F. Lanore, 2001); *Justinus Martyr, Zēna Kai Serēno. Logos Parainetikos Pros Ellēnas Pros Tryphōna Ioudaiōn Dialogos. Apologia Ypo Christianōn Pros Tēn Rōmaiōn Sygklēto. Apologia B' Ypo Christianōn Pros Antōninon Ton Eusebē* (Paris: Robert Estienne, 1551); *Opera Non Ita Pridem Graece Edita, Nuper Verò Latinè Reddita* (Basel: Hieronymus Froben; Nikolaus Episcopius, 1555).*

«

[717] c_166r_09

*Latin: "Homer imitated the poem of Orpheus, for, as Orpheus had begun, 'Iram cane, dea, Cereris frugiferentis,' so Homer repeated, 'Iram cane, dea, Pelidae Achillis.' In Justin Martyr, towards the beginning." Cf. Justinus Martyr, *Opera Non Ita Pridem Graece Edita, Nuper Verò Latinè Reddita* (Basel: Hieronymus Froben; Nikolaus Episcopius, 1555), 20.*

«

[718] c_166v_02

David (10th c. BCE): biblical figure, King of Israel.

«

[719] c_166v_08

Athanasius of Alexandria (ca. 296–ca. 373 CE): theologian and statesman based in Egypt.

«

[720] c_166v_07

Latin: "in the Synopsis"

«

[721] c_166v_04

Latin: "I was small." See Bible, Ps. 151:1.

«

[722] c_166v_05

Latin: "My hands made an organ and my fingers fashioned a psaltery." See Bible, Ps. 151:2.

«

[723] c_166v_03

Uncertain reading

«

[724] c_166v_06

Latin: "dead head," i.e., residue from an alchemical operation. The term often referred to metal oxides used as pigments, such as hematite (a red/purple iron oxide).

«

[725] c_167r_01

A description of each tool depicted is given on fol. 168r–v.

«

[726] c_167v_01

Fine powder used for priming a piece of artillery.

«

[727] c_168v_01

i.e., a flange to hang it up

«

[728] c_169v_02

Likely Istrian stone (pietra d'Istria), a building stone from the Republic of Venice or, perhaps, a stone from Istres, France.

«

[729] c_169v_01

Correction in original: -s- written over -b-

«

[730] c_170r_01

This marginal note is oriented 90 degrees clockwise to the main text and continues the last entry on this page which ends with a corresponding mark.

«

[731] c_170r_03

Trampe is translated here as "tempered" but could also be "quenched."

«

[732] c_170r_02

This continues in the margin indicated by a corresponding mark.

«

[733] c_170v_12

This whole page is upside down. The first half of this page (now found at the bottom) is in a different hand (hand E, semi-calligraphic) and records payments of rent to the heirs of Sieur Ouvrier. It is struck through with diagonal lines and is separated from the subsequent text by a horizontal line. The second half of the page (now at the top), is in the author-practitioner's main hand (hand A). This suggests that he took a bound, mostly-blank book—perhaps a book recording accounts such as the ones found here—struck through the account records, and began to record medical recipes and a list of titles under them. Then, when he ran out of room, he flipped the entire book over, turned it upside down, and began writing on what now is the first folio of the manuscript (fol. 1r).

«

[734] c_170v_13

The Ouvrier family (sometimes d'Ouvrier) was a prominent family in Toulouse (late 15th–18th c.), with some of its members serving in the city Parliament. Benoît Ouvrier (d. 1573), a merchant who owned a house located on the “rue des Fleurs,” near the Mint, is probably the feu sr Ouvryer mentioned here. The Ouvrier family had ties to the Du Cros family (see fol. 9v) through two marriages, one between Jean Ouvrier and Anne Du Cros in 1586, and the other between Gabriel Ouvrier (his brother) and Françoise Du Cros in 1592. See Debuiche and Muñoz, "Le Ms. Fr. 640 et le contexte toulousain," https://edition640.makingandknowing.org/#/essays/ann_312_ie_19.

«

[735] c_170v_14

Saint-Frajou: Haute-Garonne, district of Saint-Gaudens, canton of Isle-en-Dodon (approx. 65 km SW of Toulouse)

«

[736] c_170v_03

The meaning of this mark, visible under the paper strip in the right margin when the page is back-lit, is uncertain. It may be the symbol for the livre, though this currency is already mentioned in the same line. It may also be a hash-like mark indicating that the writer (hand E, semi-calligraphic) intended to continue this thought elsewhere on the page but forgot.

«

[737] c_170v_15

Scabieuse (*scabious*) seems to refer to several kinds of plants, not all of which belong to the genus *Scabiosa* in modern botany.

«

[738] c_170v_30

Otto I of Freising, also known as Otto Frisingensis (ca. 1114–1158): Bishop of Freising and chronicler.

«

[739] c_170v_25

A twelfth-century chronicle: Otto Frisingensis and Benedictus Chelidonius, *Rerun ab origine mundi ad ipsius usque tempora gestarum, libri octo*. *Eiusdem de gestis friderici primi aerobarbi caes.aug. Libri duo. Radevici phrisingen. Ecclesie canonici libri duo, prioribus additi, de eiusdem friderici imp. Gestis* (Strasbourg: Matthias Schürer, 1515); Otto Frisingensis et al., *De eiusdem frid. Gestis libri ii de gestis friderici i. Caes. Aug. Libri duo libri duo de eiusdem friderici imp. Gestis ligurini de gestis imp. Caesaris friderici primi augusti libri decem ligurinus, sive de gestis friderici, libri x. Ottonis episcopi frisingensis leopoldi pii marchionis austriæ f. chronicon, sive rerum ab orbe condito ad sua usque tempora gestarum, libri octo. Eiusdem de gestis friderici i.caes.aug.libri duo. Radeuici frising.canonici de eiusdem frid. Gestis libri ii. Priorib.additi. Guntheri poëtae ligurinus, sive de gestis friderici, libri x. Addita sunt et alia, cum ad friderici, tum ad posteriorum imperatorum historiam pertinentia, adiectis etiam notis et indice accurato* (Basel: Peter Perna, 1569). The reference here points to the 1569 edition.

«

[740] c_170v_16

Latin: "Vinegar made from rue, juniper berries crushed together. With this vinegar red-hot bricks shall be extinguished and the vapor shall be received through the mouth & nostrils."

«

[741] c_170v_17

Aer infaict (infected air) connotes a tiny amount of morbid substance spreading throughout the air, analogous to dye tinging clear water.

«

[742] c_170v_19

Perhaps referring to seeds of the juniper berries mentioned in the Latin passage above.

«

[743] c_170v_31

*Conrad of Licthenau (d. 1240): German nobleman and provost of Ursberg Abbey. He is thought to be the author of the *Chronicon urspergense*.*

«

[744] c_170v_26

*Burchard of Ursperg, *Chronicum abbatis urspergensis, a nino rege assyriorum magno, usque ad fridericum ii.romanorum imperatorem, ex optimis autoribus recognitum, et innumeris mendis repurgatum* (Strasbourg: Kraft Müller, 1537).*

«

[745] c_170v_32

Girolamo Mercuriale (1530–1606): physician from Forlì and professor of medicine in Padua, Bologna, and Pisa.

«

[746] c_170v_27

*Girolamo Mercuriale, *Liber responsorum et consultationum medicinalium* (Basel: Konrad von Waldkirch, 1588).*

«

[747] c_170v_04

*This list of six titles in Italic script seems to be continued on fol. 1r with the singular Italic title, *Aquatilium animalium historiæ*, found near the bottom of the page. This might indicate that when the author-practitioner ran out of room here, he turned the entire bound text over and upside down to start writing on what is now the first folio of the manuscript.*

«

[748] c_170v_20

*George Buchanan, *Rerum Scoticarum Historia Auctore Georgio Buchanano Scoto* (Edinburgh: Arbuthnet, Alexander, 1582).*

«

[749] c_170v_33

George Buchanan (1506–1582): Scottish historian and humanist.

«

[750] c_170v_34

Rembert Dodoens, also known as Rembertus Dodonaeus (1517–1585): physician and botanist from Mechelen.

«

[751] c_170v_21

Rembert Dodoens, Trium Priorum de Stirpium Historia Commentariorum Imagines Ad Vivum Expressae Una Cum Indicibus, Graece, Latine, Officinarum, Germanica, Brabantica Gallicaque Nomina Complectentibus (Antwerp: Loe, Jan van der, 1553).

«

[752] c_170v_35

Philibert de l'Orme, also known as Delorme (1514–1570): French architect.

«

[753] c_170v_22

Philibert Delorme, Nouvelles Inventions Pour Bien Bastir et a Petits Fraiz (Paris: Morel, Féderic, 1561).

«

[754] c_170v_36

Bernardino Telesio, also known as Bernardinus Telesius (1509–1588): Italian philosopher and natural scientist.

«

[755] c_170v_23

*Michel de Vascosan (ca. 1500–1576): Parisian printer. He is the publisher of Simone Porzio, *De coloribus libellus, Latinitate donatus, et commentariis illustratus una cum praefatione, qua coloris naturam declarat* (Paris: Michel de Vascosan, 1549), which the author-practitioner seems to confuse with Antonio Telesio, *Libellus de Coloribus. Ubi Multa Leguntur Praeter Aliorum Opinionem* (Venice: Vitali, Bernardino, 1528). Telesius is often associated (i.e., bound, printed) with works of French humanist Lazare de Baïf (1496–1547). See Franck Collin, "Antonio Telesio de Cosenza, Petit Traité Des Couleurs Latines (de Coloribus Libellus), éd. Michel Indergand et Christine Viglino," *Cahiers de recherches médiévales et humanistes*, 2010.*

«

[756] c_170v_37

Marbodus of Rennes, also known as Marbode and Marbœuf (1040–1123): Bishop of Rennes.

«

[757] c_170v_24

Marbodus Redonensis, Libellus de Lapidibus Preciosis (Vienna: Vietor, Hieronymus, 1511).
This work was reprinted frequently throughout the sixteenth century.

«

[758] c_170v_38

Albertus Magnus, also known as Albert of Cologne and St. Albert (ca. 1200–1280): Dominican friar, bishop, theologian, and philosopher.

«

[759] c_170v_28

Albertus Magnus, De mineralibus (Venice: Johannes de Gregoriis and Gregorius de Gregoriis, 1495).

«