

A

HERMETIC

TREATISE

*On the Counterfeiting of Precious Metals
and of the Counterfeiting of
Precious Stones*

Being the Second and Third
Degree work of the Physical
Hermetic Art and Practice of
Alchemy

As is followed by the Knights of
Barset
with divers selected Hermetic
diagrams from the Treatise on
Alchemy by *Hominus*



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The Proems

We are now come (according to the order which we proposed unto ourselves in the beginning), wherein not only a great part of the world is much conversant, but also everyone is very desirous to be a practitioner in them, and doth thirst after them with an unquenchable lust. Wherefore we are constrained to speak something concerning this subject the rather, because many rude and unskillful men, being drawn on, partly by the hope of gain, which they looked for by it, and partly by the pleasure and delight which they did take in it, have bestowed themselves in these experiments to the great slander both of the Art itself, and also of the professors thereof; so that nowadays, a man cannot handle it without the scorn and obloquy of the world, because of the disgrace and contempt, which those idiots have brought upon it. For whilst they, being altogether ignorant of the Principles of these things, have labored to make sophisticated and counterfeit gold, they have utterly miscarried in their endeavours, and wasted all their substance, and quite undone themselves, and so were deluded by the vain hope for Gold, which set them on work. Demetrius Philereus said very well of these men, That which they should have gotten, saith he, they did not get, that which they had in their own possession, they lost, and so, whereas they hoped to work a metamorphosis or alteration in the Metals, the alteration and change hath lighted heavily upon themselves, in respect to their own estate; and when they have thus overthrown themselves, they have no other comfort left them but onely thus, to broach many lies and counterfeit devices, whereby they likewise deceive others; and draw them into the very same lurches, which they themselves have before. And surely the desire, partly of the Art itself, and partly of the great gain which a great many men hoped after by the same, hath filled the world with so many Rocks, and such an infinite number of lies, that there is scarce any other matter in the like request; so that it was very well done of Dioclesian the Emperor, and it was high time for him so to do, to establish a Decree that all such lying Books that were written concerning that matter, should be cast into the fire and burnt to ashes. This was an excellent good Art discredited and disgraced by reason that they abused it: which falls out also in many other better things then this is. The Art of itself which is be set at naught, but rather to be embraced and much to be sought after especially by such as apply their minds to Philosophy, and to the searching out of the secrets of Nature: for they shall find in it many things which they will wonder at, and such as are exceedingy necessary for the use of men: and when they shall behold the experience of many kinds of transmutations and sundry effects; it will be no small delight unto them; and besides it will show them the way to profounder and worthier matters, such as the best and soundest Philosophers have not been ashamed to search into, and to handle in their writings. I do not here promise any golden

mountains, as they say, nor yet that Philosopher's Stone which the world hath so great an opinion of, and hath been bragged of in so many ages, and happily attended unto by some; neither yet do I here promise that golden liquor, where of if any man do drink, it is supposed that it will make him to be immortal; but it is a mere dream; for seeing that the world itself is variable and subject to alteration, therefore it cannot be but that which seeith the world yields, should likewise be subject to destruction; so that to promise to undertake any such matters as these are, it were best understand mere foolishness. But the things which we purpose to discourse of and to detail are these which here fier follow; and I would request the Readers to take the main good part, and to content themselves with these; lest if they attempt to proceed to further experiments herein, they prove themselves as foolish and as mad as those which we have spoken of before. These things which here you shall find, I myself have seen, and proved by experience, and therefore I am the bolder to set them abroach to the view of the whole world.

Chap. I.

Of Tin, and how it may be converted into a more excellent Metal

Tinne doth counterfeit and resemble Silver; and there is great amity and agreement betwixt these two Mettals in respect to their colour. The Nature and the colour of Tinne is such, that it will whiten all other Mettals; but it makes them brickle and easie to be knapt in sunder: onely Lead is free from this power of Tinne: but he that can skillfully make a meddly of this Mettal with others, may thereby attain to many pretty secrecies. Wherefore, we will endeavor to counterfeit Silver as near as we can: A matter which may be easily effected, if we can tell how to abolish and utterly destroy those imperfections which are found in Tinne, whereby it is to be discerned from Silver. The imperfections are these: First, it is want to make a creaking noise, and crasheth more then Silver doth: Secondly, it doth not ring to pleasantly as Silver, but hath a duller sound: Thirdly, it is of a more pale and wane color: And lastly, it is more soft and tender; for if it be put into the fire, it is not first red hot before it be melted, as Silver will be; but it clings fast to the fire, and is soon overcome and molten by the heat thereof. These are the qualities that are observed to be in Tinne; not the essential properties of the Nature thereof, but onely accidental qualities, and therefore they may be more easily expelled out of their subject. Let us see therefore how we may rid away these extsinsecal accidents: and first,

How to remedy the softness of Tin; and the creaking noise that it makes.

You must first beat it into small powder, as you shall hereafter be instructed in the manner how to do it; and when you have so done, you must reduce it to one whole body again. And if it do not lose its softness at the first time as you deal so by it, use the same course the second time, and so likewise the third time rather than fail, and by this means you shall at length obtain your purpose: for, by so doing the Tin will wax so hard, that it will endure the fire till it be red hot, before ever it will melt. By the like practice we may also harden all other soft bodies, to make them red hot before they shall be melted: but the experience thereof is more clear in Tinne then in any other Mettals whatsoever. We may also take away the creaking noise of Tinne, if we melt it seven several times, and quench it every time in the urine of children; or else in the oyl of Wall-nuts: for this is the only means to expel that quality and imperfection out of it. Thus then we have declared the manner how to extract these accidents from it: but all this while we have not shewed how it may be transformed into Silver: which now we are to speak of, as soon as ever we have shewed the manner.

How to Bring Tin into Powder,

which we promised to teach. Let your Tinne boil in the fire, and when it is very liquid, pour it forth into a stout mortar: and when it beginnith to wax cold, and to be congealed together again, you must stir it and turn it round about with a wooden pestle, and not let it stand still in any case; thus shall you cause it to be congealed into very small crums as little as dust: and when you have so done, put it into a very fine ranging sieve, and sift out the smallest of it; and that which is left behind in your sieve, because it is too great and not broken well enough, you must put it into the fire again, and use the very same course with it to break it into smaller dust, as you used before; for unless it be thoroughly broken into powder, it is not serviceable, nor fit for your purpose. Having therefore shewed you how to break your Tin into small crums, also how expel out of it those imperfections whereby it is made manifestly discerned from Silver, knowing these things are very necessary preparatives as it were to the main matter which we have in hand, let us now come to the principal experiment it self, namely

How to alter and transform Tin, that it may become silver,

You must take an earthen vessel, somewhat wide mouthed; but it must be very strongly and firmly made, that it be thoroughly able to endure the vehemency of the fire, even to be red hot. Into this vessel put your Tin broken into such small crums as have been spoken of, and therein you must with an iron ladel stirre it up and down continuously without

ceasing, till it be all on a light fire, and yet none of the Metal to be melted; when you have so done, that you have given it over, and it gathereth together in one body or lump again, you must bestow upon it the very same labour upon it the second time, so long as it may stand in small crums all on a fire for the space of six hours together, without melting. But if some part of the Metal be melted by the vehement heat of the fire, and some other part of it remain non melted, then you must take away that which is melted, and when it is congealed, you must break it into small powder once again, and you must run over your whole labour again with it, even in the same vessel and with the same instrument a before. After this, when you have brought all your Metal into that perfection, it will endure the fire without melting, then you must put it into a glass fornace where glass is want to be made, or else into some Oven that is made of purpose to reflex the heat of the fire to the best advantage, and there let it be tormented and applied with a very great fire for the space of three or four days together until such time as it is made perfectly white as snow: for the smaller that it is broken and beaten into powder, the more perfectly it will take white, and be the fitter for your purpose, and more exactly satisfy your expectations. After all this, you must put it into a vessel that shall be almost full of vinegar, and the vinegar must cover all the Tinne, and swim about three inches above it. There you must distill it and let the vinegar boil with it so long, till the Tinne hath coloured it, and made of it his own hue and thickened it into a more gross substance. Then let it stand a while, and when it is thoroughly settled, pour out the vinegar and put in new, and temper it well with those ashes or crums of Tinne; and this you must do again and again, till all of your Tinne be dissolved in the vinegar. If by this often repetition of this labour, you cannot effect such a dissolution, then you must put it once again to the fire in such a fornace, or else into such an Oven as we spake of before, that so it may be reduced into white ashes more exactly and perfectly, whereby it may be more easily dissolved into vinegar. After this, you must let vapour of the vinegar be exhaled and drained out, and the Tinne that is left behind must be put into a certain vessel where ashes have been wont to be put, and then melt some fine Lead and put amongst it; and because the Lead that is put in will bear up the Tinne aloft, therefore you must make certain little balls or pills compounded of Soap and Lime, or else of Salt-peter and Brimstone, or some other like fat earthy stuff, and cast them in amongst the Lead and Tinne, and they will cause the Tinne to drench it self within the Lead: and by this means, all your Tinne that doth take the Lead, and is incorporated into it by a just proportion and equal temperance, doth become very excellent good Silver. But this is a marvelous hard labour, and not to be achieved without very great difficulty. You may likewise alter and transform.

Tinne into Lead

An easie matter for any man to effect, by reducing Tinne into ashes or powder often times: for the often burning of it will cause the creaking noise which it is want to make. To be voided from it, and so to become Lead without anymore ado; and especially, if you use a convenient fire, when you go about to reduce it into powder.

Chap. II

Of Lead and how it may be converted into another Metal

The Adept Writers that have been conversant in the Natures of Metals, are wont to call Tinne by the name white Lead; and Lead by the name of black Tinne; insinuating thereby the affinity of the Natures of these two Metals, that they are very like each to another, and therefore may very easily be one of them transformed into the other. It is no hard matter therefore, as to change Tinne into Lead, which we have spoken of in the former Chapter, so also.

To Change Lead into Tinne

It may be effected onely by bare washing of it: for if you bath or wash Lead often times. That is if you often melt it, so that the dull and earthy substance of it be abolished, it will become Tinne very easily: for the same quick-silver, whereby the Lead was first made a subtil and pure substance, before it contracted that soil and earthiness which makes it so heavy, doth still remain in the Lead, as Gebrus hath observed; and this is it which causeth that creaking and gnashing sound, which Tinne is wont to yield, and whereby it is especially discerned from Lead: so that when the Lead hath lost its own earthy lumpishness, which is expelled by often melting; and when it is undued with the sourd of Tinne, which the quick-silver doth easily work into it, there can be no difference put betwixt them, but that the Lead is become Tinne. It is also possible to transform

Antimony into Lead:

For, that kind of Antimony which the Alchemists are wont to call by the name Regulus, if it be often times burned in the fire, and he hath thoroughly boiled, it turneth into Lead. This experiment is observed by Dioscorides, who saith, That if you take Antimony and burn it exceedingly in the fire, it be converted into Lead, Galen sheweth another experiment concerning Lead, namely,

How to procure Lead to become heaver, then of itself it is:

For, whereas he had found by his experience, that Lead hath in itself an aethereal or airy substance, be brings this experiment. Of all the Mettals, saith he, that I have been acquainted with, only Lead is increased both in bigness and also in weight for, if you lay it up in cellars and such other places of receipt that are under the ground, wherein there is a turbulent and gross foggy air, so that whatsoever is laid up in such rooms shall straightaways gather filth and soil, it will be greater and weightier then before it was. Yea, even the very clamps of Lead which have been fastened into carved Images to knit their parts more strongly together, especially those that have been fastened about their feet, have been divers times found to have waxed bigger; and some of those clamps have been seen to swell so much, that whereas in the making of such Images the leaden plates and pins were made level with the Images themselves, yet afterwards they have been so swoln, as that they have stood forth like hillocks and knobs very unevenly, out of the Christal stones whereof the Images were made. This Lead, is a Mettal that hath in it great store of quick-silver, as may appear by this, because it is a very easie mastery,

To extract Quick-Silver out of Lead.

Let your Lead be filed into very small dust, and to every two pounds of Lead thus beaten into powder, you must put one ounce of Salt-Peter, and one ounce of common Salt, and one ounce of Antimony. Let all these be well beaten and powned together, and put into a sieve; and when they are well sifted, put then into a vessel made of glass, and you must fence and plaister the glass round about on the outward side with thick loam tempered with chopped straw, and it must be laid on very fast; and that it may stick upon the vessel the better, your glass must not be smooth, but full of rigoles, as if it were wrested or writhen. When your vessel is thus prepared, you must settle and apply it to a reflexed fire, that is, to a fire made in such a place, as will reflect and beat back the heat of it with great vehemency to the best advantage: and underneath your vessels neck, you must place a large pan, or some other such vessel of great capacity and receipt, which must be half full of cold water: then close up very fast and sure, and let your fire burn but a little, and give but a small heat for the space of two hours; afterwards make it greater, so that the vessel may be thoroughly heated by it, even to be red hot; then set a blower on work, and let him not leave off to blow for the space of four whole hours together, and you shall see the quick-silver drop down into the vessel that is half full of water, being flighted, as it were, out of the Mettal by the vehement force of the fire. Commonly the quick-silver will stick to the sides of the vessels neck, and therefore you must give the neck of the vessel a little jolt or blow with your hand, that so the quick-silver may fall downward into the water-vessel. By this practise I have

extracted oftentimes out of every pound of Mettal almost an whole ounce of quick-silver; yea, sometimes more than an ounce, when I have been very diligent and laborious in performing the work. Another experiment I have seen, which drew me into great admiration,

Lead converted into quick-silver:

A counterfeiting practice, which is the chief cause that all the quick-silver almost which is usually to be had, is but bastard stuff, and meerly counterfeit; yet it is bought and sold for currant, by reason of the near likeness that it hath with the best. Let there be one pound of Lead melted in a earthen vessel, and then put into it also one pound of that Tinny metal which is usually called by the name of Marchasite: and when they are both melted together, you must stir them up and down and temper them to a perfect medley with a wooden ladle: in the mean space you must have four pounds of quick-silver warmed in another vessel standing by, to cast in upon that compounded Mettal; for unless your quick-silver be warm, it will not close nor agree well with your Mettals: then temper your quick silver and your Mettal together for a while, and presently after cast it into cold water; so shall it not congeal into any hard lump, but flote on the top of the water, and be very quick and lively. The onely blemish it hath, and that which onely may be excepted against it, is this, that it is somewhat pale and wan, and not all things so nimble and lively as the true quick-silver is, but is more slow and slimy, drawing as it were a tail after it, as other viscous and slimy things are wont to do. But put it into a vessel of glass, and lay it up for a while; for the longer you keep it, the quicker and nimbler it will be

Chap. III

Of Brass; and how to transform it into a worthier Mettal.

We will now alledge certain experiments concerning Brass; which though they are but slight and trivial, yet we will not omit to speak of them, because we would fain satisfie the humour of those, who have a great desire to reach of and be acquainted with such matters. And here we are to speak of such things that are good to stain the bodies of Mettals with some other colour then naturally they are endued withal. Yet I must needs confess that these are but fained and counterfeit colourings, such as will not last and stick by their bodies forever; neither are they yet able to abide any trial, but as soon as ever they come to the touchstone, they may easily be discerned to be but counterfeits. Howbeit, as they are not greatly to be desired, because they are but deceivable, yet not withstanding they are not utterly to be rejected as things of no value. And because there are very Books extant which Treat of any Argument of like

kind as this is, but they are full of such experiments and delights as these offer themselves to be handled by us (for they are very common things, and in every mans mouth) therefore we will in this place speak onely of those things which are easily to be gotten, and yet carry with them a very goodly show, insomuch that the best and sharpest censure may be deluded and mistaken by the beautiful gloss that is cast upon them; and it may gravel the quickest and skillfullest judgement, to define upon the suddain whether they are true or counterfeit. Yet let them be esteemed no better then they deserve. But this you must know, that as slight and trivial as they are, yet they require the handling of a very skilful Artificer: and whosoever thou art that goeth about to practice these experiments, if thou be not a skilful and well experienced workman thy self, be sure to take the advice and counsel of those that are very good Artists in this kind; for otherwise thou will certainly miscarry in them, and be defeated of thy purpose. The chief and especial things which are of force to endue Brass with a whiter colour, are these: Arsenick or Oker; that kind of quick-silver which is sublimated, as the Alchymists call it; the scum or froth of silver, which is called by the Greeks Lithargyron: the Marchasite or fire-stone; the Lees of wine; that kind of Salt which is found in Africk under the sand, when the Moon is at the full; which is commonly called Salt Ammoniack; the common and ordinary Salt which the Arabians call by the name Al-hali; Salt-peter, and lastly Alome. If you extract the liquor out of any of these, or out of all these, and when it is dissolved, put your Brass, being red hot, into it to be quenched, your Brass will become white: Or else, if you melt your Brass, and assoon as it is molten, put it into such liquor, your Brass will become white: Or else, if you draw forth into very small and thin plates, and pown those bodies we now speak of, into small powder, and then cast both the brass that is to be coloured, and the bodies that must colour it, into a melting or casting vessel, and there temper them together in a good medley, and keep them a great while in the fire, that it may be thoroughly melted, the brass will become white. Or else, if you melt your brass, and then cast upon it some of the colouring in small lumps, (for if you cast in powder and dust, it is a doubt that the force and rage of the fire will utterly consume it, so that it shall not be able to infect or stain the metal) but if you cast good store of such colouring upon the molten brass, it will endue your brass with a strange and wonderful whiteness, insomuch that it will seem to be very silver indeed. But that you may learn the better, how to work such experiments, and besides, that you may by occasion of those things which are here set down, learn how to compound and work other matters, we will now set forth unto you certain examples, how we may make

Brass to counterfeit Silver:

for when once you are trained up a little in the practice of these matters, then they will sink more easily into your understanding, then by all your reading they can do: therefore as we have spoken of such things as will do this feat, so also we will teach you how to work artificially. Take an earthen pot, and set it upon the fire with very hot coals heaped around it; put lead into it, and when you see that your lead is molten by the force of the fire, take the third part of so much silver as there was lead, and pown it into small powder, and put it to the lead into the pot; but you must sprinkle it in onely by little and little, that it may be scorched, and even burned as it were by the heat of the fire, and may float like it were oyle on the top and surface of the lead, and some of it may be so wasted by the vehemency of the heat, that it vanish away into the smoak. Then let them rest awhile, so long as there be any remainders of the coals left. After you have so done, break the vessel into pieces, and take away the scum and dross of the metal; and whereas there will stand on the top of the metal a certain oyl as it were, or a kind of gelly, you must take that, and bray it in a mortar, and cast it into a vessel by little and little where there is brass melted, and though the brass be three times so much in weight as that gelly is, yet the gelly will endue all that brass with a white silver colour. Nay, if there be more then three times so much melted brass put into that metal, it will make it all like unto silver. But if you would have your brass endued with a perfect white colour, and not discernable from silver, you must melt some silver and some brass together, and then throw them into the fire, and so take them out again after some short time; for the longer you suffer them in the fire, the worse will your experiment succeed. Which is a matter most worthy to be observed in these cases: for if your work continued any longer in the fire then need requires, it will fade in colour, and the violence of the fire will countermand and the operation and effect of your skil and labour in tempering the mettals together, and to the brass will recover his former colour in his first estate. Wherefore let your metals be kept in the fire as little while as you can, that you may make your brass whiter, and in colour most like unto silver: howbeit, though you have made it never so white, yet in time it will wax blackish and dim again; for the Arsnick that is naturally incorporated into the brasse, will always strive to restore it to the former durkish and dim colour which it is by nature endued withal. We will now also teach you another way how to make

Brass into counterfeit Silver:

and this is a more excellent and notable experiment then the former. Take six ounces of Lees of wine, eight ounces of Cristal Arsnick, half an ounce of quick-silver that hath been sublimated, two ounces of Salt-peter, one ounce and an half of glass; beat all these together in a mortar, and see that they be broken into the smallest bowder and dust that may

be. After this take three pounds of Copper, that which is commonly called Banda Mediolanensis; this you must have to be drawn out into small thin and slender plates; and when you have thus prepared your mettals and ingredients, you must take of that powder, and sprinkle it into an earthen pot by little and little, and withal put into the same pot your slender plates of Copper; and these things you must do by course, first putting in some of your powder, and then some of your Copper, and afterward some powder again, and afterward some of your little plates again, and so by turns one after another, til the pot be brim-full: then set a cover upon your pot, and plaister it all over singularly well with good stiffe mortar that is tempered with chopped straw; then bind it round about with bands and clamps of iron; and trust it up very hard and stiffe together, and then cover it over again with such mortar as before. Afterward let the pot be made hot with a great fire made round about it. The manner of the heating of your pot must be this: set the pot in the Centre as it were, that the fire may lye as it were in the circumference round about it to the distance of one foot from the Centre; a little after this, move you fire nearer to the pot, that there may not be above the distance of half a foot betwixt them; then within a while lay the fire a little nearer, and so by little and little let the fire be brought close to the pot, yea and let the pot be covered all over with hot burning coals, within the space of one hour, and so let it stand hidden in the fire for the space of six whole hours together. And after the six hours, you must not take away the coals, but let them go out and die of themselves, and let the pot so stand under them until it be dark cold: and when it is thoroughly cold, break it into pieces, and there you shall find your little thin little plates so brittle, that if you do but touch them somewhat hard with your fingers, they will soon be crumbled into dust. When you have taken them out of the pot; you must afterward put them into some casting vessel that is very hard, and durable; and there within half an hour it will be melted: then put into it some of your powder little and little, till all if it be molten together; then cast it all forth into some hollow place, into some form or mould, that it may run along into rods; and the metal will be as brittle and as easie to be broken into small crumbs, as any Ice can be. After all this, you must melt two pounds of brass; but you must first purifie and cleanse it a little, by casting upon it some broken glass, and Lees of wine, and Salt-ammoniack, and Salt-peeter, every one of them by turns, and by little and little. When you have thus cleaned it, you must put unto it one pound of that metal which you made of the Copper and powder before spoken of; and you must still sprinkle upon them some of that powder; and after all this, you must take half so much of the best silver that may be gotten, and melt it amongst the metals before spoken of and cast them all together into some hollow place like a mould, and lo you shall obtain your purposes. But that the surface and the utmost out-sides of the metal may appear white, you must throw it

into the fire, that it may be burning hot, and then take it forth, and cast it into that water wherein the Lees of wine and ordinary salt have been liquefied and dissolved; and there let it boil for a certain time and so shall you make it very white, and moreover so pliant and so easie to be framed and wrought to any fashion, that you may draw it through any little hole, yea even through the eye of a needle. Furthermore, this is not to be omitted nor buried in silence, for it is a matter of great use, and special force in the colouring of metals, that they be inwardly cleansed and purged of their dross, that they may be thoroughly washed and rid of all such scum and offals, as are incident unto them; for being thus handled, they will be more serviceable and operative for all experiments. As for example; let brass be molten, and then quenched in vinegar, and then reduced into powder with salt, so that the more gross and infectious parts thereof be extracted from it; and let it be so handled oftentimes, till there be nothing of its natural uncleanness remaining with it, and so shall it receive a deeper dye, and be changed into a more lively colour. Let the vessel wherein you melt your metals to prepare and make them fit for your turn be bored thorough in the bottom with sundry holes, that the metal being melted may strain through; but the dross, and the scum, and offals of it may be left behind, that there may be nothing but pure metal to be used in your experiments: for the less drosse and offals that your metal have, they are so much them more serviceable for your use in working. Let this therefore be a general rule always to be remembered and observed, that your metals be throughly purged and rid of their dross as much as may possibly be, before you ever entertain any of them into your service for these intendments. There is yet also another way whereby we may bring to pass that

Brass should resemble silver,

And this by Arsnick Orpine, which is an effectual means to accomplish this matter: and whereas in tract of time the metal will somewhat recover it self to its own former paleness and dim colour, we will seek to remedy it and prevent it. Take the best Arsnick Orpine that may be gotten, such as yawns and gapes as though it had scales upon it; it must be of a very orient gold colour; you must meddle this Orpine with the dust of brass that hath been filed from it, and put into them some Lees of wine; but they must be each of an equal weight and quantity when you drench them together within the liquor, and so shall it bear a continual orient colour, and glitter very brightly without ever any fading at all. After this, take you some silver, and dissolve with that kind of water which is called Aqua-fortis but it must be such as hath in it very little store of moisture; for the most waterith humour that is in it, must be evaporated in some scalding pot or other such vessel, which you must fill up to the brim six or seven several times, wick the same water, after the vapours of it have

been extracted by the heat of the fire that is under the vessel: when you have thus done, you must mingle your silver that is so dissolved, with the brass filings, and the Arsnick Orpine which we spake of before; and then you must plain it and smooth it all over with the red marble-stone, that the cleits or scales before spoken of, may be closed up; and withal, you must water it by little and little, as it were drop after drop, with the oyle that hath been expresst or extracted out of the Lees of wine, or else out of the firmest Sal-ammoniack that may be had. And when the Sun is gotten up to any strength, that it shews forth it self in very hot gleams, you must bring forth this confection, and let the force of the heat work upon it, even till it be thorough dry; afterward you must supple it with more of the same oyle again, and then let it be dried up again so long, till that which is remaining do weigh just so much as the silver weighed before it was dissolved. Then close it up in a vessel of glass, and lay it under some dunghill till it be dissolved again, and after the dissolution be gathered together into a Gelly, then you must, pour it forth, and cast into small rods and beat it with hammers till very brittle and will easily be broken; then dissolve it with Aqua-fortis, such as is compounded of vitriol and Alome tempered together: set it upon hot cinderstill it boil, and be dissolved into vapour, and so quite vanish away; and the subsiderence thereof, or the rubbish that remains behind, it will be reduced into one solid body again, If you would

Make Iron to become whiter,

You may effect it by divers and sundry fleights; yet let this onely device content you in this matter. First, you must cleasne and purge your Iron of that dross and refuse that is in it, and of that poysoned corruption of rust that it is generally infected withal: for it hath mere earthly substance and parts in it then any other metal hath, insomuch that if you boil it and purge it never so often, it will still of it self yield some new excrements. To cleanse and purge it this is the best way: Take some small thin plates of Iron, and make them red hot, and then quench them in strong lye and vinegar which have been boiled with ordinary Salt and Alome; and this you must use to do with them oftentimes, till they be somewhat whitened: the fragments or scrapings also of Iron, you must pown in a mortar, after they have been steeped in salt; and you must bray them together till the salt be quite changed, so that there be no blackness left in the liquor of it, and till the Iron be cleansed and purged from the dross that is in it. When you have thus prepared your Iron, you must whiten it on this manner: Make a plaister as it were, of quick-silver and lead tempered together; then pown them into powder, and put that powder into an earthen vessel amongst your plates of Iron that you have prepared to be whitened: close up the vessel fast, and plaister it all over with mortar, so that there be no breathing place for any air either to get in or

out: then put it into the fire, and there let it stay for one whole day together, and at length encrease your fire, that it may be so vehement hot as to melt the Iron; for the plaister or confection which was made of lead and Quick-silver, will work in the Iron two effects; for first, it will dispose it to melting, that it shall soon be dissolved; and, secondly, it will dispose it to whitening, that it shall sooner receive a glittering colour. After all this, draw forth your Iron into small thin plates again, and proceed the second time in the same course as before, till you find it hath taken so much whiteness as your purpose was to endue it withal. In like manner, if you melt it in a vessel that hath holes in the bottom of it, and melt with it lead, and the Marchasite or fire-stone, and Arsnick, and such other things as we spoke of before in our experiment with brass, you may make Iron to become white. If you put amongst it some silver, though it be not much, it will soon resemble the colour of silver: for the Iron doth easily suffer it self to be melted with gold or silver; and they may be so thoroughly incorporated into each other, that by all the rules of separation that can be used, you cannot without great labour, and very much ado separate the one of them from the other.

Chap. V.

Of Quick-silver, and of the effects and operations thereof.

In the next place it is meet that we speak something concerning Quick-silver and the manifold operations thereof: wherein we will first set down certain vulgar and common congelations that it makes with other things, because many men do desire to know them; and secondly, we will shew how it may be dissolved into water, that they which are desirous of such experiments, may be satisfied herein. First therefore we will shew.

How Quick-silver may be congealed and curdled as it was with Iron,

Put the quick-silver into a casting vessel, and put together with it that water, which the Blacksmith hath used to quench his hot Iron in; and put in also among them Ammoniack Salt, and Vitriol and Verdegrease, twice so much of every one of these, as there was quick-silver; let all these boil together in an exceeding great fire, and still turn them up and down with an Iron slice or ladle; and if at any time the water boil away, you must be sure that you have in readiness some of the same water through hot to cast into it, that it may supply the water which the fire hath made, and yet not hinder the boiling; thus will they be congealed all together in the space of six hours. After this you must take the congealed stuff when it is cold, and binde it up hard with your hands with leather thongs, or linen cloth, or others, that all the juice and moisture that is in it, may be

squeezed out of it; then let that which is squeezed and drained out; settle it self, and be congealed once again, till the whole confection be made: then put it into an earthen vessel well washed, and amongst it some spring-water, and take off as neer as you can, all the filth and scum that is upon it and is gone to waste; an in that vessel you must temper and diligently mix together your congealed matter with spring-water, till the whole matter be pure and clear: then lay it abroad in the open air three days and three nights: and the subject which you have wrought upon will wax thick and hard like a shell or a tile sheard. There is also another congelation to be made with quick-silver,

Congelation of Quick-silver with balls of Brass,

thus: make two Brass half circles, that they may fasten one within the other, that nothing may exhale; put into them quick-silver, with an equal part of white Arsenick and Tartar well powdered and searced; lute the joynts well without, that nothing may breathe forth, so let them dry, and cover them with coles all over for six hours: then make all red hot, then take it out and open it, and you shall see it all coagulated and to stick in the hollow of the Brass ball; strike it with a hammer, and it will fall off; melt it, and project it, and it will give an excellent colour like to Silver, and it is hard to discern it from Silver. If you will, you may mingle it with three parts of melted Brass, and without Silver; it will be exceedingly white, soft and malleable. It is also made another way: Make a great cup of Silver, red Arsenick and Latin, with a cover that fits close, that nothing may exhale: fill this with quick-silver, and lute the joynts with the white of an Egg, or some Pine tree rosin, as it is commonly done: hang this into a pot full of Linseed Oyl, and let it boil twelve hours; take it out, and strain it through a skin or sieve; and if any part be not coagulated, do the work again and make it coagulate. If the vessel do coagulate it slowly, so much as you find it hath lost of its weight of the silver, Arsenick and Alchymy make that good again, for we cannot know by the weight: use it, it is wonderful that the quick-silver will draw to itself out of the vessel, and quick-silver will enter in. Now I shall shew what may be sometimes useful,

To draw water out of Quick-silver,

Make a vessel of potters earth, that will endure the fire, of which crucibles are made six foot long and of a foot Diameter, glassed within with glass, about a foot broad at the bottom, a finger thick, narrow at top, bigger at the bottom. About the neck let there be a hole as big as ones finger, and a little pipe coming forth, by which you may holy put in the quick-silver; on the top of the mouth let there be a glass cap, fitted with a pipe, and let it be smeered with clammy clay, and bind it above that it

breathe not forth. For this work make a furnace, let it be so large at the top, that it may be fit to receive the bottom of the vessel, a foot broad and deep. You must make the grate the fire is made upon, with that art, that when need is you may draw it back on one side, and the fire may fall beneath. Set therefore the empty vessel into the furnace, and by degrees kindle the fire: Lastly, make the bottom red hot; when you see it to be so, which you may know by the top, you must look through the glass cap; presently by the hole prepared pour in ten or fifteen pounds of quick-silver, and presently with clay cast upon it stop that hole, and take away the grate that the fire may fall to the lower parts and forthwith quench it with water. Then you shall see that the water or quick-silver will run forth at the hole of the cap, into the receiver under it, about an ounce in quantity: take the vessel from the fire, and pour forth the quick-silver, and do as before, and always one ounce of water will distill forth: keep this for Cymical operations. I found this the best for to smug up women with. This artifice was found to purify quick-silver. I shall not pass over another art, no less wonderful than profitable for use.

To make quick-silver to grow a Tree

Dissolve silver in aqua fortis, what is dissolved evaporate into thin air at the fire, that there remain at the bottom a thick unctious substance; Then distill fountain water twice or thrice, and pour it on that thick matter, shaking it well; then let it stand a little, and pour into another glass vessel the most pure water, in which the silver is: adde to the water a pound of quick-silver, in a moist transparent crystalline glass that will attract it to that silver, in the space of a day will there spring up a most beautiful tree from the bottom, and hairy, as made of the most fine beards of corn, and it will fill the whole vessel, that the eye can behold nothing more pleasant. The same is made of gold with aquaregia.

Chap. VI

Of Silver.

I shall teach how to give silver a tincture that it may shew like pure gold; and after that, how it may be turned to true gold.

To give Silver a Gold colour,

Burn burnt brass with stibium, and melted with half silver, it will have the perfect colour of gold; and mingle it with gold, it will be the better colour. We burn brass thus: I know not any one that hath taught it: you shall do it after this manner: melt brass in a crucible, with as much stibium: when they are both melted, put in as much stibium as before,

and pour it out on a plain Marble stone, that it may cool there, and be fit to beat into plates. Then shall you make two bricks hollow, that the plates may be fitly laid in there: when you have fitted them, let them be closed fast together, and bound with iron bands, and well luted: when they are dried put them in a glass fornace, and let them stand therein a week, to burn exactly, take them out and use them. And

To tincture Silver into gold,

you must do thus: Make first such a tart lye, put quick lime into a pot, whose bottom is full of many small holes, put in a piece of wood or tiles heard upon it, then by degrees pour in the powder and hot water, and by the narrow holes at the bottom, let it drain into a clead earthen vessel under it: do this again to make it exceedingly tart. Powder stibium and pour into this, that it may evaporate into the thin air; let it boil at an easie fire: for when it boils, the water will be of a purple colour: then strain it into a clean vessel through a linnen cloth; again, pour on the lye on the powders that remain, and let it boil so long at the fire till the water seems of a bloody colour no more: Then boil the lye that is colored, putting fire under, till the water be all exhaled: but the powder that remains being dry, with the oyl of Tartar dired and dissolved, must be cast again upon plates made of equal parts of gold and silver, within an earthen crucible; cover it so long with coles, and renew your work, till it be perfectly like gold. Also I can make the same.

Otherwise.

If I mingle the congealed quick-silver that I speak of with a cap, with a third part of silver, you shall find the silver to be of a golden colour: you shall melt this with the same quantity of gold, and put it into a pot: pour on it very sharp vinegar and let it boil a quarter of a day, and the colour will be augmented: Put this to the utmost trial of gold, that is, with common salt, and powder of bricks, yet addin, Vitriol, and so shall you have repped gold. We can also extract.

Gold out of Silver,

And not so little but it will pay your cost, and afford you much gain. The way is this: Put the fine filings of Iron into a Crucible that will endure fire, let it glow red hot, and melt: then take artificial Chrysocolle, such as Goldsmiths use to solder with, and red Arsenick, and by degrees strew them in: when you have done this, cast in an equal part of Silver, and let it be exquisitely purged by a strong vessel made of Ashes: all the dregs of the Gold being now removed, cast it into water of separation, and the Gold will fall to the bottom of the vessel, take it: there is nothing of

many things that I have found more true, more gainful or, more hard: spare no labour, and do it as you should, lest you lose your labour: or otherwise, let the thin filings of Iron soak for a day in sea-water, let it dry, and let it be red hot in the fire so long in a Crucible, till it run, then cast in an equal quantity of silver, with half brass, let it be projected into a hollow place: then purge it exactly in an ash vessel: for the Iron being excluded and its dregs, put it into water of separation, and gather what falls to the bottom, and it will be excellent Gold. May it will be profitable to

Fix Cinnaber.

He that desires it, I think he must do thus, break the Cinnaber into pieces as big as Wall-nuts, and put them into a glass vessel that is of the same bigness, and the pieces must be mingled with thrice the weight of silver, and laid by courses, and the vessel must be luted, and suffer it to dry, or set it in the sun; then cover it with ashes, and let it boil so long on a gentle fire, till it become of a lead colour and break not, which will not be unless you tend it constantly till you come so far. Then purge it with a double quantity of lead; and when it is purged if it be put to all tryals, it will stand the stronger, and be more heavy and of more vertue: the more easie fire you use, the better will the business be effected: but so shall we try to repair silver, and revive it when it is spoil'd. Let sublimate quick-silver boil in distil'd vinegar, then mingle quick-silver, and in a glass retort, let the quick-silver evaporate in a hot fire, and fall into the receiver, keep it; If you be skilful, you shall find but little of the weight left. Others do it with the Regulus of Antimony. But you shall do it sooner and more gainfully thus: Place the broken pieces of Cinnaber as big as dice, into a long linnen bag, hanging equally from the pot sides; then pour on the sharpest vinegar, with alum and tartar, double as much, quick lime four parts, and as much of oaken ashes, as it is usual to be made; or you must make some. Let it boil a whole day, take it out and boil it in oyl, be diligent about it, and let it stay there twenty four hours: take the pieces of Cinnaber out of the oyl, and smear them with the white of an egge beaten, then role it with a third part of the filings of silver: put it into the bottom of a convenient vessel, and lute it well with the best earth, as I said: set it to the fire three days, and at last increase the fire, that it may almost melt and run: take it off, and wash it from its faeces that are left, as the last proof of silver, and bring it to be true and natural. Also it will be pleasant

From fixt Cinnaber to draw out a silver beard.

If you put into the same vessel, and make a gentle fire under, silver that is pure, not mixed with lead, will become hairy like a wood, that there is nothing more pleasant to behold

Chap. VII

Of Operations necessary for use.

I thought fit to set down some Operations which are generally thought fit for our works: and if you know them not, you will not easily obtain your desire. I have set them down here, that you might not be put to seek them elsewhere: First;

To draw forth the life of Tinne.

The filings of Tinne must be put into a pot of earth, with equal part of salt-peter, you shall set on top of this seven, as many other earthen pots with hole bored into them, and stop these holes well with clay: set above this a glass vessel with the mouth downwards, or with an open pipe, with a vessel under it: put fire to it, and you shall hear it make a noise when it is hot: the; life flies away in the flame, and you shall find it in the hollow pots, and in the bottom of the glased vessel compacted together. If you bore an earthen vessel on the side, you may do it something more easily by degrees, and you shall stop it. So also

From Stibium

we may extract it. Stibium that Druggists call Antimony, is grownd small in handmills, then let a new crucible of earth be made red hot in a cole fire; cast into it presently by degrees, Stibium, twice as much Tartar, four parts of salt-peter, finely powdered: when the fume riseth, cover it with a cover, let the fume rising evaporate: then take it off, and cast in more, till all the powder be burnt: then let it stand a little at the fire, take it off and let it cool, and skim off the dregs on the top, and you shall find at the bottom what the Chycists call the Regulus; it is like Lead, and easily changed into it. For saith Dioscorides, should it burn a little more, it turns into Lead. Now I will shew how one may draw a more noble Metal

To the outside,

As foolish Chymists say, for the think that by their impostures they do draw forth the parts lying in the middle, and that the internal parts are the basest of all; but they erre exceedingly: For they eat onely the outward parts in the superficies, that are the weakest, and a little quick-

silver is drawn forth, which I approve not. For they corrode all things that their Medicament enters, the harder parts are left and are polished and whitened: may be they are perswaded of this by the medals of the Ancients, that were within all brass, but outwardly seemed like pure silver; but those were soldered together, and beaten with hammers, and then stamped. Yet it is very much to do it as they did, and I think it cannot be done. But the things that polish are these, common Salt, Alom, Vitriol, quick Brimstone, Tartar; and for Gold; onely Verdigrease, and Salt Ammoniack. When you would go about it, you must powder part of them, and put them into a vessel with the metal. The crucible must be luted with clay, and covered: there must be left but a very small hole for perspiration: then set it in a gentle fire, and let it burn and blow not, lest the metal melt: when the powders are burnt they will sink down: which you shall know by the smoke, then take off the cover and look into them. But men make the Metal red hot, and then when it is hot they drench it in: or otherwise; they put it in vinegar till it become well cleansed, and when you have wrapt the work in linnen rags, that was well luted, cast it into an earthen vessel of vinegar, and boil it long, take it out and cast it into urine, let it boil in salt and vinegar till no filth almost rise, and the foul spots of the ingredients be gone; and if you find it is not exceedingly white, do the same again till you come to perfection: Or else proceed otherwise by order: Let your work boil in an earthen pot of water, with salt, alom, and tartar when the whole innerficies is grown white, let it alone a while: then let them boil three hours with equal parts of brimstone, salt-peter, and salt, that it may hang in the middle of them, and not touch the sides of the vessel, take it out, and rub it with sand, till the fume of the sulphur be removed again: let it boil again as at first, and do so it will wax white, that it will endure the fire, and not be rejected for counterfeit; you shall find it profitable if you do it well, and you will rejoyce, if you do not abuse it to your own ruine.

Chap. VIII

How to make a Metal more weighty.

It is a question amongst Chymists, and such as are addicted to those studies, how it might be that silver might equal gold in weight, and every metal might exceed its own weight. That may be also made gold, without any detriment to the stamp or engraving, and silver may increase and decrease in its weight, if so be it made in some vessel. I have undertaken here to teach how to do that easily, that others do with great difficulty. Take this rule to do it by, that

The weight of a Golden vessel may increase,

without hurring the mark, if the magnitude do not equal the weight. You shall rub gold with thin silver, with your hands or fingers, until it may drink it in, and make up the weight you would have it, sticking on the superficies. Then prepare a strong lixivium of brimstone and quick lime, and cast it with the gold into an earthen pot with a wide mouth: put a small fire under, and let them boil so long; till you see that they have gained their colour, then take it out, and you shall have it: Or else draw forth of the yolks of eggs and the litharge of gold, a water with strong fire, and quench red hot gold in it, and you have it,

Another that is excellent.

You shall bring silver to powder, either with aqua fortis, or calx: the calx is afterwards wash it with water, to wash away the salt wet a golden vessel or plate with water or spittle, that the quantity of the powder you need may stick on the outward superficies; yet put it not on the edges, for the fraud will be easily discovered by rubbing it on the touch stone. Then finely powder salt one third part, brick as much, vitriol made red two parts: take a brick and make a hole in it as big as the vessel is, in the bottom whereof strew alom de plume: then again pour on the powder with your work till you have filled the hole, then cover the hole with another brick, and fasten it with an Iron pin, and lute the joynts well with clay: let this dry, and let it stand in a reverberating fire about a quarter of a day; and when it is cold, open it, and you shall find the gold all of a silver colour, and more weighty, without any hurt to the stamp. Now to bring it to its former colour, do thus: Take Verdigrease four parts, Sal ammoniack two parts, salt-peter a half part, as much brick, alom a fourth part; mingle these with the waters, and with the vessel with it: then with iron tongs put it upon burning coles, that it may be red hot: take it off, and plunge it in urine, and it will regain the colour, if it shine too much, and you would have it of a lower colour, the remedy is to wet it in urine, and let it stand on a plate red hot to cool. But thus you shall make vitriol very red: put it into a vessel covered with coles, and boil it till it change to a most bright red: take it out and lay it aside, and do not use it for an ill purpose. We may with the fragments of brass

Do this business otherwise:

This shall supply the place of silver, and it shall become too weighty: Or otherwise, melt two parts of brass with silver, then make it into small thin plates; in the meanwhile make a powder of the dregs of aqua fortis, namely of salt-peter and vitriol, and in a strong melting vessel, put the plate and the powder to augment gold, fill the vessel in a preponderous order. Then lute the mouth of it and let it sit in a gentle fire half a day: take it off, always renewing the same till it come desired weight. We

have taught how to increase the weight, and not hurt the fashion or stamp. Now I shall show how without loss of weight, not yet the stamp being hurt,

Gold and Silver may be diminished:

Some use to do it with aqua fortis, but it makes the work rough with knots and holes; you shall do it therefore thus: Strew powder of brimstone upon the work, and put a candle to it round about, or burn it under your work, by degree it will consume by burning; strike it with a hammer on the contrary side, and the superficies will fall off, as much in quantity as you plate, as you use the brimstone. Now shall I shew how

To separate gold from silver Cups that are gilded:

For it is oft-times a custome for Goldsmiths to melt the vessels and cast them away, and to make new ones again; not knowing how without great trouble, to part the gold from the silver, and therefore melt both together. To part them, do thus: Take salt Ammoniack, brimstone half a part: powder them fine and anoint the gilded part of the vessel with oyl: then strew on the powder, and take the vessel in a pair of tongs, and put it into the fire; when it is very hot, strike it with an iron, and the powder shaken will fall into the water, in a platter under it, and the vessel will remain unaltered. Also it is done

Another way

with quick-silver: Put quick-silver into an earthen vessel with a very wide mouth, and let it heat so long at the fire, that you can endure the heat of it on your finger, put into it: put the gild plate of silver into it, and when the quick-silver sticks to the gold, take it out and put it into a Charger, into which the gold, when it is cold, will fall with the quick-silver. Going over this work again, until no more gold appears in the vessel. Then put the gold with the quick-silver that was shaken into the Charger, into a linnen clout, and press it out with your hands, and let the quick-silver fall into some other receiver, the gold will stay behind in the rag, take it and put it into a cole made with a hole in it, blow till blow till it melt, make it into a lump, and boil it in an earthen vessel with a little Stibium, and pour it forth into another vessel, that the gold may fall to the bottom, and the Stibium stay atop. But if you will

Part Gold from a vessel of Brass,

wet the vessel in cold water, and set it in the fire: when it is red hot, quench it in cold water; then scrape off the gold with latin wire bound together.

Chap. IX

To part Metals without aqua fortis.

Because waters are drawn from salts with difficulty, with loss of time and great charges: I shall shew you how to part gold from silver and brass, and silver from brass, without aqua fortis; but by some easie operation, with little cost and loss of time: And first I shall shew how

To part Gold from Silver.

Cast a lump of gold mixt with silver into an earthen vessel, that will hold fire, with the same weight of Antimony, thus: the vessel is red hot, and the lump is melted, and turned about with the force of the fire; cast a little Stibium in, and in a little time it will melt also; and when you see it, cast in the rest of the Stibium, and cover the vessel with a cover: let the mixture boil, as long as one may repeat the Lords prayer: take away the vessel with a pair of tongs, and cast it into another iron Pyramidal vessel: red hot, called a Crucible, that in the bottom of it rams fat; shaking it gently, that the heavier part of gold separated from the silver, may fall into the bottom: when the vessel is cold it is shaken off, and the part next the bottom will be gold, the upper part silver; and if be not well parted, refuse not to go over the same work again, but take a less quantity of Stibium. Let therefore the gold be purged again, and let the Stibium be boiled, and there will be always in the bottom a little piece of gold. And as the dregs remain, after the same channel purge them again in the cople, and you shall have your silver without any loss of the weight, because they are both perfect bodies; but the silver onely will lose a little. But would you have your silver to lose less, do thus: add to two pounds and a half of Stibium, wine-lees two pounds, and boil them together in an earthen vessel, and the mass will remain in the bottom, which must be also boiled in a cople; then adding pieces of lead to it, purge it into a cople, wherein the other things being consumed by the fire, the silver onely will remain: but if you do not boil your Stibium in wine-lees, as I said, part of the silver will be lost, and the cople will draw the silver to it. The same may be done

Another way.

Take three ounces of brimstone, powder them, and mingle them with one ounce common oyl, and set them to the fire in a glazed dish of earth: let

the fire be first gentle, then augment it, till it run, and seem to run over: take it from the fire, and let it cool, then cast it into sharp vinegar, so the oyl will swim above the vinegar, the brimstone will fall down to the bottom; cast away the vinegar, and let the brimstone boil in strong vinegar, and you shall see the vinegar coloured, you shall strain the vinegar through a wisp into a glassed vessel, to which adde more brimstone, boil it again, and again strain out the lye into the vessel: doing this so oft, till the Lixivium comes forth muddy, or a black colour. Let the Lixivium settle one night: again drain it through a wisp, and you shall find the brimstone almost white at the bottom of the vessel: adde that to what you had before, and set it again to boil with three parts as much distilled vinegar, till the vinegar all evaporate and dry the brimstone: take heed it burn not: when it is dry, put it again into distilled vinegar, working the same way so often, until putting a little of it upon a red hot plate of iron, it will melt without flame or smoke. Then cast it on a lump of gold and silver, and the gold will sink to the bottom presently, but the silver will remain on the top. For if brimstone be boil'd in a Lixivium so strong, that it will beat an egg, until it will not smoke, and will melt on a fire-cole; if it be projected on a mass of gold and silver mingled, when they are melted, it will part the gold from the silver. Also there is an ingenious and admirable way

To part silver from brass:

with certain powders. The best are those are made of powdered lead, half so much quick brimstone, and arsenick, and common salt double as much, salt-peter one half; powder those fine each by themselves, then mingle them. Take the mixt material, with half so much more of the powder, and in a vessel that will endure fire, strew it in by turns, and set the vessel fil'd at a strong fire, till all melt; take it out and cast it into another vessel, that is broad atop, narrow at bottom, and hot, as we said, and smeered with ram or sowes grease clarified: let it cool, for you shall find the silver at the bottom, and the brass on the top: part one from the other with an iron rasp, or file: if you will, you may purge your silver in a cople. But the silver must be made into thin plates, that when it is strewed interchangeably with the powders, they may come at in on all sides: then cover the vessel with its cover and lute it well. But the salt must be decrepitated that it leap not out, and the brimstone prepared and fixed. But we may thus

Part gold from brass:

Make salt of these things that follow, namely Vitriol, Alom, Salt-peter, quick Brimstone, of each a pound, Salt-amminiack half a pound. Powder them all, and boil them in a lye made of ashes, one part, as much quick

lime, four parts of beech-ashes: melt them at the fire, and decant them, and boil them till the Lixivium be gone; then dry it, and keep it in a place not moist, let it melt; then mingle with one pound of powder of lead, and strew on of this powder six ounces for every pound of brass made hot in a melting vessel; and let them be shaken, and stirred vehemently with an iron thing to stir with: when the vessel is cold, break it, and you shall find a lump of gold in the bottom. Do the rest as I said.

Chap. X

A compendious way to part gold or silver from other Metals with aqua fortis.

We shall teach thus compendiously to part gold from silver, and silver from other metals; and it is no small gain to be got by it, if a man well understood what I write: for I have known some by this art that have got great wealth. For example, take a mixture of brass and silver, dissolve it in common aqua fortis: when it is consumed, cast fountain-water into it, to remove the sharpness of the water, and that it can no more corrode the metal. Put the water into a great mouthed earthen vessel, and plunge plates of brass therein; for the silver will stick to them like a cloud, the brass is best in the water: put the water into a glass retort with a large belly, and make a soft fire under, and the fountain-water will distill forth by degrees. When you know that the whole quantity of fountain-water is distilled out, or the belly of the retort looks of a yellow colour, and the sent of the salts pierceth your nostrils: take away the receiver, and put another that is empty to it, and lute it well that nothing break forth. Augment the fire, and you shall draw off your aqua fortis as strong as before, and the brass will be at the bottom of the retort: The aqua fortis will be as good as it was, and you may use it oft-times.



Of Counterfeiting Precious Stones

The Proeme.

From the adulterating of the Metals, we shall pass to the counterfeiting of Jewels. They are by the same reason, both Arts are of kin, and done by the fire. And it is no fraud, saith Pliny, to get gain to live by; and the desire of money hath so kindled the firebrand of luxury, that the most cunning artists are sometimes cheated. They are counterfeited by diverse ways, either by cutting Jewels in the middle, and putting in the colours, and joyning them together; or else by giving a tincture to Crystal that is all one piece, or counterfeiting Crystal by many ingredients; or we shall attempt to make true Jewels to depart from their proper colour, and all of them to be so handsomely coloured, that they may shew like natural jewels. Lastly, I shall shew how to make Smalts of divers colours.

Chap. I.

Of certain salts used in the composition of Gems.

We will first set down certain operations, which are very necessary in the making of Gems, lest we be forced to repeat the same thing over again: And first,

How to make Sal Soda.

The herb Kali or Saltwort is commonly called Soda: Grinde this soda very small, and sift it into powder: put it into a brass Cauldron and boil it, pouring in for every pound of Soda, a firkin of water. Let it boil for four hours, till the water be consumed to a third part. Then rake it from the fire, and let it stand twelve hours, while the dregs settle to the bottom, and the water becomes clear: then drain out the water with a linen cloth, into another vessel, and pour fresh water into the Cauldron: Boil it again, and when it is cold, as before, and all the dross settled, filtrate the clear water out again: Do as much the third time, still having a care to try with your tongue, whether it be still salt. At last, strain the water, and set it in an earthen vessel over the fire, keeping a constant fire under it, until the moisture being almost consumed, the water grow more thick, and be condensed into salt; which must presently be taken out with an iron ladle; and of five pound of Soda, you will have one pound of salt.

How to make Salt of Tartar.

Take the lees of old wine, and dry it carefully; it is commonly called Tartar: put it into an Alimbeck, made in such sort, that the flame may be retorted from the top, and so augment the heat. There let it burn, you will see it grow white ; then turn it with your iron tongs, so that the upper part which is white may be at bottom, and turn the back up to the flame : when it hath cest'd smoaking, take it out, and break part of it, to see whether it be white quite through, for that is an argument of the sufficient burning; because it oftentimes happens, that the outside onely is burned, and the rest of it remaineth crude. Therefore, when it hath gained the colour of chalk, it must be taken out; and when it is cold, grinde it, and lay it in water in some wide mouth'd vessel a quarter of aday. When the water is grown clear, filtrate it; and strain it into another vessel, and then pour water again unto the settlement, observing the same things we spoke before, until the water have taken out all the salt, which will come to pass in the third or fourth time. Pour your waters which you have saved, into a vessel of glass; and all things being ready, put live coles under it, and attend the work until the water be consumed by the force of the fire, which being done, the salt will stick to the bottom: It being thus made, preserve it in a dry place, lest it turn to oyl.

Chap. II.

How Flint, or Crystal is to be prepared, and how Pastils are boiled.

The matter of which Gems are made, is either Crystal or Flint, from whence we strike fire, or round pebbles found by river sides; those are the best which are taken up by the river Thames, white, clear and of the bigness of an egge ; for of those are made the best counterfeit Gemms;

though all will serve in some sort. Some think that Crystal is the best for this purpose, because of the brightness and transparency of it ; but they are deceived. The way of making Gems is this: Take river pebbles and put them in a fornace, in that place where the retorted flame is most intense; when they are red hot, take them out and fling them into the water: then dry them, and powder them in a mortar, or hand-mill, until they are very fine; put them into a wide-mouth vessel, full of rain water, and shake it well in your hands, until the finest part will rise to the top, and the grossest will settle to the bottom: to that which swims at the top pour fresh water, and sift the dust again: and do this oftentimes, until the gross part be quite separated and sunk down. Then take out the water, and let it settle, and in the bottom will lie a certain slimy matter; gather together and reserve the fine powder. But whilst the stone is ground, both the mortar and the mill will lose somewhat of themselves, which being mixt with the powder will foul the gem: wherefore it will be worth the labor to wash that away: to which end, let water be often poured into the lavel, and stirred about; the dust of the mortar will rise to the top, by reason of its levity, and the powder of the pebbles will retire to the bottom by reason of its weight; skim the lavel, and separate them with a spoon, till all that sandy and black dust be taken off: then strain out the water, and reserve the powder dry. This being done, we must teach.

How Pastils are boiled.

Artificers call those pellets which are made of the salts, and the forenamed powder and water, Pastils. Take 5 parts salt of Tartar, as many of Salt of Soda; double the quantity of these of the forespoken powder of pebbles, and mix them very well in a stone mortar: sprinkle them with water & wet them, so that they may grow into a past, and make Pastils of them in the bigness of your fist; set them in the sun, and dry them well. Then put them into a fornace of reverberation, the space of six hours, increasing the fire by degrees, that at last they may become red hot, but not melt; wherefore use no bellows: when they are baked enough, let them cool and they will become so hard, that they will endure almost the hammer.

Chap. III.

Of the Fornace and the Parts Thereof.

Now the Fornace is to be built, which is like that of glass-makers, but less according to the proportion of the work. Let your fornace be eight foot high, and consist of two vaults; the roof of the lower must be a handful and a half thick: the vault itself must have a little door, by which you may cast in wood to feed the fire there. Let it also have on the top,

and in the middle of its roof, a hole about a foot in breadth, by which the flame may penetrate into the second vault, and reach to the upper roof; whence the flame being reverberated, doth cause a vehement heat. In this upper vault there must be cut out in the wall small holes of a handful in breadth, which must open and shut, to set the pots and pans on the floor, and to take them out again. Artificers call the pots Crucibles; they are made of clay, which is brought from Valencia, and doth very strongly endure fire: They must be a finger thick, and a foot and a half deep, their bottom somewhat thicker, lest they should break with the force of the fire. All things being thus provided, cast in your wood and fire, and let the fornace heat by degrees, so that it may be perfectly hot in a quarter of a day. Your workmen must be diligent to perform their duty; then let the Pastils, being broken into pieces the bigness of a wall-nut, be put into crucibles, and set in the holes of the fornace built for that purpose, with a pair of iron tongs to every pot. When they melt, they will rise up in bubbles, and growing greater and greater, must be pricked with sharp wires; that the vapor passing out, the bubbles may sink down again, and not run over the mouth of the crucibles. Then let the other pieces be put in, and do as before, until the pots be filled to the top: and continue the fire for a whole day, until the matter be concocted. Then put an iron hook into the pots, and try whether the matter have obtained a perfect transparency: which if it have, take it out of the pots with iron instruments for that purpose, and cast it into clear water, to wash off the filth and stains, and to purge out the salt: for when the Gems are made, on a suddain the salt breaks forth, as it were spued out, and overcast them like a cloud. Yet there must be a great deal of diligence used, whilst you draw out this vitrified matter, lest it touch the sides of the fornace; for it will cleave thereto like birdlime, hardly to be pulled off without part of the wall: as also lest it fall into the vessels: for it is very difficult to separate it, and it prejudices the clearness of the glass. When it is cold, put it again into the crucibles, and let it glow for two days, until it be concocted into perfect glass. When this vitrified matter hath stood for two days, some, to make it more fine and bright, lest it should be specked with certain little bubbles (to which glass is very subject) put into the crucible some white lead, which presently groweth red, then melts with the glass and becomes clear and perspicuous. Make your tryal then with an iron hook; for if it be clear of those bubbles, it is perfected, and so will be a perfect mass of Gems. Now we will teach the several Colours, Yellow, Green or Blue, wherein we will cast our Gems.

Chap. IV.

To make Colours,

While the Crystal is preparing in the fornace, by the same fire the Colours may be also made: And first,

How to make Crocus of Iron:

Take three or four pounds of the limature of Iron, wash it well in a broad vessel; for by putting it into water, the weight of the iron will carry that to the bottom; but the straws and chips, and such kind of filth, will swim on the top ; so you will have your filings clean and wash'd. Then dry it well, and put it into an earthen glazed pot with a large mouth, and pour into it three or four gallons of the best and sharpest vinegar: there let it macerate there or four weeks, stirring it every day seven or eight times with an iron rod; then giving it time to settle, pour out the vinegar into another pot, and put fresh vinegar into the iron; and do this, till the vinegar have consumed all the filings. Then put all the vinegar into an earthen vessel, and set it on the fire, and let it boil quite away: In the bottom there will remain a filmy dirty matter, mixt with a kind of fatness of the iron, which the fire by continuance will catch hold of: let it burn, and the remaining dust will be Crocus. Others file your rusty nails, and heating them red hot, quench them in vinegar; then strain them, and dry the rust, and set it again to the fire, till it be red hot, then quench it again with vinegar; this they do three or four times: at length they boil the vinegar away and take the remaining Crocus from the bottom. Next remains to shew.

How to reduce Ziphera into a Powder.

A little window is to be made out of the side of the fornace, nigh to which must be built a little cell or oven, so joyned to the mouth of the oven, that the flame may be brought in through a little hole. Let this cell be a foot in length and breadth. Set the Saffron upon a Potters tile, into the cell and shut the door: let it be red hot, and after six hours take it out and put it into water, so will it cleave into pieces; let it be dried, stamped and so finely seirced , that it may scarce be felt. But if it cannot be effected with a pestle and mortar; pour water upon the powder and stir it with your hands, and let it settle for a while; then strain it into another vessel, and pour fresh water into the powder; and reiterate this so often, till that which setleth, being beat and brayed, do pass through with water: then dry it , and it will become very fine powder.

How to burn Copper.

Set the filings of Copper, with an equal quantity of salt mixt in an earthen pot, over the fire, and turn it about three or four hours with an iron hook, that it may be burned on all sides: There let it burn a whole

natural day: then take it out, and divide it into two parts; lay the one part aside, and set the other with salt on the fire again, for an artificial day: do the same three or four times, that it may be more perfectly calcined, always having a care that it be as hot as may be, but that it melt not. When it is burnt, it is black.

Chap. V.

How Gems are coloured.

All things being thus prepared; there is nothing more, I think, remaineth to make and end of this work, but to know how to colour them. And we will begin with the way

How to dye a Sapphire.

Artificers begin with a Sapphire: for when it is coloured, unless it be presently removed from the fire, it loseth the tincture; and the longer it remains in the fire, the brighter it groweth. Put a little Zaphara, as they call it, into a pot of glass, two drachms to a pound of glass; then stir it continually from top to bottom with an iron hook: when it is very well mixed, make tryal whether the colour please you or no, by taking a little out of the pot. If it be too faint, adde some more Zaphara; if too deep, put in more glass, and let it boil six hours. Thus you may

Colour Cyanus,

or sea-water, another kind of Sapphire. Beat your calcined brass into a very fine powder, that you may scarce feel it; for otherwise it will mix with the Crystal, and make it coarser: the quantity cannot be defined for there are lighter and deeper of that kind: for the most part, for one pound one drachm will be sufficient.

How to counterfeit the colour of Amethyst:

To a pound of Crystal, put a dram of that they call Manganess, and so the colour is made. If the Gem be great, make it the paler; if small, make it deeper, for they use such for rings, and other uses.

To counterfeit the Topaz.

To every pound of glass, adde a quarter of an ounce of crocus of Iron, and three ounces of red-lead, to make it of a brighter red. First put in the lead, then the crocus.

The Chrysolite,

When you have made a Topaze, and would have a Chrysolite, adde a little more Copper, that it may have a little verdure: for the Chrysolite differeth from the Topaz in nothing, but that it hath a greater luster. So we are wont

To counterfeit an Emerald.

This shall be the last: for we must let our work be as quick as possible, because the copper being heavy, when it is mixed with the Crystal, doth presently sink down to the bottom of the pots, and so the Gems well be of too pale a colour. Therefore thus you must do: when you give the tincture to a Cianus, you may easily turn it into Smaragde, by adding crocus of iron, in half the quantity of the copper or brass, viz. if at first you put in a fourth part of copper: Now you must adde an eighth part of crocus, and as much of copper. After the colours are cast in, let it boil six hours, that the material may grow clear again: for the casting in the colours will make them contract a cloudiness. Afterwards let the fire decrease by degrees, until the fornace be cold: then take out the pots and break them, wherein you shall find your counterfeit precious Stones.

Chap. VI.

How Gems may otherwise be made.

The manner which I have set down, is peculiar and usual to our Artificers, and by them is also accounted a secret. But I will set down another way which I had determind always to keep secret to myself; for by it are made with less charge, less time, and less labour, much more refulgent, bright and livelier Gems, whose superficies and luster, the salt shall not deface in a much longer time. Although those old counterfeits which are found at Puteolt, in the mortar of ruined houses, and on the shores, are yet very bright, and of perfect clearness, so that they seem beyond the imitation of our age: Yet I will endeavour by this way, not onely to equal them, but to make much better. Wherefore give ear, and believe: the materials are thus made: Take the comb of a Cock, and cutting his gullet in two, keep the head and neck. Put into a pot and set it in a hard fire; stop it close that no coles or ashes arising with the smoke, or soote, fall in, and spoil the luster of it. When the fire is kindled, you will hear it hiss: when it is red hot, take it up with an iron tongs, and quench it in clear water, and dry it: Do this three times, changing the water, lest there should be any filth; then grinde it on a marble till it be so fine that you may blow it about, and reserve it for use. Thence have you the Philosophers Stone, most fragrant in fire, and chief in the

triplicity. If thou are ignorant of the Philosophers Stone, learn it from these verses, which I found in an old Manuscript.

*Arctus est hominus, qui constat sax elementis.
Cui p si addideris, s. m.mutare si bene sois.
Hoc crit os nostrum constans lapis Philosophorum.*

Now we have advertised you of the materials: let us advise also about the colour. And first of all, I will shew you.

How to counterfeit a Topaz.

Put your material into a pot, and cover it with a lid, full of holes; over which there must be laid another, that it may exhale, and yet receive no hurt from the smoke: let it stand on its fornace to the middle space of a whole day, and it will be a Topaze. Now

To counterfeit a Chrysolite,

cram the Cock, and for every ounce give him to eat two grains of the beloved flower of Venus: stroak him, and in due time thou shalt see.

To make an Emerald.

Feed the Cock again, and for every ounce, give him four grains of wheat, and he will shine with a most bright luster. But

To make a Jacinth,

give the Cock graines of the bloody Stone, instead of wheat, and he will easily lay hold of them.

Chap. VII.

Of Several Tinctures of Crystal.

I have declared divers tinctures of glass, and those no vulgar and common ones, but such as are rarely known, and gained, and tried with a great deal of labour. Now I will relate some ways of staining Crystals, and especially those that are choice, and known to very few; if not onely to my self.

To stain a Crystal to the colour of a Jacinth, or a Ruby, without breaking, or wearing it.

Take six parts of Stibium, four of Orpin, three of Arsenick, as much of Sulphur, two of Tutty; beat them all asunder, and sift them through a fine seirce: put them into a pot: hang your Crystal by wires, or cover it over with the powders, and so set it on the fire, that it may be hot, four or five hours; but use no bellows, lest it break in pieces, or melt. It is a certain sign of being perfectly coloured, if you take out a piece, and that be of a bright and shining colour: otherwise deliver it to the fire again, and after some time try it again. But you must have a great care, lest it cool too suddenly when you take it off the fire, for it will crumble and fall to pieces. If a violet color pleaseth you, take it soon from the fire: if you would have a deep purple, let it stand longer: we can make a violet with Orpin onely.

To turn a Saphire into a Diamond.

This stone, as all others, being put in the fire, loseth his colour: For the force of the fire maketh the colour fade. Many do it several ways: for some melt gold, and put the Saphire in the middle of it; others put it on a plate of iron, and set it in the middle of the fornace of reverberation; others burn it in the middle of a heap of iron dust. I am wont to do it a safer way, thus: I fill an earthen pot with unsili'd lime, in the middle of which I place my Saphire, and cover it over with coal, which being kindled, I stop the bellows from blowing, for they will make it flie into pieces. When I think it has changed, I take a care that the fire may go out itself: and then taking out the stone, I see whether it hath contracted a sufficient whiteness; if it have, I put it again in its former place, and let it cool with the fire; if not, I cover it again, often looking on it, until the force of the fire have consumed all the colour, which it will do in five or six hours; if you find that the colour be not quite vanished, do again as before, until it be perfect white. You must be very diligent, that the fire heat by degrees, and also cool; for it often happeneth, that sudden cold doth either make it congeal, or flie into pieces. All other stones lose their colour, like the Saphire; some sooner, some later, according to their hardness. For the Amethyst; you must use but a soft and gentle fire; for a vehement one will over-harden it, and turn it to dust. This is the art we use, to turn other precious stones into Diamonds, which being cut in the middle, and coloured, maketh another kind of adulterating Gems; which by this experiment we will make known: And it is

How to make a stone white on one side, and red or blew on the other.

I have seen precious stones thus made, and in great esteem with great persons, being of two colours: on one side a Saphire, and on the other a Diamond, and so of divers colours. Which may be done after this after this manner: For example, we would have a Saphire should be white on

one side, and blew on the other: or should be white on one side, and red on the other: thus it may be done. Plaister up that side which you would have red or blew, with chalk, and let it be dried; then commit it to the fire, those ways we spoke of before, and the naked side will lose the colour and turn white, that it will seem a miracle of Nature, to those that know not by how slight an art it may be done.

How to stain glass of divers colours.

I will not pass by a thing worth the relation, which happened by chance, while we were making these experiments. The flower of Tinne taketh away the perspicuity of Crystal glass, and maketh it of divers colours: for being sprinkled upon Crystal glasses that are polished with a wheel, and set to the fire, it does variously colour them, and maketh them cloudy; so that one part will look like a stone, and another like an Opale of divers colours. But you must often take it out from the fire, and order it rightly, till it be according to your desire. I have before told you how to make it out of Tinne for the purpose. I will adde somewhat more, indeed no secret, nor very necessary, but that nothing may be omitted by us in this work, *viz.*

How to make a Jacinth.

beautiful enough, and not much unlike a true one. Put lead into a hard earthen pot, and set it on the fire in a glass-makers fornace, there let it remain for some days, till the lead be vitrified, and it will be of the colour of a Jacinth.

To counterfeit an Emerald.

You may do this almost in the same manner; and it will resemble the colour of a pleasant green corn. Dissolve silver with strong water, then casting into the water some plates of Copper, as I told you, it will cleave to them. Gather it together, and dry it, and set in into a glass-makers fornace in an earthen pot, within a few days it will become an Emerald. To do the same with other metals, I will leave to the trial of others; it is enough for me to have found out and discovered the way.

To counterfeit Carbuncles.

This we do with Orpin, and use it in some ornaments, for they are brittle, and of a most flagrant colour, and have much of the scarlet blush, and cast forth red sparkles. Take four ounces of Orpin, and grind it small: then put it into a glass vessel, whose bottom you must fortifie against the force of the fire with mortar made with straw, and stop the mouth of it

gently. The fire being kindled, the smoke flieth up, and the thinnest part of the material will rise to the top: and you will see it stick to the sides of the glass, and the neck: it will grow bigger by degrees, and new parts still flying up, will make it grow thicker; and like boyling water gather into bubbles, which at last will encrease so big, that they will fall down: Some will stick in the neck of the glass, all of a most fragrant colour, but brittle and small. Break the glass, and take off with a sharp point of a knife, those red congealed bubbles which stick to the glass and use them. If you would make one great one of those little bubbles: lay a great many little ones upon a piece of glass, and melt them, and they will run into one: a most pleasant sight to see.

Chap. VIII.

Of making smalt or Enamel.

After Gems we will endeavour to make Smalt or Enamel. It is a work almost of the same nature, and of the same mixture of colours; this onely difference is between them, that in Gems the glass is transparent, in this it is more dense and solid. In ancient times they made their Checker or Mosaique work of it: the Gold-smiths do use it in colouring and enameling gold. It is Tinne that gives it a body and solidity.

To make white Enammel,

Take two ounces of Lead ashes, four of Tinne; and make it into a body, with double the quantity of glass: role it into round balls, ans set it on a gentle fire all night: take heed it stick not to the sides of the pot, but stir it about with an iron spattle, and when it is melted, increase the fire, and the business is done.

To make black Smalt.

To a pound of glass, you must adde a drachm of Manganess, for so it will be of the colour of a Lyon: then adde a drachm of Zaphara, and the mixture will turn black: make often tryal, if it be of a dark purple or violet-colour: for the Tinne that giveth it the body, will make it blacker.

To make Smalt of a deep yellow.

You may put to every pound of Crystal a little Crocus Marcis, and three ounces of Jalloline, as they call it, which engravers use: at last Lead and Tin. But if you desire

To make Smalt of a paler yellow,

Instead of Jalloline, adde Jalerso, and you will have your desire.

To make green Smalt,

Adde burned Copper, and so it will be of a deeper colour: but if you desire it a paler, adde the flakes of Copper, which flie off, while the smith hammereth it, being red hot.

To make red Smalt,

Add the rust of iron, very finely beaten: but when you would make

Smalt dark on one side, and transparent on the other,

Make your Pastils of earth, and double as much glass; set it a whole night in the fire of reverberation, and let it melt in a convenient sessel, stirring it with an iron rod: so you shall perceive both transparent and opacous parts in the same little Orb. So

To make Smalt of the colour of an Amethyst.

It is done with nothing but Manganess: and if you would have it of a deeper colour, adde more of the body, that is, of the flower of Lead and Tin.

To make Smalt of skie-colour.

It may be effected with Zaphara, by adding somewhat more of the body.

To make speckled Smalt,

which being full of small specks, shall seem to be compounded of a great many lices, very pleasant to behold. The opacous Smalt being made, pour it upon marble, and then presently sprinkle some Crocus upon it, or drop some pale colour in specks, all over it, and you shall have your desire.

To make Smalt of two colours,

cast Smalt first of one color upon marble, as before; and presently after, some of another colour upon it that: then with an iron rod press them close, and joyn them together.

To make the best kind of Smalt,

such as Godsmiths use, to every pot allow two roles of Sal Soda, and some sand, of which glass is made, and it will be much more perfect.

Chap. IX.

To make Smalt of a clear rose-colour.

The most skilful glass-makers do labour very much, in colouring Smalt of a rose-colour; which is commonly called Rothclere: seeing that in former times they did it most be unfully and artificially. I will set down what both I my self have done in it, and what I have received from other friends: I have performed the best I could to shew others an oportune way of making better. The manner is this: cast ten pounds of Crystal in a pot, and when you know it to be well melted, adde a pound of the best red lead, by half at a time, stirring it with an iron rod as fast as you can; for the weight of it will make it sink to the bottom: when it is well mixed, take it out of the pot with iron instruments fit for the purpose, and cast it into water: do this thrice: then mix with it five ounces of Tin calcined, and Cinnabaris of most bright colour, and so stirring them about for three hours, let them stand awhile. When this is done, adde moreover thre ounces of vitrified Tin, and beat them together without any intermission, and you will see a most lively rose-colour in the glass, which you may use in enameiling Gold.

To make Glass of Tin.

Set a pound of Tinne in a strong earthen pot, into the fire: let it heat and melt; then remove it with iron tongs into the hottest flames of the glass-makers fornace, for three or four days. Afterwards, the pot being taken out, and cold; break it, and in the top you will find glass of a saffron colour, not clear: but the longer it standeth in the fire, the perfecter it will grow; neither have I known better in this kind, of those many that I have tried. It must be reduced into fine powder: for the which not onely a mortar and mills will be requisite, but also a Porphyrian stone. If it be too florid, you may make it of a more faint colour, by adding glass to it.

Another way to make it.

This is onely for friends: Take nine parts of burnt Tinne, seven of Lead, two of Cinnabaris; of Spanish-snder and Tartar, one part and a half; of the Blood-stone one part, of Painters red a fourth part. And do with it, as in the former.

Chap. X.

Of leaves of Metal to be put under Gems.

There are certain leaves of Metal laid under Gems, which being perspicuous, are thereby made paler or deeper, as you will: for it you would have them of a fainter colour, you must put under them leaves of a more clear brightness: if of a deeper, leaves of a darker hue. Moreover, Gems being transparent, are seen quite through, and discover the bottom of the ring; which taketh much of their beauty off. This is an invention of later times, who by terminating the transparency of stones, with leaves of a most bright and pleasant colour, do fit and make up, and mend the colour of stones. I have been very much delighted in this kind of work, and therefore will deliver it particularly. They are to be made either of Copper alone, or of Copper, Gold, and Silver, mixt together. I will speak of those which are made of Copper alone: You must buy at the Brasiers-shops some thin plates of Copper, of the thickness of strong paper, that they may be the easier made thinner, which you must cut into pieces of three fingers in length and two in breadth; so that a sheet of two pound, will be divided into a hundred and thirty parts: these we must divide again into two parts, that they may be hammered more easily: Take forty and beat them, as Artificers do gold, when they beat it out into thin rays. Let the anvil and hammer be smooth and polished, lest the heavy strokes should make dents in the Copper, and break it. Discontinue your work by turns, so that you may hammer the Copper while it is hot, and prepared by the fire, and put it into the fire, when it is cold: for if you do otherwise, it will break in pieces; which you must presently remove from the rest; for those that are broken, will break others. But that they may be the more easier prepared, when they begin to be exteruated, I make use of this invention. There must be prepared two plates of iron, of a hand square, and the thickness of paper. Double one of them, that it may receive the other within the folds of it: so that they may receive the plates of Copper in the middle, and enclose them on all sides, that they can neither slip out, nor any dust or ashes fall in, to stick to them. When you have thus enclosed the Copper plates, put them into the fire, and heat them; then take them out with iron tongs, and shaking off the ashes, beat them with your hammer till they are cold, and so they will become thin and fine rays. But while you are beating one, set others to heat; and do this eight times over, until you have hammer'd them very thin, and made them fit for your purpose. It will be worth your labor to look often upon them, to see if any be broken in the working, for they will break their fellows. But because they are wont to grow black in the working, and foul, so that they oftentimes deceive the eye; therefore it is fit, that you have a pot of water ready, with an equal quantity of Tartar, and salt in it, and let it boil over the fire. Put into it your rays, and stirre them about continually, till they be boiled white. Then take them out,

and wash them in a pot of clear water, till they be very clean: then dry them with a linnen cloth, and then heat them, and beat them on the anvil again, as before, until they spread into rays, as thin as leaf-gold. When this work is to be done, the hammer and anvil must be as smooth and polished, as a bright looking-glass; which you may effect in this manner. First, hold them to the grinde-stone, wherewith they grinde knives, until they be smooth and planed: then rub them with fine sand, and Pumice-stone; afterwards glaze them with a wheel, and polish them with a plate of lead, and powder of emerald: if you use any other art, you will but lose your labour. Thus in two days your work will be finished, that is, by heating your plates, eight or ten times, and preparing them, and by whitening them four times at least: Finally, examine them all, wheter they be whole, and of a sufficient thinness: so that if any remain too thick, they may again be brought to the hammer and perfected. But I must advertise you, that the thinner they grow, the less time they must lye in the fire, because the will presently melt: and so also in the water, because the salt will eat into them. At last, cut them with shears into square pieces, that they may be more convenient for use.

Chap. XI.

How leaves of Metals are to be polished.

The plates being thus thinned and finished, we will fall to polishing of them. But first we must provide tools, wherewith to perform it. Take a plate of copper of a foot in length, and a hand in breadth, most exquisitely burnished, that it may be as smooth as a looking-glass: bow it either with your hand, or a hammer, little by little, into the form of a semicylinder. Then turn a piece of wood, so that it may be equal, and fit for it in every part, and be received into the convexity of it, where being fastned with four nails at the corners of the plate, it may remain stedfast. Fix this wood upon a little frame, with two bars of a foot height, fastened to the ends of it. Now we will begin to burnish the plates; which must be thus done: provide chalk made into fine powder, after this sort; take some beaten clay, wrap it in a clean and indifferently fine cloth, and put it into a washing bowl full of water; stirre it about here and there, in the water, that the finest part may be washed through, and the courser remain in the cloth: then put the new chalk into the cloth again; stirre it and strain it till it all pass through the cloth, and then suffer the water to serile, and seirce it through a strainer; onely changing the water until no gross settlement remain: Then lay the cloth over the mouth of the vessel, which must receive it, and tie it slack on: so strain it, that you may be the sure, that nothing but what is very fine can pass through: then press out the water, and referie the chalk. Lay this clay, thus prepared, upon the Copper, and rub it with a poplar stick, till it shine like gold: then wash it

with water, over a wide-mouth pan that may receive the waters. After this, have a blood-stone ready, very well polished, upon a plate of lead with the dust of Emerald, it will become most exquisitely smooth: therefore, lay your rays of copper upon the copper, and spread it abroad with the thumb of your left hand; then cast on the clay, and pour water on to wash it, and then wipe it off, and let onely the water remain to fasten them upon the copper. Then take into your hands the stone, being fastened to a stick; and polish the plates with it, having a great care that they do not run into wrinkles; for then they are quite spoiled: but when they begin to move, pour on some of the water, and that will fix them again: Continue this, till you have made it all over as bright and smooth as a looking-glass. A token of their perfect polishing is, when no marks of the running of the stone, is seen upon them. Then taking them off from the wood, cast them into a pot of water, until the rest are all finished; and then wrap them in a clean linnen cloth: dry them, and lay them up in boxes, free from all dust and filth: but bend them like a half-pillar, so that the polished side may be inward, and tie them so with a string.

Chap. XII.

Of building a fornace for the colouring Plates.

Now we will shew how to colour them: but first, let us describe the fornace, wherein it must be done. Therefore let a fornace be made of iron plates of a convenient thickness: let it be a foot in height, and as much in the diameter of the length; let it be covered on top, with a circular plate: In the center of the roof of it, cut a round hole, a handful in breadth, and set another fornace upon it, of the same length and breadth, and make a hole in that also, which must be set against the other, and joyn them close together. Make a door in the lower fornace, close to the ground; let it be made with an arch, four fingers wide, and jet out half a foot, like the mouth of an oven, and be joyned in the same manner to the great fornace. Then kindle your coals in another place, until they cease smoking, and with iron tongs cast them into the foresaid fornace: Heat it very well, and let the outward fornace or mouth of the oven be filled half way with live coals. These being thus disposed, fast to colouring the plates. And first I will teach you

How to colour the plates with a purple colour.

Take the plates tyed about with thread, as I told you, and fit them upon a pair of iron tongs, which you must fasten at the fore-end with an iron ring, that they may not open: hold them upon the hole of the upper

fornace, that they may receive the ascending smoak; and turn them about, until by degrees you shall perceive them gather a purple colour, without any other smoak then what ariseth from the heat of the coals; when you think them coloured enough, remove them from the smoke, and lay them aside.

How to make them of a Sapphire colour.

It is done much after the same way: for taking the rays in an iron tongs, and holding them over the hole of the fornace, cast upon the coals through the low arched door, the feathers of a goose, which grow upon her breast, and then lay upon them a red hot iron rod. for the smoke of the feathers, arising through the tunnel of the fornace, will beat upon the rays, and make them of a sky-colour: when the iron rod groweth cold, take another and put in. It is very admirable, how on a suddain these copper rays will change into several colours: wherefore when they have obtained the colour which you sesire, take them, take them off the fornace presently, for otherwise they will alter into another.

How to make them of a silver colour.

Take a little silver, and dissolve it with *aqua fortis*: then pour some fountain-water into it, and your copper rays: presently the water will be troubled, and will stick upon the copper like silver fleeces: cast away the water, and wash the silver, and dry in the sun; and when it is dry, lay it upon a marble, and mix with it an ounce of Tartar, and as much ordinary salt; grinde them together till they be well mixed. This being made into powder, lay it on copper, and rub it with your fingers, and it will make a shine like silver: then spread the rays upon the round wood, and the copper, wet them with the water, lay the powder on them, and rub them with your thumbs, that they may become of a silver colour; steep them in water, and levigate them with the blood-stone upon the aforesaid copper; then set them in the smoke, and they will shine with a sky-colour.

How to make them of the colour of an Emerald.

It is very difficult, and there scarce is one of very many that will prove right. First, make your rays of a sky-colour, as before; then take those which have not took that colour rightly, and lay two of them upon the hole of the fornace; and through the vault of the little door, fling some leaves of Box upon red hot plates of iron, where they will crackle like bay-leaves, and send up a smoke through the hole, which will colour the rays. But before they come to be of a green colour, they must pass through many other colours, as yellow, red, and sky-colour; but they must continue some time before they obtain a perfect green.

How to make them red, like a Ruby.

Fling some stocks of Scarlet upon the live coles, and lay the thin plates over the hole, and the arising smoke will color them red.

How to make them of a colour of the Amethyst.

When it is made of a sky-colour, it passeth through the colour of the Amethyst; take it therefore off in time, and you have your with.

Chap. XIII.

How rays are to be coloured by a mixture of Metals.

I Will now shew how rays may be coloured by a mixture of other metals; which is of more difficulty, but of longer continuance. The former cost but little labour, but they easily lose their colour: these are harder to be made; but keep their colour longer. Take half a pound of copper, and melt it in a melting pot, put there unto half a crown of gold; and when it is well melted, and mixed, add some tartar, that when it cooleth, the top of it may be plain and smooth: after it is cold set it aside. the take another half pound of copper, and melt it in the same manner; mix a drachm of silver with it, and let it cool: take it out of the pot, and file the out-side of smooth; for the least crack, or chap, would spoil the work. You may know whether there be any crack within side or without, by this sign: place it in an even poise upon a piece of iron, and strike it with another piece; if it is sound equally, and ring clearly, it is whole; if it do jar, it is cracked somewhere. Let your pieces of metal be about a finger in bigness; beat then gently upon the anvil, lest the break somewhere; set them in the fire and season them, and when they are cold, beat them with the hammer into thin rays, as I have said before: if they chance to crack, file off the flaws; and when they have been seasoned twice or thrice, in the fire, have your pot of water ready, prepared with salt and tartar, to whiten them, that you may more exactly find uot the cracks.

To make shew of the colour of a Ruby.

The plates being finished, if you would make them of a ruby colour, do it with stocksof scarlet, as before; but then the rags must be of the mixture of copper and gold.

To make them of the colour of a Sapphire or Emerald.

Let the plates be of copper and silver: the Sapphire is made with goose feathers, but the Emerald with box-leaves, holding them somewhat longer over the fire. And these are the experiments which I have made concerning Gems.

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