



THE COMPLETE WORKS  
OF

RUDOLPH  
GLAUER

trans: Chris. Packe



PHILOSOPHICAL  
FURNACES

FOURTH PART



## THE

## FOURTH PART

of

## PHILOSOPHICAL FURNACES:

In which is described the Nature of the Fourth Furnace; by the help whereof, Minerals and Metals are tried, and examined after a more compendious way, than hitherto after the common manner; also the separation of Metals by the force of Fusion, and other necessary things that are done by the power of Fusion or Melting. Most profitable for Chymists, Triers, and Diggers of Minerals.

Of making the Furnace.

This Furnace may be made greater, or smaller, as you please, according to the matter to be tried: and if the DIAMETER thereof within, be but of one foot, you may set it in a crucible containing two or three pound; but greater crucibles require a greater furnace. Now this furnace must be quadrangular, and be built of stones, and lute, such which abide the fire, of the height of o one or two feet from the bottom to the grate, which must be such as may be cleared from the dross mixed with coals, or such as was the grate of the first furnace, consisting of two strong cross iron bars fastened in the furnace with certain distances for the receiving of 5, 6, or 7 other lesser iron bars which

are to be moveable, so that when they are obstructed they may be removed, and cleared from the dross; the lower part of the furnace must have near the bottom a hole (in the forepart) of the heighth, and breadth of a little span, with an iron or copper door, shutting close: the lower part also must have another hole near the grate on the other side with its register for the government of the fire, and for the attracting of wind. Above the grate, and a hand breadth from the grate must be another hole for putting in of coals, and crucibles, suitable to the proportion of the furnace, and the height thereof must be of one foot, and the latitude of half a foot, if the Inward Diameter of the furnace be of one foot, whereby the crucibles may be the more conveniently handled, and the coals be cast in with a fire-pan: Let this hole also have a very strong door of atone covered over with lute, either of which may endure the fire, and shut very close, that the fire may thereby (when the crucible is placed in the fire) attract air, but only from the collateral hole under the grate. Let the height of the furnace (being coated above) from the hole appointed for the putting in of coals and crucibles, be of one great span: Let there also be a round hole in the furnace, having the third part of the intrinsecal diameter of the furnace, appointed for the flame and smoke, to which if you will use a very violent fire, put to It a strong iron pipe of the height of 5, 6, 8, or 12 feet, for by how much the higher you set your pipe, the stronger fire may you give, and if you will you may erect above the furnace 1, 2, or 3 partitions with their doors serving to divers uses according to the flame that is gathered into them, by reason of divers degrees of fire,

which is in them, for the lowest is so hot, that It can easily contain in flux fusible metals, minerals, and salts; and serve for cementation, calcinatlons, and reverberations; also for burning of crucibles, and other earthen vessels, made of the best earth (of which In the Fifth part) and for vitriflcatioris, and sometimes for trials and burnings, & etc. The second division of heat, which is more remiss, serves for the burnings of minerals and metals as of lead, tin, Iron, and copper, that are necessary for calcinations; also for the necessary calcination of Tartar, and the fixed salt of other vegetables, that is required in chymical operation, as also the calcining of bones, and horns for cuples, and the ashes of wood. The third division or chamber is yet more remiss, and serves for the drying of crucibles, and other vessels that are made of the best earth, and afterwards to be burnt in the first partition. There may also other things be done by the help of these partitions, so that thou needest not for their sakes kindle a peculiar fire. But if thou wilt give a melting fire the strongest of all, put a long pipe to the lower hole appointed for drawing wind, and having a register; for by how much the fire attracts the air more remotely and another flame is forced to beat upon the metals, so much the greater power of the heat is there in the fusion of them. For which business sake thou hast need to have as that inferiour pipe, so also that superiour pipe in the top of the furnace. And if thou hast a fit chamber, in which another may go up from below by the proper chimney, thou mayest build another furnace in the superiour chimney, and perforate the wall with the applying of a register, that the fire may be forced to attract the

air from below through the collateral chimney, where you need not that long pipe but only may open a door, or window of the lower chamber, that the air may come into the chimney; and the fire attract the wind out of the collateral chimney, which it doth very vehemently, yea and stronger, than If it were helped with bellows, so that even the furnace, unless it were built of very good and fixed earth, would by too great a heat be destroyed; for Oftentimes the strongest crucibles melt with too much heat, wherefore a register is made for the governing of the fire.

And by the help of this furnace, with Gods blessing, I found out my choisest secrets. For before, and indeed from my youth I underwent the trougle of those vulgar labours performed by bellows, and common vents, not without loss of my health, by reason of the unavoidable malignant and poisonous fumes, which danger this furnace was without, not only of poisonous and malignant fumes, but also of all excessive heat:

For our furnace sends forth no fume (but above, so drawing, that the door being opened for the putting in of coals, it attracts by the vehemency of the fire, another fume, that is remote by the distance of half an eli. And because the fire doth so vehemently attract, it keeps its heat within it self, so that there is no fear of burning; yet you must cover your hand that holds the tongs with a linnen glove twice double, and wet in water, and with the other hand a wooden fence that is perspectible to preserve your eyes; otherwise it wants all danger of vapours, or fumes, as hath been said, and all excessive heat; the which is a great benefit in Art. I do ingenuously confess, if I had not found

this a few years since, I had not without loss left off all Alchemy together with its tedious labours. For I had spent many years of my life In great misery of labours, in superfluous cares, and watchings, as also in stinks, so that going into my Elaboratory with loathing, I should behold so many materials in so many, and such various pots, boxes, and other vessels, and also as many broken as whole instruments of earth, glass, iron, and copper, and did Judge my self so unhappy that I had made my self a slave to this Art, and especially because scarce one of 100, whereof I was one, did get his victuals and cloaths thereby. For these reasons I was determined to bid farewell to Chyministry, and to apply my self to Physick, and Chirurgery, In which I was always happy. But what? Whilest I thought to do as I resolved, and to cast forth of the doors all and each vessel of divers kinds, I found some crucibles broken, and in them many grains of gold and silver, formerly melted in them, which together with others gathered together, I thought to melt; but seeing I could not melt such things being very hard to be melted, without the help of bellows (which I had sold) I began to consider the matter with my self more seriously, and so I found out this furnace, and being invented, I presently built and proved it, which in tryings I found so good, that I did again take hope of my labours, and would no more despair.

Seeing therefore an easy, and compendious way of melting metals, I began to work, and to begin a new search, and every day I found more and more in nature, viz, the greatest and most pleasant secrets of nature; wherefore I did without ceasing seek, until God had opened mine eyes

to see that which I sought a long time for in vain. Where also I observed, that although I had before had more knowledge of nature, yet without this furnace I could scarce have done any thing that had been singular. And so God willing, by the help of this furnace, I found out more daily, for which blessing I give immortal God immortal thanks, resolving to communicate this new invention candidly, and faithfully for the sake of my neighbour. Judge therefore O Chymist! Whether this, or that which is made by the help of bellows and common vents, be the best? For how long doth he that will melt a hard metal in a wind furnace give fire to it before it will flow, and with what loss of time, and coals? He that doth melt by the help of bellows hath need of a companion to blow, with great danger of breaking the crucible with the wind, and of making it fall when the coals are abated, or of impurities falling into the crucible in case the cover thereof should fall off, although there can be no detriment by impurities falling in. If the matter be metallick, but not so if it be a salt or mineral, (without which that cannot be perfected in the fire) not induring the impurities of the coals, but boiling over by reason of them. Now our furnace is free from this danger, because the wind comes from beneath and crucibles come always into sight, not being so over-whelmed with coals as in the common way, & etc. For by this means the matter to be melted is flowed, although the crucibles be not covered over with coals, nor with a cover, and although thou hast not a companion to blow, for you may at pleasure give any degree of fire by the direction of the register. When therefore thou makest any trial in the fire have this furnace which is

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recommended to thee, which build rightly with its register for the governing of the fire, and for the drawing of wind, and without doubt this labour shall not be in vain.

How minerals are to be tryed.

The manner of trying minerals hath been already made known, wherefore it is not needful here to write many things, because divers Authors, as GEORGIUS AGRICOLA, LAZARUS ERCKER, and others have sufficiently wrote thereof, to whose writings I refer thee, especially to that most famous LAZARUS ERCKER which is so much commended, DE PROBATIONE MINERALIUM, as well maglignant (obstinate) as mild. But thus much know, being that which experience hath also taught us, that neither he nor his predecessours had a perfect knowledge of all things, nor would reveal all things they knew, For many excellent things do yet lye hid, and perhaps shall yet for a while lye hid by reason of the ingratitude of the world; although the most famous Philosophers do with one consent affirm that imperfect metals, as lead, tin, iron, copper, and Mercury, are intrinsecally gold, and silver, although it may seem very improbable to many that are not curious, but contented with the opinions of their parents; supposing those minerals to be barren that leave nothing in the cuple, when they are tryed with lead: when as yet that proof by cuples although famous, is not yet that true Philosophical trial of metals, but only vulgar, according to the testimony of Philosophers, as of ISAAC HOLLANDUS, and others, especially of PARACELSUS in many places treating



of metals, but especially In his book VEXATIONUM ALCHEMISTARTJM, containing a true description of the properties, and perfection of metals. Which although not being to be understood by all, matters not; for a very easy art is not to be communicated to all, according to PARACELSUS saying. Imperfect metals being freed from their impurities have in them abundance of gold and silver, But how metals are to be purged, and separated he doth not teach, but only commends LEAD to be the Author; which made the Alchyrnist beleive that it was common lead, not knowing that the water thereof (lead) did not only purge other metals, but also lead it self; supposing also that the trial of tin, copper, and iron, made in a cuple with lead to be that true genuine bath thereof; not observing that lead hath no affinity with iron, and tin in a stronger fire, but to reject what is black, and unclean, without any perfection. Now this lead can do, if viz, it be mixed with a mineral that hath gold or silver in it, and be melted in. the fire incorporated with it, it may together with their impurities enter into the Cuple, the good gold and silver being left in the Cuple, which is the proof of minerals that are digged, and used; and it is done upon this account, viz, gold and silver may be naturally purged of their superfluous sulphur so as never to be any more radically united, and mixed with those that be imperfect, as being polluted with abundance of crude, impure sulphur, although they may be melted together in the fire; yet that mixture being retained in the fire, the combustible sulphur of common metals, acts upon its own proper argent vive, and turns it into dross, which being separated from the metals enters into the porous matter of the cuples, that which

doth not happen in tests, fixed in the fire, which that dross being separated from the metals cannot enter into, being made of an earth that is durable in the fire, the dross remaining in them, which otherwise was wont to enter into those cuples that are made of the ashes of bones, or wood.

Wherefore by little and little it goes away into the cuple, viz. as much as the fire reduced into a Litharge, or dross, until all the Lead mixed with the Gold and Silver together with other imperfect metals mixed with it go into dross, and hide themselves in the cuple, the pure gold and silver being left in the cuple. For Lead in a plain vessel, feeling the heat from above, but beneath cold, is turned into Litharge, which if it be in an earthen fixed vessel, the Litharge remains, and goes into a yellow transparent glass at last, if it be not mixed with other metals, as iron, copper, tin; which being mixed therewith, give to the glass a green, red, black, or white colour, according to the quantity of the metallick matter: but in a porous cuple made of ashes, the Litharge, or dross finding pores, enters into the cuple by little and little, and successively, until all the Lead be entered in, which could not be if it were not turned into Litharge. This vulgar trying is therefore nothing else but a transmutation of Lead, with the imperfect metals mixed with it, into dross, which entering into the cuple leaves in the cuple pure gold, and silver, that cannot be turned into dross by reason of their purity.

But perhaps this discourse may seem to thee unprofitable, and superfluous, because this trial of metals is known all the world over: but

for answer, I say that it is not superfluous, because many refiners err, supposing that corporeal Lead together with the imperfect metals that are mixed with it, goes into the cuple, not being yet turned into Litharge, because corporeal Lead is again melted from thence; for whose sake this discourse is not properly ordained, as being those that operate out of use, and custom only without discretion; but rather for their sakes, who do incessantly seek after, and search into the secrets of nature, viz, seeking after that Philosophical tryal, which is known to few, by the help whereof more gold and silver is obtained than by the common way, but it is not to be discovered in this place; for all must not have the knowledge thereof; It is sufficient that I have demonstrated the possibility thereof. Yet know this, if thou knowest how to prepare Lead, Tin, Copper, and Iron, and to fit them for a radical union, viz. that aforesaid water of Saturn, so as they may endure the force of the fire together, thou mayest separate and attract gold, and silver from the aforesaid imperfect metals, and with gain leaving them in the cuple, or else you shall draw little or nothing from thence (See Explicat. Mirac. Mundi,) And if you do intend to try them with Lead after the vulgar way, and bring them into dross, yet you do nothing, because tin and iron abounding with gold and silver, do not remain with the lead in a strong fire, but are lifted up like a skin or dross, by reason of their superfluous sulphur, swimming like fat upon water, without any separation, unless it be tin or iron, which got gold or silver from the mine in their first fusion.

And by this means it falls out sometimes, that some may make a good

proof, but out of ignorance, not knowing a reason of their operation, wherefore they cannot do the same again. For if Chymists, and Refiners did consider the matter more profoundly, enquiring the cause, wherefore lead being tryed, deprived of its silver, and melted in a cuple, should yet contain in it self silver, without doubt they would hit upon a good foundation; without which knowledge all their labour in imperfect metals would be in vain, And let this suffice concerning that Philosophical tryal, which is known to few; There is no need of speaking any thing of that vulgar, being every where known, of which LAZARUS ERCKER wrote plainly and fully.

There is also another proof of minerals, which is without Lead, with Venice, or any other good fusible glass, where one or two ounces of the powdered mineral are mixed with half an ounce of the powdered glass, and being mixed and covered in a crucible, are melted, and poured out; by which means the glass attracts, and dissolves that mineral, and is thereby coloured, which shews what metal is contained in the mine, after which may be made another tryal by Lead, tryal being first made by the first proof. And this is the fittest proof for the hardest minerals, which are even invincible, as are the LAPIS HEMITITIS, SMIRIS, granats, taick black and red, and those which abound oftentimes with gold, and silver, which because they cannot be mixed with Lead are not esteemed, but are oftentimes cast away, although they abound with gold and silver, and this because they cannot be tryed, Which being tryed after the aforesaid manner, and consequently the treasures lying therein being discovered., thou mayst afterward with more confidence handle them,

and reduce them to better profit. Now those colours which follow, indicate the tenure of them. Glass resembling the greenness of the Sea signifies meer copper, but the greenness of grass, signifies copper, and iron mixed together: glass of a rusty colour signifies iron: yellowish glass signifies tin, glass of a yellow golden colour, of like a red ruby signifies silver: Blue glass like a saphir signifies pure gold; a smaragdine signifies gold mixed with silver: An Amethyst colour signifies gold, silver, copper, and iron mixed together. Besides these, glass sometimes gets other colours, according to the diversity of the weight of divers metals mixed together; which use will teach with a further practise that is to be made with Saturn.

There is also another precursory tryal of minerals, and metals, which is made with Salt-peter, where especially tin, Iron, and copper do largely draw forth their treasures hid in them, which they will not yield being tryed by Lead, the which is not a sign of their poverty; but rather of not a true tryal made by Lead, which is not the true, and genuine judge, and tryer of metals. For otherwise (if it were) it would draw forth their treasure as well out of a greater quantity of metallick matter, as out of the lesser. Now follows the tryal by Nitre: Make a mixture of one part of sulphur, of two parts of pure Tartar, and four parts of purified Nitre, then take an ounce of this mixture, and one dram of the mineral or metal ground small, mix those together, and being put into a crucible, put a red hot iron or burning coal to them, and that mixture will be inflamed, and yield a most vehement fire, reducing that mineral or metal into dross: And what is not brought into

dross must again be mixed with the aforesaid mixture, and be burnt as before, until the whole be consumed by the fire. Then make that dross or salt containing in it the metal that is destroyed, to flow so long in a strong crucible, until it be made glass; which being poured out there are found grains of gold or silver, which came from the mineral or metal that was tryed. And this operation (if it be well done) will be a pleasant sight, but without profit, because it cannot be done in a great quantity, and by reason of the price of the Nitre. Wherefore I set this way of tryal only for demonstration sake, that it might appear how almost all tin, iron, and copper, contain in them gold and silver, although they do not draw it forth in the Cuple.

Now do not suppose that this is transmutation, which is only separation; wherefore thou must consider with thy self how that may be performed otherwise. But take heed that thou do not kindle this mixture from beneath, being put upon the coals, but from above, by reason of the danger of flashing: Also metals are easily fusible by the following mixture. Take one part of the saw-dust of the wood of the tell- tree being well dried, two parts of sulphur, eight or nine parts of pure Nitre. Make STRATUM SUPER STRATUM in a crucible, and take to 11, or 12 parts of this mixture; one part of the metal subtilty ground, and kindle them, and the mine being melted will yield grains of pure Gold and Silver, if the mine were not too impure, the impurity thereof be consumed by that most vehement fire. And if this tryal be not for thy profit, yet it is rational, and may be for thine instruction.

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Of the melting of mines and metals.

The melting of these in a great quantity is not for this place, because they cannot be done by this furnace, but it is treated of plainly enough by others in their writings of minerals.

Of the separation of metals.

This is a most ancient and profitable Art, whereby one metal may be separated from another: And it is the most part done always, viz. by AQUA FORTIS, by cement, by flux with sulphur, and lead, and lastly by Antimony; which ways that most witty LAZARUS ERCKER, hath clearly, and distinctly described, whose description is not to be found fault with, although some necessary things may be added thereunto, which being but few, I thought It superfluous to add them in this place.

And that separation consists in three chief metals, Gold, Silver, and Copper; he made no mention of other metals, and two of the aforesaid four ways are in use, as very easy, for they are done with AQUA FORTIS and Cement, the two others most commonly neglected, which are done by benefit of melting with Sulphur and Lead; and also by Antimony: that which is admirable, because metals are easier separated by benefit of these two ways, than, by AQUA FORTIS and Cements, suspected of waste, whereas not Sulphur and Antimony, but the ignorant worker, not knowing the nature of Sulphur and Antimony, is rather to be blamed, because he knows not how to order them, and withal leaves the nearer

way of separation: and I must needs confess it that without this furnace I would not separate with them, because with that common way of furnaces and bellows, the stink of Sulphur and Antimony hurtful to the Liver, Lungs, Brain, and Heart, is received by the Nostrils to the hazard of health: for which cause I do not wonder that those two ways requiring greater diligence than those two former by AQUA FORTIS and Cements are rejected. But this furnace being known, with which without danger one may melt, I doubt not of excelling the two former ways hereafter as more profitable than them. For he who knows Antimony, may not only easily with small cost separate Gold from the addition without any loss of it, and speedily refine it, but also easier separate gilt silver, then by Sulphur, Lead, & etc. in great store without any loss of Gold or Silver.

And this is the easiest way of the separation of Gold and Silver which is done by the benefit of melting, requiring no more charge than the coals; for there is Antimony which hath Gold in it as much as it is worth, which will be the separators gain: I would have you know this, how Antimony may again be separated from Gold and Silver, not by the common way, which is done by bellows, but by the special way of separation wherewith the Antimony is preserved, so that it may be used again for the same purpose; which I will treat of in another place. Besides the four ways spoken of, there is also another way, best of all, by the nitrous spirit of salt, namely after this manner: Rx. the spirit of salt (prepared by our first and second Furnace) acuated with Nitre dissolved in it, to which add grain Gold mixed with Silver and Copper, put



it in a glass vial in hot sand to dissolve, and the Gold together with the Copper will be dissolved in It, and the Silver left in the bottom of the vial: decant off the solution, to which add something, precipitating Gold, and make them boil together, and the pure fine gold will be separated and precipitated like the finest meal, serving Writers and Painters; the Copper being left in the water; which thou mayst if thou wilt precipitate from the water, but It is better to take away the water, which will serve again for the same use. If the precipitated Gold be washed and dryed it gives in the melting (by which nothing is lost) the best and purest Gold. For finer gold can neither be made by AQUA PORTIS nor by Antimony.

Therefore this is the best way of all, not only for the small cost, but also for the easiness yielding the best Gold of all others.

Then take the calcined Silver left in the gourd, sweeten and dry it, which done make a little salt of Tartar to melt in a crucible, to which by course put a little of the refined silver with a spoon, and it will presently be made a body without any loss. You may alsà boil that Calx as yet moist newly taken out of the gourd with a Lixivium of Salt of Tartar, even to the evaporation of all moisture: and melt the dry remnant, where also nothing is lost. Without this medium the calx of Silver (drawn from AQUA REGIA) is not fusible of it self, turning into a brittle matter, like horn that is white, or of a middle colour between white and yellow, called therefore of Chymists, the HORN OF THE MOON; in reducing which many have tried much, which reduction we have already taught. For want of spirit of salt take AQUA REGIA made of

AQUA FORTIS and salt Armoniack, which doth the same, but with greater charges. This also is to be preferred before other ways, which makes to the separation of any Gold of any degree, if so be it exceed Silver in weight; which is necessarily required in the solution made with AQUA FORTIS.

But that you may see the prerogative of this separation, mark a little, when you separate by the QUARTO and by AQUA FORTIS you must put just two or three parts of refined Silver to one of course Gold, where first the cost and labour of refining the Silver to be melted and grained with Gold are required: then a good quantity of AQUA FORTIS to dissolve, precipitate, edulcorate, dry and melt a great deal of silver. Consider then I pray, the labours and charges of my separation and the vulgar. When thou separatest with Cements there is need of boxes, and continual fire of one degree, which labour is tedious for times sake, and costly for coals, which labour you must twice or thrice take in regard of the mixt dross. Now again consider the labour and charges of both separations. When thou separatest by Sulphur and Antimony, which is the best way, without great charges, if thou knowest to separate Gold from Antimony without blowing, but this is tedious because thrice greater labour, then our way, tedious indeed by reason of the difficulty of a perfect separation of Gold and Silver from the Antimonial dross. Think therefore what way of separation you will use to refine Gold speedily, surely you will chuse mine.

This way of separation hath also this prerogative, that it hath no need of refined silver which is done by the benefit of burning, but

only its granulation, solution or separation by the use of AQUA FORTIS, where though copper mixt with silver makes waste, yet by the help of this salt it is soon precipitated. By this means gilt silver is soon separated, the gold being dissolved by the nitrous spirit, and precipitated with the aforesaid matter precipitating. As for the separation of gilt silver which is to be done by the help of fusion, and none is easier done than with Sulphur and Antimony, where when the necessary manual (ingredients) are known; a great deal is separated in a short time, but if thou knowest not how to handle Antimony and Sulphur (for which our Furnace very well befits) leave there, and use the common way, therefore lay not thy fault afterward on me, writing for thy good.

Of Separating the courser metals.

The manner of separating Tin from Lead, and Copper from Iron, without loss of both metals, by preserving both, hath hitherto been unknown, which seems impossible to me by reason of the combustibility of both metals; and superfluous for the small profit, and saving charges. But how Gold and Silver may be separated from Tin with which commonly this abounds, without any waste, hath been long since sought to no purpose: but a possibility will appear to a serious considerer; and though I never tryed in great quantity, being content with a precipitation made with a little; I am yet perswaded this business will succeed in a great quantity and with much profit; namely by the help of a Furnace made on purpose where gold and silver precipitated with lead and HALB KOPF by

extream heat of fire; that tin is extracted to the remanence of the tenth part, which remainder you must peculiarly take and keep. Which done you must precipitate new tin in the foresaid Furnace, and so extract to the remainder of the REGULUS, which being extracted from, is to be added to the first and reserved; which labour is to be reiterated, till thou hast a sufficient quantity of REGULUS filling the Furnace; which again thou must precipitate; for by this means gold and silver are brought together, so that they may easily afterward be separated from the superfluous tin. By this means I count the separation profitable, where but little substance is lost, which is turned into ashes and smoke. Nor doth adding lead and HALB KOPF hinder, because sometimes lead is mixt with tin, and the HALB KOPF is separated again. It is good therefore to separate pots and old dishes, by reason of the mixture of lead, and to precipitate the gold and silver from them, by the adjection of EALB KOPF only, where the residue is no way altered by the HALB KOPF, therefore thou mayst sell it, or refine it again: which in my judgement will be to great advantage.

What is to be held concerning the perfection of Metals.

This knot is scarce soluble, for so many and divers opinions of so many ages, so that most men slighting the testimonies of true Philosophers, will not believe the truth, especially, because scarce one of a hundred can be found who is not impoverisht with this art: the incredulous therefore is not to be blamed for his doubting, no signs of truth appearing,

yet experience testifies a possibility by art and nature, though examples are rare, I pray with how great absurdity should one deny Heaven and Hell never seen? But thou saist we must believe this as revealed by God, his Prophets and Apostles; but so is not this, but the Philo- sophick tradition of Heathens. I answer, though most Philosophers were heathen (yet some have been Christians) yet their works are not to be despised, because not handling our salvation: to whom if CHRIST had Preached, surely they had believed him. For it appears by their books that they were pious and honest men; who though not Professors of CHRIST, yet they did His Will indeed which we, though not in words, in action deny; who if they had been wicked, why took they so much pains in making books for the good and profit of their Neighbour about Virtue and Piety? Why spent they not rather their life time in leisure and pleasure, as is the custom now adays with them who are appointed to instruct us? Why should they gull posterity with trifles and lyes, expecting from thence no profit? For most of them were not poor, but very rich Kings and Princes, Besides these, there have been many Christians seriously confirming the truth of the Art: Men indeed of special note, namely, Bishops, Doctors, & etc. Such were THOMAS AQUANAS, ALBERTUS MAGNUS, LULLIUS, ARNOLDUS, ROGER BACON, BASIL, & etc. Why should very pious men deceive posterity with their Works, and lead them into Errors? Although there should not remain the Works of Famous Worthies, yet there would be a plain confirming the truth of this Art. For I am perswaded there are some to be found having this knowledge, and privetely possessing it. For who is so mad to reveal himself to the world, to receive

nought but envy for his reward? Let no man therefore doubt of this secret Art's truth. But say you: Why stand you so much for the Art? Did you ever see or perform any thing in it? I reply, though I never made projections to perfect metals, nor saw transmutations; yet I am sure of this, I have often from metals with metals, leaving no gold and silver in the cupel, extracted gold and silver by the help of fire:

But I will not have you think that one imperfect metal will perfect another, or turn it into gold or silver, impure and drossy without, in comparison of gold and silver; for how can such metals perfect another imperfect? Which thus understand. For as in the vegetable Kingdom, water cleanseth water, or juice with seething as is wont to be done in purifying honey and sugar, or any other vegetable juice, with common water, and white of eggs: so also you must understand of mineral juices or metal, of which if we know the water and white, surely we might refine the impurity, in which gold and silver lie hid, as in black shales, and powerfully extract gold and silver, which is not a transmutation of metals, but an eduction of gold and silver from the dung-hill; Dost thou ask how Gold and Silver can be educed from copper, iron, tin, and lead, to wit, by the help of lotion, out of which none is drawn with that best proof (as 'Tis thought) of Cupels? To which we answered before of the proof of Cupels not to be sufficient for all the several metals. I need therefore say no more, but I refer the studious Reader to PARACELSUS his Book, the VEXATION OF CH!MISTS, where thou shalt find another lotion and purification of metals, which heretofore was unknown to Miners and Dealers in Minerals. As for example: A Miner finding

the ore of copper, useth his skill delivered by the ancients to his utmost endeavour, whereby he may cleanse it and reduce it to metal: where first he breaks it into pieces, and boils it, for to take away the superfluous sulphur<sup>1</sup>, then by virtue of melting, he brings it into a stone (so called) which afterward again he commits to fire, and freeth it by the addition of lead, of its gold and silver: which done, he blacks and reddens It, turning it into copper, which is his last labour, whereby the copper is made malleable and vendible: which done, the Chymist coming, tries another separation, by whose help gold and silver is extracted, as yet tryed of very few, of which mention is here made. PARACELSUS also saith in the same place, that God hath given some an easier way of separating gold and silver from courser metals, and indeed without refining the ore, which Is a special and curious Art, which he teach- eth not in plain terms, but only saith it is sufficiently taught in seven rules Of that book, where he treats of the nature and propriety of metals; in which you may seek it. And this purification of courser metals I count most easy, which I have often tryed in small quantities: and I doubt not but God hath shewn other Artists also other purifications by which imperfect metals are perfected; for example, if one would purge the fruit of the earth by distillation, so that the dregs and impurities being taken away, it would grow up with a new clear clarified Body: as if one distil black and impure Amber by a retort, the separation would be made by Fire, of the water savouring of an EMPYREUM, of the oil and volatile salt, and the CAPUT MORTUUM be left in the bottom of the retort; by which means, in a very short time without great labour,

is made a great alteration and emendation of Amber, though the oil be black, impure, and stinking: but if it be again distilled by a retort with some mundifying water, as with the spirit of salt (namely through a fresh clean retort) there will be made a new separation by that spirit of salt, and a far clearer oil will be extracted; the dregs with the stink left in the bottom of the retort, which afterward may be twice or thrice rectified again with fresh spirit of salt, until it get the clearness of water, and sweetness of scent resembling Amber and musk.

And this transmutation makes of a hard thing, a soft, unlike the former in shape, which though never so soft and liquid, oily, may again be coagulated, so that it becomes as It was at first, after this manner following. Take the said oil very well clarified, add to it fresh spirit of salt, set it in digestion, and the oil will attract from the spirit of salt, salt enough for its own recoagulation, and again it acquires the hardness of Amber, of an excellent clear and admirable colour; of which half an ounce is worth more than some pounds of black Amber; of which scarce the eight or tenth part remains in purifying, all the foul superfluities cast away.

By this means I think one may cleanse and mend black metals, if so be the manner of their cleansing were known by distillation, sublimation and recoagulation. But thou say'st that metals cannot like vegetables be purified by force of distillation, to which I present our first furnace not given to peasants, but Chymists, purifying metals; so also the possibility of their perfection is shown by help of fermentation. For as fresh leaven can ferment the vegetables juices, which



are perfected by fermentation, the dregs being cast away as one may see in wine, ale, and other liquors, whose lasting and perfection proceeds from no other thing but fermentation purifying the vegetable juices, without which they could not otherwise withstand the Elements, subject to corruption in a very short time, which fermented last some years: 80 also if we knew the proper ferment of metals, surely we might refine and perfect them, so that they not being any more subject to rust, would be able to prevail against fire and water, and be nourished and fed by them. For so the world heretofore perished with water, and shall at last perish with fire, and our bodies must rot and be purified by fire before we come to the sight of God. And thus far of the fermentation of metals, wherewith they are amended and perfected. Metals also are purified and amended like milk set on the fire; whose cream the better part (the substance of butter) in the top is separated from the whey and cheese, and the hotter the place is, the sooner the separation is made even, so it is with the separation of metals; where metals put into a Fitted hot place by themselves without any addition of another thing (the metals being before reduced to a milky substance of curd) are separated in time, by parting the nobler parts from the ignobler, opening a great treasure: and as in winter time milk is hardly separated with a weak heat; just so metals if not helped with Fire, as one may see in iron, which in a long time under the earth is turned into gold without Art, For often iron ore is found with golden veins very goodly to behold, severed from the course, earthy and crude sulphur, by force of the central heat, And commonly in such ore no vitriol is found, being

separated and bettered by its contrary. But a long time is required for that subterraneous separation, which Art very speedily performs; as is wont to be done with milk in winter when we presently make butter of it, when we put it to the fire to part the cream speedily; which separation is helped by the precipitation made with acid things, mortifying the urinous salt of the milk, by which means all principles are separated by themselves, as butter, cheese, whey: so in a quarter of an hour separation is made by boiling, which else without acid things could not be done in some weeks, If then it be possible in vegetables and animals, why not in minerals? For what but gold and silver is found in lead, iron, tin, and copper, though it doth not appear? Why is all goodness denied to the courser metals granted to vegetables and animals not equal to them for lasting? Whence is the natural perfection of lead, tin, iron, and copper to be proved? Nature ever seeks the perfection of her fruits: but course metals are imperfect: Why then is not nature helped with Art in perfecting them? But the bond of metallick parts is worth observation, which being broken, the parts are separated. Urinous salt (as I may say) is the bond of the parts making milk, as of butter, whey, and cheese, which is to be mortified by its contrary acid for separation. But in iron the parts are bound with a vitriolate salt, as with a bond, which is to be mortified with its contrary, urinous or nitrous salt for separation. Be therefore who knoweth to take away the superfluous salt of iron, either by moist or dry means, doubtless shall have iron not soon subject to rust.

Fire also bath incredible force of It self in changing metals.

Is

not steel made of iron by force of Fire, and iron steel by different proceeding? Experience daily teacheth us also divers kinds of changes and refinings by Fire; why is it not possible in metals by an expert Chymist having skill in them? Who would believe that a live bird lurks in an egg, and an herb having leaves, flowers, and odour, in the seed? Why may not then abortive metals, getting not yet perfection, be perfected by Art, with help of Fire? Is not an unripe apple or pear ripened by the heat of the Sun? Which some curious and industrious men observing, have imitated nature in their works; and have found some metals not destroyed with the heat of Fire, but enriched with a secret gainful heat: so that melted (digestion being made) they have yielded double weight of gold and silver. Yea I my self have seen the common ore of lead digested after the aforesaid manner, which was not only enriched with silver thereby, but also partaked of gold which it wanted before in ordinary tryal. Besides one might work this in great quantity, as with an hundred pounds; which work of minerals will without doubt bring great profit to the skillful triers of lead: But know this, that not every tryal of lead will be furnished with gold, but the ore to be ever enriched with silver, experience being witness.

Many such things are found in Nature incredible to the ignorant, and those that are unexercised. But If we mortals were more diligent in reading the book written with the hand of God in the pages of the four Elements, surely we should Find more secrets and wonders in them, but skill and wealth is got with sweat of face and not by sloth; therefore LABOUR and PRAY. Metals are also meliorated by the help of gradation

like unto germination.

For it is well known, that the shoot or grass of some fruitful garden tree implanted in a wood, makes that tree afterwards to bear not wild fruits, but very good and sweet like them of the implanted shoot, as one may see in iron dissolved in an acid spirit, fermented with Venus and turned into Copper: by which means doubtless copper is turned into silver, and silver into gold, if the true manner of fermentation were known.

Now this transmutation is like digestion, making beef or horse flesh of grass in the stomach of oxe and horse, and mans flesh or beef, in the stomach of man.

The better parts also are separated from the worser by the attractive strength of the like, as is to be seen in a metal abounding with sulphur, to which if iron be added in fusion, the sulphur deserts its native metal, (by which means it is more purified) and joins its self to the iron, with which it hath more affinity and familiarity, than with its own metal; for example, if iron be added to lead ore full of sulphur in the melting, this melted metal is made malleable, which else would be black and brittle. And if something else to be put to the melted malleable metal were known to us, to take away in the melting, the redundant, crude, combustible sulphur, questionless it would yet be made purer; which thing being unknown, metals remain in their impurity. And indeed God hath done well in this as in all other his works, that he hath concealed his knowledge from us: for if it were known to the covetous, they would buy up all lead, tin, copper, and iron, to turn into gold, so that rerall and poor Labourers could hardly buy metallick

instruments for their use, for the scarcity; but God will not have all metals turned into Gold.

A Similitude of taking away the superfluous sulphur of some metals in fusion, being given to keep the purer parts; so likewise is there another manner of separating, the purer parts from the impure, namely, by the attractive power of the like, where the purer parts are drawn together by their like, the impurer and heterogeneous part is rejected: and that may be shown as well by the moist as dry way: an example of the moist way followeth.

If quick Mercury be added to impure gold or silver dissolved in its proper MENSTRUUM, the mercury draws to it self the invisible gold and silver from the MENSTRUUM and mixt Impurity and associates what is purest to it self, which separation swiftly succeeds. Mercury performs the same likewise in the dry way: namely, when some earth having some gold and silver, is moistened with acid water, and they are so long bruised together, till the Mercury draws the better part; which done you must wash the dead earth left, with common water, and separate the mercury being dried from the attracted gold and silver, by trajecting them through a skin, but the Mercury draws but one metal from the earth, and indeed the best at one time; which being separated, it draws another metal; for example, if in some one earth, gold, silver, copper and iron lye hid, the first time the mercury draws the gold, the second the silver, but copper and iron hardly by reason of their dross, but tin and lead easily, but easiest of all gold by reason of its purity like to mercury.

Another Demonstration by the dry way.

Put under a tile a cuple with lead, to which add a grain of very pure gold, most exactly weighed (for memories sake) make the gold in the cuple to fulminate, and the lead will enter the cuple, the gold being left pale in the cuple: of which pale colour there is no other cause than the mixture of silver, drawn from the lead by the gold. But thou wilt say, that thou knowest this, that gold fulminated with lead, is made paler and weightier, by reason of the silver in the lead, left with the gold in the trial, augmenting the weight, and thence making it pale: to which I reply, though lead leave some silver in trying in the cuple, mixt with the gold added to it, augmenting its weight, and changing the colour; yet it is proved by the weight, that lead leaves more being mixt with gold in the cuple, than when tryed without gold. Hence it is proved, that gold in the fire draws its like from other metals, augmenting its weight: and this also gold doth in the moist way: for if it be dissolved in. its own MENSTRUUM, together with copper, and put in digestion, and then separated, it attracts gold from the copper; which labour, though not done with profit, yet witnesseth a possibility. But if the MENSTRUUM of gold augmenting the attracting power of gold or multiplying the same were known, but diminishing the retentive power of copper, doubtless some gain were to be expected; and indeed more, if gold and copper, together be melted in fire with the dry mineral MENSTRUUM, by which means the weight of gold would be increased according to PARACELSUS saying Metals mixt together in. a strong fire, continued

a pretty while, the imperfection vanisheth and leaves perfection in its place.

Which surely well done, is a work not wanting gain. For I freely confess, that I would sometime incorporate silver with iron, when as gold from iron gave me a good increase of pure gold, instead of fixt silver sought after. And by this means often some not thought on thing happens to Artists, as to my self with first silver, not rightly considering the business. Therefore inedling with metals, be sure when you find some encrease, to weigh well what it was at first. For many think long trying silver with iron, by the Blood-stone, Load-stone, Emerald, LAPIS CALANINARIS, Red-talck, Granats, Antimony, Arsenick, Sulphur, Flints, & etc. having mature and immature, volatile and fixt gold in them, finding in the trying good gold; that this gold is made of the silver by the help and use of the foresaid minerals, which is false. For the silver drew that gold out of those minerals, in which before it lurked volatile. Yet I deny not the possibility of changing silver, as being inwar4ly very like gold, but not by help of cementation with the said minerals, because that gold proceeds not from the silver, but those minerals, attracted by the silver. This labour is compared to seed cast into good ground, where dying, by its own power it draws its like to it self, whence it is multiplied an hundred fold.

And it behoveth in this work now and then to wet the metallick earth, with proper aetallick waters, being dryed up with heat (which operation is called of the Philosophers inceration) else the earth will be barren, and it behoveth that this water be fleer in kind to the earth, so that

when they are united they yield a certain fatness. For as it appears from sandy dry earth, moistened with rain water, not bringing forth fruit agreeable to its seed, for the small heat also of the Sun consuming the moisture, and burning the seed in the earth, which mixt with cows dung or other, keeps the water so as that it cannot be so soon consumed. By the same reason it is necessary that thy earth and water be mixt, lest thy seed be burnt up. Which work if well handled, it will not be in vain, requiring the exceeding diligence of nourishing the earth with warmth and moisture, when the earth is drowned with too- much moisture, or hath too little, it cannot increase, and this is one of the best labours, with which I draw forth good gold and silver of baser metals, requiring the best vessels, retaining the seed together with its earth, and water in its proper heat. I doubt not but this work also in greater quantity may be performed, firmly believing that the courser metals, especially lead, the fittest of all not only to be perfected into gold and silver, but also into good medicine: which without question is a Philosophick labour granted from God, as a great comfort to the Chymist, but warily to be used. For that all and singular Gods gifts he will not have common: as indeed I have found, when I had invented a very excellent work, that I shewing it to a friend, neither could I afterwards teach it to him, nor do it again for my self. Therefore indeed justly men are doubtful in writing such matters: for many seek with idleness to get the inventions of others, performed with great costs and labour. Therefore it is safer to be silent and give leave to seek, than to publish secrets, that they may undergo the pains and



charges to be born in inventing high matters; nor any more hereafter may the ingrateful so impudently gape after others Labours. Therefore I would entreat all men both of high and low degree, that they would not molest and tire me hereafter with their Petitions and Epistles, and that they would not turn my good will of benefiting others to the ruin of my self, but be contented with my writings published for the profit of my neighbour. Nor do you think that I possess and promise golden mountains. For what I have written, I have writ to discover nature, in these discourses of the perfection of course metals in small quantity: For I have never made trial in a great quantity, trying truth and possibility in a lesser only, in small crucibles: therefore those things which I have writ are written to that end that the possibility of the Art, may appear, of perfect metals to be wrought out of imperfect, therefore he who hath occasion may make trial in a greater quantity: but as for my part wanting opportunity, I expect Gods blessing, whereby upon occasion I may make tryal in a greater quantity, and so receive the fruit of my labour and great charges.

Also metallick bodies are transmuted by another means, namely by the benefit of a tinging metallick spirit, as one may see in AURUM FULMINANS, sometimes kindled upon a smooth clean metallick plate, fixing a very deep golden tincture upon the plate, so that it may bear the Touch-stone. The same also happens in the moist way, where plated metals put into a gradatory spirit made of Nitre, and certain minerals, being pierced by the spirit, obtain another kind agreeing to the spirit. But if one doubt of the metallick gradation, made with AURUM FULMINANS; he

may try the certainty from the often firing of fresh AURUM FULMINANS, upon the same plate; for he shall see that it is not the colour of the metal, and outwardly gilded, but deeply tinged. Likewise one may try the certainty by a humid spirit, if the transformed metals are tryed, whence the mutual action and passion of subtilimed spirits plainly appears, for the power of spirits is very great, and incredible to one not exercised; and this gradation of inferiour metals, Philosophers both ancient and modern, do not only confirm, but also diggers of mmorals taught by experience, that mineral vapours by penetration change courser into purer metals, LAZEPUS ERCKER being witness, that iron is changed into good natural copper in green salt waters, & that he saw a pit, in which iron nails and other things cast in, by the penetration of a cupreous spirit were turned into good copper. I do not deny that metallick dissolutions of some metals do stick precipitated to the plates, and to make them of a golden, silver, or cupreous colour; for it is well known, that iron cast into a vitriol water not to be turned into copper, but to draw copper out of the water, of which thing we treat not here, confirming the possibility of metallick transmutations by a tinging and piercing spirit; therefore I again maintain that great power is in. metallick spirits; look only upon course and opake earth, and besides that clear and limpid water with which the clearer and more powerful air proceeding from the water cometh from the earth. Are not whole Countries drowned with water, sometimes Towns and Cities taken away? Cannot the air destroy the strongest Houses; especially shut up in the earth, shake the Land for some miles, and afterward demolish

whole Cities and Mountains with the death of Men? All which things are done naturally. Wind artificially raised by Nitre threatens a far greater danger, which no man can deny. Although that corporeal Elements exercise so great power, yet they cannot pierce metals without hurt, nor stones and glass, and things soon penetrated by fire. Therefore not by an occult but a manifest power of Sun and Fire, which it hath over metals, stones and glass, which are easily pierced by them without any impediment: and why should not metals compact of a certain metallick subtile and piercing spirit be penetrated by help of fire, and changed into another species? As is already spoken of AURUM FULMINANS and AQUA GRADATORIA. Therefore there is no doubt of the possibility of the metallick tingent spirit changing courser metals into finer, both by the dry and moist way: For Metals may be purified the same way as Tartar and Vitriol, and other salts, namely by the benefit of much water. For it is manifest that vitriol is purged with iron and copper mixt with it, namely dissolved and coagulated in much water, so that it waxes as white as allom; which purification is but a separation of the metal from the salt, made by the benefit of much water debilitating the salt, so that it cannot longer retain the mixt metal, which is precipitated like some slime, not unprofitable, because the chiefest part of the vitriol, from which is the greenness, viz. Copper, Iron, and Sulphur. And as by help of separation metals are drawn from vitriol, more perfect than salts; so also it is with metals when the perfecter and better part is separated by help of precipitation: as for Tartar, it is nourished by the addition of water, but its better part is not

precipitated as in vitriol, but the courser part which is its blackness and feculency. As for example: Common Tartar by the often solution (made with a sufficient quantity of water) and coagulation is made very pure and white, because in every solution made with fresh clear water, it always becomes purer; and not only by this means white Tartar, but also red and feculent, is reduced into transparent crystals, and indeed very speedily by virtue of a certain precipitation; whose limosity is the cause of the obscurity of the crystalline salt of tartar, and is nothing else but an unsavory thing, dead and useless, mixt with the tartar in its coagulation in Hogs-heads of wine, and separated again by power of solution.

And these examples of the two salts of Vitriol and Tartar, are not in vain set down, because they shew the difference in precipitation:

For in. some Metals, by force of precipitation, the courser part is separated; but in other, the better and choicer, according to the prevalency of this or that part.

In Vitriol, the better part (Copper and Iron) is the least, which is precipitated and separated from the courser and greater part, viz. Salt; But, in. Tartar, the courser and less part is precipitated and separated from the greater and better part clarified: The like is in Metals. Therefore, let every one be wary in separating: and consider before, whether the better or courser part of the Metal is to be precipitated; without which Knowledge, no Man can meddle with this business. Let also the Workman be ware, who expects any profit from his labour, of Corrosive Waters; as AQUA FORTIS, AQUA REGIA, Spirit of Salt, Vitriol,

Allom, Vinegar, & etc. in the solution from which no Good proceeds, as utterly destroying and corrupting all and each of them: proving the same in these words, FROM METALS, BY METALS, AND WITH METALS, METALS ARE MADE PERFECT. Metals are also purified; maturated and separated from their Vices, by Nitre burning up the superfluous Sulphur.

And all the aforesaid perfections of metals are but particular. For every particular medicine, as well humane, as metallick, purgeth, separateth and perfecteth or amendeth by the taking away the superfluity. For a universal medicine worketh its perfections and emendations, by strengthening and multiplying the radical moisture as well of animals as metals, expelling its enemy by its own natural virtue. But thou sayest excellent examples indeed are delivered by me, but not the manner of doing them. R. I have delivered more than you think, although you dont perceive it: for I am sure after my death that my books will be in a greater esteem, from which it will appear that I have not sought vain glory, but the profit of my neighbour to the utmost of my power. But do not, seeing my freeness of writing, think that you may wrest many things from me. For assure your self, that although I have written many things for the publick good, yet I intend not by this means to trouble my self. For I cannot satisfy the desires of all men, nor answer their Epistles, nor enrich all men, who neither am rich my self, nor have sought riches. For although I have gotten. the knowledge of these things by Gods blessing, and have tryed the truth of it in small quantity, yet have I never made experience in great store for wealths sake, being contented with Gods blessing.

And let this suffice concerning the several purifications of metals according to my experience; as for that universal medicine so famous, I cannot judge of it, being a thing unknown to me; but the possibility thereof I am forced to affirm, being moved with the several transmutions of metals; which being unknown, it behoves us to be contented with that favour which God hath bestowed on us. For oftentimes question-less it is better to know little, for Eternal Salvations sake; for most commonly wealth and learning puff up. And pride brings to the Devil the Author of it, from whence God of his mercy preserve us.

Of the Philosophers Stone.

I have undergone much charge and labour for many years, to extract the tincture or anima of gold, for a medicine to be made therewith, which at length I have obtained, where I have observed the remainder of the gold, the soul or better part being extracted to be no more gold, nor longer to endure fire. Whence I conjectured, that such an extraction being fixt again, can perfect courser metals and turn them into gold: But I could not hitherto try the truth of my conceived opinion living at this time in a foreign place; therefore against my will, although greedy of novelty, I have been forced to abstain from the work. In the mean time considering the opinions of the Philosophers concerning their gold, not the vulgar, asserting the universal medicine to be prepared therewith. I have again affused a certain Philosophical Vinegar to Copper for to extract the tincture, where almost all the Copper like

whitish earth is separated from the tincture in digestion, which earth by no Art I could again reduce into a metallick body.

Which experiment again confirmed me of a possibility of this Medicine. Which labour though I never followed, yet I doubt not but an humane medicine, though not also a metallick is attainable thence by a diligent workman. The soul therefore with all the metallick attributes, consisting in so small a quantity, which is scarce the hundredeth part of the weight, which being extracted and separated, the remaining body is no more a metal, but a useless and dead earth; but it is not to be doubted but being fixt again, it may reassume and perfect another metallick body. Therefore I am confidently perewaded by the aforesaid Reasons, That such a medicine is to be made of mineral and metallick things, vim, in the flowing, changing baser metals into better. But do not think that I writing these things make gold or copper the matter of this medicine, which I do not hold, well knowing that there are other subjects easily to be handled, abounding with tinctures.

So thou hast heard now my opinion of the Universal Medicine, which my experience in Gold, Copper, and other Minerals and Metals hath caused: which I will not preach for GOSPEL, because it is human to err. Therefore no certainty is to be had, before its final and compleat perfection, and indeed once or twice tryed for certainties sake. For an excellent way once found out, cannot always be often repeated, which happens doubtless as well to others as to me. Therefore we must not triumph before the Victory; for unthought on impediments may frustrate Hope: but God is rather to be implored in our labours, that he would

be pleased to bless our endeavours, that we may use well his gifts in this life as good stewards, and afterward bestow the free reward of our labours, watchings, and cares on us sinners, namely, everlasting Rest and Salvation out of his meer Mercy.

Whether Minerals, as Antimony, Arsenick, Orpiment, Cobalt, Zinck, Sulphur, & etc. may be transmuted into metals, and into what?

It is long since debated among Chymists, whether the aforesaid Minerals proceed from the same principles with Metals, and whether to be counted Metals; in which Controversity they have not agreed to this day, when as one approves that which another denies, so that a student of Chymistry knows not to what side he had best assent.

But this knowledge not a little helping, concerning the purifying of metals, I would put my opinion also grounded upon experience, for the satisfying the doubtful, the simplicity of them is strange who hold not one and the same beginning to be of minerals and metals, saying, if metals might be made by nature, of minerals surely it had long since been done; but it was never, experience witnessing; for remaining minerals, they are never transplanted into metals. I Answer, metals grow one way, also vegetables another, soon budding, and again soon dying; but it is not so with metals; for all lasting things have long time of digestion, according to the saying, THAT WHICH IS SOON MADE, DOTH SOON FADE; this is to be understood not only of vegetables and minerals, but also of animals, as appears from the budding of some vegetables,



coming in six months space to their perfection, and then again perishing: when as things requiring longer time of digestion and perfection are much more lasting. A Mushroom in the space of one or two nights grows out of a rotten wood, again soon vanishing: not so the Oak. Oxen, and Horses in the space of two or three years comes to perfection, scarce living the twentyeth, or twenty-fourth year: but a Man requiring twenty four years to his perfection, lives sixty, eighty, or an hundred years. So also we must conceive of lasting metals requiring many ages, and also very long time of digestion and perfection.; metals therefore requiring a very long time of digestion to their perfection, it is granted to no man ever to see the beginning, and the end of them; the transplantation of minerals into metals by nature cannot be denyed; especially, because that in the ores of metals, especially of course ones, minerals are also found; wherefore diggers of minerals, when they find them, conceive good hopes of finding metals, of which they are termed the COVERLIDS, for seldom metals are found without minerals, or minerals without metals; nor also are ever minerals found wanting gold or silver; therefore minerals are properly termed the EMBRYO of Metals; because by art and fire a good part of gold and silver is drawn out of them by fusion; which if they do not proceed from the metallick roots, whence proceeds that gold and silver? For an Ox is not born of an infant, nor a man of a Calf, for always like is produced of its like.

Therefore minerals are counted but unripe fruits in respect of metals, not yet obtaining their ripeness and perfection, nor separated from the superfluous earth; for how should a bird be hatched of an egg by

an heat, not predestined for the generation of a bird? For so we must understand of minerals, which if they be deprived of their metallick nature, how should by fire metals be produced from thence? But thou saist that thou never sawest the production of perfect metals out of courser; therefore that it is neither likely, nor credible to thee, to whom many things as yet lye hid, as from most men, perversly and foolishly denying things unknown; for daily experience witnesseth, that the viler minerals and metals by taking away the superfluous sulphur (how-ever it be, done) obtain a greater degree of perfection, therefore should not thy heart believe, and thy tongue speak what thou seest with thine eyes? For experience shews that good gold and silver might be drawn out by art almost out of all course minerals and metals, yet more out of some then of others, and speedier; for there is not that dark night, that is altogether deprived of light, which may not be manifested by a hollow glass; nor is there an element (though never so pure) not mixt with other elements, nor any malignity deprived of all good, or on the contrary. And as it is possible to gather the hidden beams of the Sun in the aire, so also hidden perfect metals dispersed in the imperfect metals, and minerals by fire, and an expert Artist: if once they are placed in fire with their proper solvents, where the homogeneous parts are gathered, and the hetrogeneous separated; so that there is no need to go into the INDIES to seek gold and silver in. those new Islands, which is possible to find plentifully here in. GERMANY, if so be the merciful God would please to turn away those present cruel Plagues, and bring them out of old metals, viz. Lead, Tin, Iron, and Copper, there

left by the Dealers in minerals; Indeed without the culture of minerals. Let no man therefore judge himself to be poor, because he is only poor and in want (although otherwise very rich and abounding in wealth, which yet in a moment he is forced to forsake) that being ungrateful, neither knoweth nor acknowledgeth God in his works.

What I pray is in less esteem in the world, than old Iron and Lead, which are acceptable to the wise to use in. the Lotion of Copper and Tin with the mineral White? But how they are to be washed, is a difficulty to the unexercised in the fire, and shall be delivered by similitudes: You see Antimony fresh digged out of the earth, very black and impure; which by fusion separated from its superfluity (which, though nature gave to it not in vain, but as an help to its purification, according to that: GOD AND NATURE DO NOTHING IN VAIN) is made more pure, and endowed with a body nearer to metals than its mineral, which if afterwards melted with the salt of Tartar, the crude and combustibile sulphur is mortified thereby, and is turned into dross, and separated from the pure mercurial part, so that hereby is made a new and fresh separation of the parts, of which one portion being white and brittle, sinks to the bottom, the other lighter, to wit, the combustibile sulphur is on the top with the salt of Tartar; which poured out into a Cone, when they are cold, may be separated with the hammer; the inferiour part of which is called by the Chymists REGULUS, which is purer than Antimony cast the first time out of its mineral; and this is the usual purging of Antimony used by Chymists; to which (REGULUS) if afterward any thing should be added, for a third purification, without doubt it would not

only be made purer but more fixt and malleable. For if white REGULUS be preparable out of black Antimony, why not as well malleable metal out of the REGULUS.

Another way of separating the superfluous Antimonial Sulphur.

Rx. Antimony powdered one part, Salt-peter half as much, mingle them, and kindle the mixture with a live coal, and let that Antimonial sulphur, with the nitre be burnt up, the darkish mass being left, to wit, of a brown colour; which melted for the space of an hour in a strong fire yields an Antimony like to that which is made with salt of Tartar, but somewhat less in quantity: in like manner the parts of Antimony are separated, viz, if Antimony, Nitre, and crude Tartar be mingled in an equal weight, and being mixt are kindled and melted. There is also another separation of the Antimonial parts; when of small bits of iron one part is put into a strong crucible, in a wind Furnace, to which being red hot, cast two parts of ground Antimony, for fusion, and the superfluous combustible sulphur will forsake the Antimony, and join to the iron, a metal more amicable to it; mixt with which, it forsaketh its own proper pure Mercury, and sulphur or REGULUS, which is almost the half part of the Antimony.

And these four ways, by which the superfluous combustible sulphur of Antimony is separated are most common, not set down as secrets, but for demonstration sake, that it may appear how sulphureous minerals are, to be perfected and purified, which are little amended; yet shewing

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a better way not only for Antimony, but also for Arsenick and Orpm, although these two cannot be so done with Iron, Nitre and Tartar by reason of their volatility; but with Oil, or other fat things in close crucibles, giving a REGULUS like to the Antimonial; and these REGULI make Tin hard, to sound and be compact; if to one pound one ounce be added in fusion, for making good household stuff. And in tryal they give good Gold.

And as it is said of purging Antimony, so also it is to be under-stood of the rest, as WISMUTH, ZINCK, LAPIS CALAMINARIS, Lead, Tin, Iron and Copper, to be purged from their superfluous sulphur, if thou wilt draw more perfect metals, viz. Gold and Silver out of them with gain. And so I make an end of metallick lotions; recommending to Chy- mists, NITRE, TARTAR, FLINTS, AND LEAD; for who knoweth to use them, shall not Lose his labour in Chymistry: but tis to be lamented, that every where good earth and fixt in. the fire, is not to be gotten, retaining Lead and Salts; for without our old Saturn little or nothing can be done in refining metals; therefore who goes to try any thing in this Art, let him seek the best earth retaining Lead twenty four hours space afterward let him consult with Tin, what VULCAN has to be done with Iron; who will tell him what he must suffer, before he obtain the Crown.

Of the tincture of Sol and Antimony.

Sometimes an alteration happens to mans body, from the attraction of mineral vapours (which cannot be done by my Furnace) in the tryal; therefore here I will set down a certain medicine for the Workmans sake,

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as well for preserving as curing, namely, a clear rubin fixt, and soluble of Gold and Antimony. Take of pure Gold half an ounce, dissolve it in AQUA REGIA; precipitate the solution with liquor of Flints, as before is said in the Second part; edulcorate and dry the calx, and it will be prepared; take REGULUS MAPTIS (of which is spoken in a little before) beaten fine, to which mix three parts of the purest Nitre; place the mixture in the crucible between burning coals, putting to fire by degrees: which done make a stronger, viz, for fusion; for then the mass will be made purple, which taken forth and cooled grind very small, of which take three or four parts and mix with one part of the aforesaid golden caix; place it mixed in a strong crucible covered over in the aforesaid wind Furnace, and make the mass to flow together like a metal, and it will assume the Antimonial Nitre in. the fusion, and will dissolve the Gold or the calx of Gold, and a mass of an Amethyst colour will be made therewith, which so long leave in the fire, till it get the clearness of a Ruby, which one may try with a clean wire or iron bowed and put therein, although in. the mean time the mass deprived of fusibility, is thickened; it is meat to add some nitre or Tartar, for speeding fusion, and that as often as shall be needful. Lastly, pour the mass, when it shall come to the utmost redness of a Ruby, hot into a clean copper mortar, which there leave until it cool, and it will be in colour very like to an Oriental Ruby; then bruise it hot into powder, for taking air it would melt, and extract the tincture by the a! fusion of the spirit of Wine in a Vial, and the Gold together with the Antimony will remain very white like the finest Talc, to be washed with clear water,

in a glass,edulcorated and dried; which melted with a stronger fire, gives a Yellow glass, in which no Gold appears, yet separable by way of precipitation with the filings of iron and copper, from which it recovers its ancient colour, but without profit, by reason of the waste, the tinged spirit is to be taken away from the tincture, which is a very sovereign medicine in many grievous diseases.

Although thou mayest suspect this not to be the simple tincture of SOL, but of Nitre and Tartar mixt, be sure that the quantity of Nitre added not to exceed; and suppose that tincture of Tartar and Nitre., I pray what waste is there? Since that is so good a medicine by it self, & I am perswaded, this tincture of SOL to be better than those set down in the Second part. That Ruby may be so used by it self with proper vehicles, seeing it is a sovereign medicine of it self; or else exposed to the air and resolved to a liquor; for the medicine is no less than a tincture, because the Gold in it, and the purer part of Antimony are made potable without corrosives. Wonderful is the power of salts in metals to be destroyed, perfected and changed by fusion; for it happened to me one time making this Ruby, placing two other crucibles also with metals, by this containing gold with the prepared REGULUS of Antimony (for easily two or three, or more crucibles may be placed in this furnace, to be ruled with one fire, which cannot be done in a common furnace by that means) about to put in a certain salt into the crucible next to the crucible of gold, that by a mistake I cast it into the crucible with gold only, whence so great a conflict arose, that there was danger of boiling over; therefore forced to remove it

out of the furnace presently with tongs, and to effuse it, supposing that the Ruby was lost by my rash putting in of salt; therefore I would only save the gold. And I found the effused mass red like blood, purer than a Ruby, but no Gold; but white grains like Lead dispersed here and there in the salts, by reason of their smallness, not separateable but by the solution of the salts, which being separated by the solution of water from the red tincture like blood, remained in the bottom of the glass, which afterward for fusions sake I placed in a new crucible in. that furnace, but willing to try the fusion. I found the crucible empty, and all the Gold vanished, a little excepted sticking on the top to the crucible and the cover, which I took away and melted for experience sake in a new close crucible, but all of it presently feeling heat flew away like Arsenick, no sign being left in the crucible; and so I was deprived of my Gold.

At length I took the red solution, and abstracted the water from the salts, and I found the salt red like blood, which I put in a clean crucible in. the furnace for to try whether any metallick body might thence be extracted; but I found the effused salt deprived of all tin.cture and redness, which seems strange to me even to this day, that by help of this salt the whole substance of gold, viz, the tincture together with the remainder flew away, having so great volatality.

Which labour afterward I would reiterate, but it happened not so at all as at the first time; there was indeed some alteration of the gold made, but its volatilization was not so great, the cause of which things, I think was the ignorance of the weight of the foresaid salt, cast in at the first time



against my will.

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And two reasons chiefly moved me to insert this history, First, that it may appear bow soon one may mistake In a small thing frustrating the whole process. Secondly, That the truth of the Philosophers nay appear writing that gold by art is reducible into a lower degree, equil to lead (which happened to me in this work) and that it is harder to destroy gold and make it like to an Imperfect metal, than to transmute an imperfect metal into gold; therefore I am glad in my heart that I saw such an experiment; of which thing our phantastick Philosophers will hear nothing, writingwhole volumnes against the truth, stiftly affirming, gold to be incorruptible, which is an arrant lye; for I can shew the contrary (If need be) many ways. I wonder indeed what moves such men to slight a thing unknown, I do not use to judge things unknown to me.

How dare they deny the transmutation of metals, knowing not how to use coals and tongs? Truly I confess those rude and circumforanteous Montebanks, not a little to defile and disgraci true Chymistry, every where cheating men by their fraud, being needy and opprest with penury; unless per-adventure they find some credulous rich man giving them food and raiment for the conceivedhope of Gain and Skill, of which also some being furnished with gold, go clad like painted Parrots, whom I judge to be hated worse than a Dog or a Snake, but innocient Chymistry is not therefore to be despised. Some covetous men besotted with folly and madness, laying out their moneys with an uncertain hope of gain, who afterward the thing ill succeeding, are forced to live in poverty, whose case is not to be pityed, destroying their money out of covetousness.

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Some seek wealth not out of covetousness, but rather that they may have wherewith to live, and may search nature, which are to be excused if they are deceived by knaves, yet not to be praised if they spend above their ability.

Another tincture and medicine of Gold.

Dissolve gold in. AQUA REGIA, being dissolved, precipitate it with liquor of the salt. of flints, pour some more of the aforesaid liquo.r to the precipitated gold, then place them in sand to boil for some hours space, and the liquor of flints will extract the tincture of the gold, and be dyed with a purple colour; to which, pour rain water, and make it to boil together with that purple liquor, and the flint will be precipitated, the tincture of an excellent colour with the salt of Tartar left; from which it is necessary to extract the water even to driness, and a very fine salt of a purple colour will remain in the bottom of the glass, out of which with the spirit of wine, may be drawn a tincture as red as blood, little inferiour in virtue to potable gold; for many things lie hid in the purple salt, of which more things might be spoken if occasion permitted; therefore let it suffice to shew the way of destroying gold, for that golden salt may in a very short time, viz, an hour, be perfected with small labour and transmuted into a wonder of nature; confuting the slanders of the noble Art of Alchemy; for which gift we ought to give immortal thanks to the immortal God.

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Of Looking-glasses.

I Rave made mention in the treatise of AUPUM POTABILE, not only of the material heat of fire, but also of turning the finest beams of the Sun into a material bodily substance, by help of certain instruments by which they are collected. I have also mentioned there a concave Glass, whose preparation I will here give, it being not known to all men, the best that I know is as followeth. First, patterns are to be made of the best matter, namely, hair and Potters clay, of which thing in. the Fifth part, conformable to the glasses, in form and figure circularly round; for else they cannot gather the Sun-beams together, and again put them forth; the fault of which thing is to be ascribed only to the pattern or mold: for the fusion and polishing of glasses is no singular Art, being known even to Bell-founders, but to melt them when very well shapted of the best matter and rightly to polish them, this is Art: and first to cut the patterns round, being very well Shaped by the use of a sharp Iron Instrument cannot briefly be demonstrated; therefore I will send the Reader to Authors prolixity handling this thing, viz. ARCHIMEDES and JOHAN BAPTIST. PORTA, and others; but if thou wantest those Authors, or dost not understand them, see thou have a Globe exactly turned for making the Molds as folioweth: first make a mixture of meal and sifted ashes, which spread equally between two boards, as the manner is to spread past made of Flower and Butter for Pies and Tarts, answering in thickness to the glass to be shaped, then with a Compass make a circle as big as you please, which cut with a knife, and put it on

the Globe, and sprinkle quick lime on it out of a searce or five, and put clay well prepared with hair over it of the thickness of two fingers breadth, and if it be a great piece you must impose cross wires strengthening the Mold, least it be bent or broken. Afterward one part being hardened with the heat of the Sun or fire, take away all that from the Globe, and put it on some hollow thing, on which it may on all sides stand well, and also sprinkle quick lime or the powder of coals on the other side, and put upon this the other-part of the pattern, and again expose it by degrees, to be dryed by the heat of Sun or fire, lest it crack; which done, take away the ends making those parts of the Mold or pattern from the inward or middle, which ends set one against another to the inward parts, the distance at least of a hands breadth, and put between in the top a few live coals to harden the Mold all over; to which put on other coals, and then more, and so by degrees even to the top, that they may be well kindled in their lighter parts; but if the Molds are very thick, one fire will not suffice, but it will be necessary to add more coals, until they be thoroughly kindled in the inner parts; afterwards, let the fire go out by degrees, that the types may grow cold, but not altogether, but so that you may touch them; and presently besmear finely the sifted ashes mixt with water, with a pencil, to stop up the chinks arisen from the burning the hair, and for smoothing the types; then again make both parts (after thou hast framed a hole in them for a Tunnel) clean, being wary lest any foul thing fall upon them; and carefully bind them together with iron or copper wire; and very well lute over the joining with clay prepared with hair; and put

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on an earthen Tunnel, and place the Mold in. dry sand up to the top:

And thou oughtest in the mean while thou burnest and preparest the Mold, to melt the metallick mixture, that it may be poured into the hot Mold, the Metal being well melted, cast in a bit of searcloth, which burning, pour out the melted Metal into the hot Mold, being wary lest coals or some other thing fall into the crucible, and be poured with the Metal into the Mold, spoiling the glass; then the glass cool of it self in. the Mold, if the matter do not moulder in the cooling: And if it should moulder in the cooling, which indeed would lessen it, it behoves that the cast glass be presently taken out of the Mold, and covered over with a hot earthen or iron vessel, that it may cool under it, which otherwise, Cooling shut up in the Mold not being able to moulder, is broke in pieces, but a little below you shall perceive, what be those mouldering metals.

And this is the common way (and the best) of melting, if so be thou art exercised: there are also other ways; first, when molds are made of wood or lead, agreeing to the glass, to be impressed with sand, or the finest powder of tyles or other earth, as is the custom of coppersmiths; and this way only serveth for lesser glasses.

The third way which is the best of all, but hardest to one not exercised, is as follows; make a waxen mold with a Cylinder to be placed between two boards, as is aforesaid of the first way, which put upon the globe for to shape it, and let it be hardned in the cold; then take it away, and spread over it the following mixture with a pencil; which see that it be dryed in.

the shadow, then apply potters clay, prepared  
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with hair, the thickness of one or two fingers breadth; then take away the wax in manner following from the earth: make a round hole in. the earthen mold with a knife, coming even to the wax; which done, place it near a coal fire, the mold being bending down, and the melted wax will run through the hole, into which pour the hot (not burnt) metal, & etc. that liniment which is anoynted on the wax must be very well prepared least while the wax melt, it fall and melt away with the wax, nor let the wax pierce the earthen mold and spoil it. Now the liniment follows: Burn potters clay well washed in a furnace even to redness; afterward grind it and take away its finest part with washing of water, so that you may have an impalpable powder, which dry, and again burn with a strong fire: after grind it with rain water and salt Armoniack sublimed, upon a stone, as Painters use to prepare their colours, bring it to the just consistence of a paint, and mixture will be made; the salt Armoniack keeps that fine powder, lest it melt away with the wax: and the prepared earth makes a tender and fine fusion.

The metallick mixture for the matter of the Looking-Glass.

There are divers of these mixtures, of which one is alwaies better than the other, which by how much 'tis the harder, by so much the glass is the better; and by how much the harder the metal is, by so much the better it is polished; nor doth the hardness of the mixture suffice, but its whiteness is also required: for red proceeds from too much copper; black from too much iron, or duskie from too much tin, and doth not

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make the true representations of things, but changeth the shape and colour of them: for example sake, too much copper rendereth the Species redder than they are to be, and so of the rest; let therefore the matal- ick mixture be very white; but if burning glasses are to be made, it is no matter what colour it be of, if so be that the mixture be hard. I WIU set down one of the best, Rx. of Copper plates the thinnest beaten to pieces one part, of white Arsenick a quarter part; first moisten the plates with the liquor of the salt of Tartar, and make a Stratum super Stratum, with plates and Arsenjck powdered, by sprinkling this on them, until the crucible be filled; to which pour the oil of Linseed, as much as sufficeth to cover the copper and Arsenick; which done put on the cover with the best lute, then place the crucible (the lute being dried) in sand, so that only the upper part of the cover may stick out and administer fire by degrees, at first little; secondly somewhat stronger, till at length it be hot, that all the oil may evaporate; in the mean time, the oil will prepare the copper, and retain the Arsenick, and will make it enter into the plates, like oil piercing dry Leather; Or place the crucible upon a grate and put Fire to it, which administer by degrees, until the oil evaporate in the boiling. Lastly, when it shall cool, break the crucible, and thou shalt find the copper of diverse colours, especially if thou shalt take Orpm in stead of Arsenick, and twice or thrice increased in magnitude, and brittle.

R. of this copper one part, and of latton (ORICHALCUM) two parts, melt it with a very quick Fire, and first indeed the latton, to which afterward add the friable copper; pour out the

mixture melted and thou  
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shalt have a very hard metal unfileable, yet not so brittle, but like steel, of which diverse things may be formed serving instead of iron and steel instruments, take of this hard metal three parts of the best tin without lead one part, melt and effuse it, and the matter of looking glasses will be made. This mixture is a hard white metal making the best looking glasses, but if this labour seem tedious, take of copper three parts, of tin one part, of white Arsenick half a part for the matter of looking-glasses, which are fine but brittle, as well in the melting as polishing, therefore carefully to be handled. I must here set down a thing worthy to be observed, and known to few; viz, a false Opinion of many, especially of those who attribute knowledge to themselves of the properties of metals. In the second part (of subtile spirits) mention is made of the pores of metals, for experience witnesseth, that those subtile spirits as of harts-horn, tartar, soot, and sometimes those sulphureous ones of salts and metals do evaporate through pewter vessels, which at the first hearing every man cannot conceive, for whose sake this discourse is made. Make two balls of Copper, and two of pure Tin not mixt with lead, of one and the same form and quantity, the weight of which balls observe exactly, which done, again melt the aforesaid balls or bullets into one, and first the copper, to which melted add the Tin, lest much Tin evaporate in the melting, & presently pour out the mixture melted into the mold of the first balls, and there will not come forth four nor scarce three balls, the weight of the four balls being reserved; if then metals are not porous, whence I prey doth that great alteration of quantity proceed? Therefore know that metals



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are porous more or less; gold hath the fewest pores, silver hath more, Mercury more than that, Lead more than Mercury, Copper more than Lead, and Iron than Copper, but tin hath most of all.

If we could destroy metals, and again educe them destroyed from power to act, surely they would not be so porous, And as a child without correction is unapt to any goodness, but corrected is endued with all kind of virtue and learning, so also we must understand of metals which left in their natural state, namely drawn out of the earth without correction and emendation remain volatile, but corrupted and regenerated are made more noble, even as our bodies destroyed and corrupted, at length shall arise clarified before they come into Gods sight. Well said PARACELSUS, that if in one hour metals were destroyed an hundred times, yet they could not be without a body, reassuming a new species and indeed a better, for it is rightly said, UNIUS CORRUPTIO, ALTERIUS GENERATIO; for the mortification of a superfluous sulphureous body is the regeneration of the mercurial soul, for without a destruction of metals perfection cannot be; therefore metals are to be destroyed and made formless, that thereby the superfluous earthy combustible sulphur being separated, the pure fine Mercurial species may spring forth. Of which thing more, when we speak of Artificial Stones.

Of the smoothing and polishing of looking-glasses.

A Looking-glass though it be very exactly melted and proportioned, yet it is of no value if not rightly polished and

smoothed; for easily

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in the smoothing any part it may suffer some damage hurtful to it, and it is necessary to take from them first, the grosser part by the wheel, as the custom is with Pewterers and Copper-smiths with a sandy stone, then to apply to them a finer stone with water, until they are sufficiently smoothed by grinding; which done, the looking glasses are again to be taken from the wheel and to be moved to the small wooden wheel covered with leather, rubbed over with a fine prepared glazing stone until the crevices contracted in the turning no more appear, having got a cross line, afterward another small wheel covered with leather is required, to which a blood-stone prepared and washed with the ashes of tin rubbed on, to which likewise by the aforesaid means, according to the same line, the looking-glasses are so long to be moved till they get a sufficient fineness and brightness. You must keep such looking-glasses from the moist air, and breathing, and to wipe them when infected with air and breathing not with any woollen or linnen cloath, but with a Goats or Harts skin, and not any way, but according to the cross line, and with which the looking-glasses are smoothed. They may also be smoothed by lead artificially melted, by first rubbing them with a smiris and water, and then with a finer smiris and lead; lastly with a blood stone and ashes of tin; likewise also with whetstones, by changing for a finer every time, whence at length also they acquire a splendour by the ashes of tin.

Also the outward part of the looking-glasses (convex) may be smoothed, which represents the species short, and spreade the dispersed rays: but the inward part (hollow) gathers and multiplies, and puts forth or exposeth the image.

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Let these things suffice concerning the melting of looking glasses, & polishing requisites, for the collection of the Sun beams, and although from the aforesaid mixture other kinds of looking-glasses might be made representing wonderful shapes and several excellent things, as Cylindrick, Pyramidal, Parabolick, & etc. they are omitted as impertinent to this place, yet I could shew a way to make them, because I have undergone no small labours and charges in the searching of their preparation and use, if it were necessary. But of all looking-glasses that is most useful whose preparation we have shewn, whose diameter is at least two or three spans, if thou wilt perform any special thing; although it be but of one or two spans, yet it gathers abundance of beams, so that thou mayest melt tin and lead with it, if it be well shaped: yet the larger are the better, Nor ought they to be too deep, that they may cast their beams the further, and better perform their actions of functions, let them have the twentyeth or thirtyeth part of the sphere (the section being exactly observed) which is the foundation of the Art.

Of Artificial Gems, and Metallick Glasses.

As for metallicke glasses pertaining to Alchemy, and much conducing to the perfection of metals, and esteemed by the Ancient Philosophers, I would not omit to say somewhat in this place, because they are easily made by this furnace.

And indeed the Ancients have found these glasses questionless by

chance, in reducing the calcined bodys into glass by a strong fire, for very many secrets by this means not sought for are found out. Oftentimes it happens to our labours, that past hope we find something better or worse, than the thing sought; and I think it hath thus happened with these glasses, but however it be, I am sure these glasses have stood us in much stead; for ISAAC HOLLAND saith plainly, That vitrified metals, being again brought to metals, by that reduction do give better and nobler metals than the first vitrified; and indeed gold gives a tincture, but silver gold., and copper silver; and so consequently the glass of other metals give better metals in reduction, the truth of which experience proves, and although I have not yet made great tryal in this work, yet I know that metals brought into dead ashes to be turned into clear glass cannot be again reduced into metals without great profit: yet one metal is more pliable than another, nor are our glasses the Artificial stones of gold-smiths fixed to other large ones for ornaments sake, made by the addition of glass made of fusile sand; but ours are made of the juice of metals, But I do not deny the virtue of Venice glass, and others in. the mund.ifying of metals, chiefly copper and tin., which yet is not comparable with metallick juices. I freely confess I have tryed this thing twenty times, and I never was decieved by it: But I know not whether it may prove so in a greater quantity, because I never tryed it, doubting of my vessels not fit to retain fusible glasses a requisit time: for I have spent much labour in making these kind of vessels, but hitherto in vain. For there is very great hope of gain, if thou hast very strong crucibles, nor is

this perfection of metals without reason,  
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for whilst the metal is burnt to ashes, much of the superfluous combustible sulphur is burnt (as you may see in Lead, Tin, and Copper, from the sparks appearing in their calcination whilst they are stirred and separated) which if again reduced (viz, being calcined) its better and heavier part (by benefit of melting) sinketh to the bottom, the worser flowing on the top is changed into dross or glass. And so the separation of metals is made by the help of the Fire alone, to the ignorant and unexpert incredible: but consider gilt silver to be separated in fusion, which is as it were corrupted by- the common sulphur, and the metallick species, being lost, it turns to a black dross before that in melting it forsakes the gold: which way also silver is separated from copper, and this from iron. Observe also that black and crude Antimony, being reduced into ashes by calcination, and melted is separated by a strong Fire, the purer parts descending pure and white like silver, but the impure parts ascending are changed into glass or dross, which separation would never be made without inceneration although the Antimony should have stood long influx.

Thou seest therefore the power of Fire alone in melting metals, wherefore believe thou that thy labor shall not be in vain if thou knowest how to help the Fire. Exercise thy self therefore in it, for thou art sufficiently instructed, and this furnace will help thee; without which it is impossible to manage such things well, as experiment testifies, confirming my words.

Mention being made of metallick glasses, which belongs to the perfection of metals, I am forced to say something also of other AMANSA,

or coloured glasses, which are called Gems, and are worn for beautifying, which though it be not profitable, yet it is a delightful labour, which knowledge, as well noble as ignoble have long sought, not for gain, but recreation sake, erring from the true way (although prolixity described in many tongues) through ignorance of the art to render crystal or flint fusible, and colouring it, being content with lead glasses made of one part of crystals, or flints, and three or four parts of minium or ceruse, glass of no worth, as not only very soft and unapt for polishing, but also heavier than it ought by means of the lead, and having a yellow or green colour, for every glass made of crystal or flint, and minium or ceruse by themselves, viz, without the addition of other colours, gets a yellow colour from the Lead, hindering and altering other mixt colours; therefore a good stone is not made this way of lead and flint, but Leaden glasses of this sort, Venice glass, Ashes of tin, and colours being added to them, be used diversly of the gold-smiths, namely to colour gold, otherwise of no moment.

Therefore I will give another preparation, namely out of flints and crystals alone without minium and ceruse, with metallick colours, having the colour and elegancy of excellent stones; but not harder than glass; for although crystal is harder than iron, yet by melting it is deprived of its hardness in some measure, and is made like to glass, yet so much hardness reserved, as serves to write on another glass, which glasses are easily polished, and in all things and by all, most like, hardness excepted, to natural stones; with which not only various kinds of stones may be made, and other gold, silver, and wooden works

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or pictures adorned; but also diverse supellectils, as salts, hasts or hilts, cups, & etc. and also images and antiquities may be formed (by fusion) like to those cut out of gems by the hand of an Ingenious workman, most delightful.

They are made after this manner: first you must look for flints and crystals not coloured, but very white, gathered out of sand or streams, which you must heat in a covered crucible, and quench them glowing hot in cold water, that they may crack and may be pulverised; otherwise they are so hard that when they are powdered, they take part of the mortar and so are defiled; therefore it is worth your labour to handle them well. Afterward Rx. of flints, prepared, and the purest salt of Tartar, made In glazed vessels, but not in copper or iron, equil parts, mingle them and keep them for use.

And if thou wilt made this mass into a gem, you must first mingle some colour (what you desire) afterward so long place it (being put into a clean covered crucible scarce half full) in a very strong fire, till all the salt of Tartar hath evaporated, and the flint together with the colour come into substance fusible like glass: you must then. put a small clean iron wire, and draw out a little of the melted mass for tryal; whether it have stood long enough in. the fire, whether there be yet pustles and little sands, or whether it being exactly melted, it shall descend to the bottom, which done, you must take off the crucible, and place it under some hot iron or earthen vessel, that it may wax cold with the melted stone; otherwise the mass will be broken in the crucible in-to very small parts, and would be unfit for greater works:

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neither must you pour out the melted mass for fear of the attraction of silex, and pustles to arise thence. But being willing to make out of the Mass by Fusion, not Engraving Money or Images; there is no need to leave the mass in the crucible to cool, but presently to pour it out hot in a copper mortar, and nothing will stick to the crucible, but all the mass will be poured out without any waste: And this mass, if thou wilt, thou maist powder or break into very small bits for fusion and impression. But the mass when cooled in the crucible, is to be taken by breaking the crucible, and to be reduced into greater or lesser stones by cutting; but melting for money or images; you must place the money or image, which you will imitate, with the backside or hinder-part downward in an iron Ring, a Fingers breadth broad of greater capacity than the money, upon a stone or plain wood, and sprinkle on a little Tripoly, or fine Sand, through a cloath, namely, as much as sufficeth to cover the mold, and upon this to put more, well moistened with water, like ashes of cupels, and to press it, being most tenacious, firmly to the mold, but warily, lest the mold move; which done, you must turn the ring, and with a knife lift up the mold, and to take it, being lifted up with ones hands or tongs, the image being left in the sand, to be dryed by heat of the Sun or Fire. Afterward to cast the image, place the ring with the image impressed in the sand under a tile, and administer a strong fire, that the whole ring, with the sand, and the image in the sand may be very hot: then take of f the ring, to see if the image have suffered any loss; which, if it have not, you must put upon it so much of the aforesaid glass, coursly beaten, as sufficeth



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in the fusion to fill the image impressed on the sand; which done, put the ring again under the tile, and admiflister a fire of fusion, till the glass melt in the ring; to which, touch with a smooth iron and light, (with a handle) being hot the ring being taken out of the furnace with tongs, pressing the glass well to the mold; and then place it under a hot iron, or earthen vessel to cool; and being cold, take the image from the mold, which answers to it in. all things, if thou hast aright proceeded, exactly representing the Carvers art, or a seal impressed on a jewel, which excellent work is most fit to feign, and represent Antiquities and Rarities.

The colouring of the aforesaid mass follows, by which it is made most like to Gems.

It behooveth that colours be taken from metals and minerals, namely from Copper, Iron, Gold, Silver, Wismuth, Magnesia and Granate; of other colours I know nothing of certainty, Copper commonly makes a colour green like the Sea, Copper with Iron, grass-green; Granate a smaragdine colour, Iron yellow or 3acynth; Gold the best skie colour; Wismuth common skie colour; Magnesia Amethystine, mixt, they give other colours; E. gr. Gold mixt with Silver gives an Amethyst colour; Iron and Copper, a pale green; Wismuth and Magnesia, a purple; Silver and Magnesia, various colours like an Opal.

Images are also made of divers colours, if the masses Of diverse colours be broken Into bits and mixt, be put upon the

Mold, & etc.

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And if thou desirest an opac mass (green, red, skie colour, & etc.) add a little calx of Tin darkning, on which as on a Basis the colours insist. For example, in making a Turcoise stone or a Lazulus, mingle with the Azure made of the silver Marcasit or Zafora, (to the colour of the mass) the calx of Tin, that they may melt together, and before the impression be made, put upon the Mold some prepared gold, then spread and put upon this the af resaid glass; and the fusion and impression being made, will be made thence a stone having golden veins like LAPIS LAZULUS very delightful; But there must be a caix of Gold not losing its splendor in the fire, such as is made by Mercury, or that which is better, which is precipitated out of AQUA REGIA: of which above.

Of the preparation of the colours for colouring the mass of Flints and Crystals.

The plates of copper often heated, are to be quenched in cold water of which more in the Fifth part, from three to six grains of it may be mixed with 1 ounce of the mass for a Sea-green colour. Iron reduced into crocus by reverberation; of which from four to 10 grains are added to the mass for a yellow or Jacynth colour; Silver Is dissolved in AQUA FORTIS, and precipitated with the liquor of Flints after it is edulcorated and dried, whereof from one to six grains, added tol ounce of the mass, they make niixt colours.

Gold is dissolved in AQUA REGIA, edulcorated and dried, precipitated first with liquor of Flints, whereof from four

grains to 1/2k ounce

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mixt with one ounce of the mass, make a most elegant Sarhire. And if from three to six of that soluble ruby made of the Gold, and the nitrous REGULUS MARTIS be added to 1 ounce of the mass, they make a very polite ruby: Magnesia pulverised, whereof, from six to fourteen grains, to 1 ounce of the mass, make an Amethyst.

Marcasit dissolved in AQUA REGIA precipitated with the liquor of flints,edulcorated and th-yed, whereof from one to five grains, to 1 ounce of the mass, give a Sapphire, but not comparably so polite as one made with gold.

But being unwilling to calcine Marcasite, let him take Zafora, and mingle to 1 ounce from five to ten grains; Granates of BOHEMIA, or Oriental pulverised, add from six grains to 1/24 ounce to 1/8 ounce of the mass, for little green stones like to the natural smaraged or emerald: other things which remain of the mixture of the colours, are to be learned by experience.

To what uses coloured flints and crystals are appointed, is not here to be treated of; one use excepted, which I set down for the eyes, which are weakened by too much watching, the heat of fire and smoak; see thou have a waxen mold circularlyround, of the bigness of a dish or trencher; (theOptiques are wont to call such LENTES) to which, put the best clay well mixed with hair; anoit the waxen type with oil, and exactly apply the best prepared earth of crucibles (and durable in the fire) the thickness of a finger; which being dryed, perforate in some part, that the wax being melted by the fire, may flow forth: afterward burn the mold in an earthen furnace; being burnt, fill it with prepared

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glass, and place it in a wind furnace till the glass melt; which at length being cooled, take off the type by attrition, and there shalt thou have the crystal resembling the form of the type; which afterward thou must make and polish like spectacles in an iron dish on both sides; and take it out with a strong iron wire, and thou shalt have a good crystalline LENS for a small-price, which otherwise is scarce made of crystal of so great a bigness. And if thou wilt, thou maist colour the glass green, very pleasant to the sight, and fit a foot to It for greater benefit. And the glass doth not only serve for the Multiplication of light in the night time, that thou may see a thing a far off in a chamber, but also for the fixing and calcining minerals by the Sun-beams, and melting of Metals, and multiplying of Pictures, like an hollow glass, and also for other uses it may be compared with an hollow looking-glass, which doth the same of an equil bigness with the hollow glass; nor is there any other difference of them but reflexion. This glass instrument is made likewise another way, and by less cost and labour, if it be of a polished looking-glass, if two great orbes are cut out with a diamond, and if they are somewhat softened with fire, and are left there so long in the heat, until they shall stick like wax very close to the stone, which done, let them be cooled again, which afterward taken out, will represent the form of an hollow glass; to which, it behoves to fix a leaf on the convex part. And the glasses do the same than an hollow metallick looking-glass doth, the reflexion excepted, which is not so strong as of the hollow glass: And although the glasses are sooner broke; yet they are very fit for the making of the following Instrument.

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And they are bound together with a strong wire, applyed across on the concave part, and ash hole is cut in the brim with a diamond on one side, of the bigness of a pea, then the crevices are exactly closed in every place with the best lute; which done, a silver or copper ring is to be tied about it, holding those glasses straightly, so that the Instrument may be fitted to the foot, all which well done, those strong wires are separated or cut off, with which the glasses were bound at first, namely, near the copper ring: afterward very pure AQUA VITA is to be put in through a funnel, as much as is required for the filling it up, the Instrument being filled, the hole is shut up, which is to be kept for use; and this Instrument is better than the hollow glass; especially, if it have in its diameter the breadth of one foot, and may be applyed to prospective pictures, it doth excellently represent and multiply them.

Behind which, if you place a candle in the night, it gives so much light in the Chamber, that you would think it came from the Sun. It doth also many other things which are here omitted as, superfluous. And you may gather the dispersed light in the aire in the night time with it, so that you may read the smallest writing. Such and others of the like things may be done by this furnace, all which to set down, would swell the Book too much. Other things of the metals examination and purification by fusion, in another place.

Take this, Reader, which is given to thee, in good part, at another time thou shalt have better; and do not mistake my writings, as if I did reprove the examinations of metals by the Ancients, fusions and

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separations, who only would communicate my opinion, and yield my assistance for further proceeding; for I know that dealers in metals giving too much credit to their small proof when they find nothing, do, contemn ores as barren, often abounding with gold and silver; when nevertheless, JOHN MATHES. says expressly in his SAREPTA, that minerals oftentimes tryed in a small quantity do yield no gold and silver, which in a great quantity, yield a great deal, wherefore credit is not always to be given to such tryals, often deceiving, as experience testifies.

And this not only in those minerals which are digged out of the earth; but also in those calyie and sandy minerals, abounding with silver and golden flames; out of which neither by the less nor greater proofs, nor ablution nor Mercury is drawn with gain, that thin and fiery dispersed gold: which by some waters is done without fire easily; for I know such mines are found neer many rivers of Germany, and many places in other Nations of Europe, out of which honest gain without much cost and labour may easily be gotten. Neither are they dreams, which I have spoken parabolically of the perfection of metals, for it is possible by art to help nature in the perfecting things. There is therefore no more need of any thing than of knowledge; therefore the nature of metals being known, and their properties, they are easily separated, purged and perfected.

But what I have written of the universal medicine, I have done for the aforesaid causes, which have made me believe the thing, not as professor of the Art. The other things of coloured red glasses and looking glasses I have added, because they are

easily prepared by this furnace,  
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as sometimes necessary in some works. Other things of the  
handling metals are not without cause now omitted, which happily  
may be sometime delivered in another place, wherefore now we  
end.

FINIS.