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NERI'S

*ART of GLASS;*

TRANSLATED BY

C. M.



*Torris Latiensis.*

TYPIS MEDIO-MONTANIS  
IMPRESSIT  
F. CREES,  
1826.





TO THE MOST ILLUSTRIOUS AND EXCELLENT LORD

DON ANTONIO MEDICI.

*Antonio Neri.*

HAVING taken much pains for many years from my youth about the Art of Glass, and having experimented therein many true and marvellous conclusions, I have compiled a Treatise of them with as much clearness as I could, to the end to publish it to the world to please and delight (as much as in me lay) men understanding in that profession, having found out many things by my own invention, and some others tried by able men, and found most true. I will make manifest those hidden Mysteries, for the reasons abovesaid. If I do attain this my intention, it shall occasion me hereafter to be encouraged to publish the rest of my Labours about other Chymical and Physical matters, having likewise in both experimented many most profitable, credible, and admirable Conclusions, for no other reason, but to understand them truly. I judge that I ought not to dedicate this Book to any other, but your Illustrious Excellence, who have been always my singular Protector, as also, because you are understanding of this, and of whatsoever Noble and Precious knowledge, being exercised continually in these Arts, which are required in a true and generous Prince; I beseech you then to accept, if not the work, yet my devout mind towards your great merit, and vertue of your most Illustrious Excellence, for whom I pray to God to pour on you all happiness.

*From Florence,*  
6 Jan. 1611.







TO THE HONOURABLE  
AND TRUE PROMOTER OF ALL SOLID LEARNING,

ROBERT BOYLE, ESQ.

SIR,

*THIS Treatise challengeth the inscription of your Name for many reasons. The Author of it dedicated this Piece to a Person of Honour, and eminent parts, both which concur in you, and herein I thought fit to follow his footsteps. Then your ability to judge of the Piece, being for the most part Chymical, wherein you have shewed the world not onely your great progress and singular knowledge, but have also taught it the true use of that most beneficial Art, as to the improvement of reason and Philosophie. Most writers therein delivering only a farrago of processes and unintelligible Enigma's. But You have chalked out the way of solid reasoning upon whatsoever occurs to observation in such experiments. Next, you were the principal cause that this Book is made publick, by proposing and urging my undertaking of it, till it came to a command from that most noble Society, and serious indagators of Nature, meeting at Gresham College, whose desire I neither could nor ought to decline ; though their and your choice might have been much more happy, there being many of that Company far more adapted for this undertaking than myself. Besides, I doubt not, but You will much promote by Your practice the Art it's self, there being scarcely any thing contained in it but You have already judiciously had experience in. Not because this Translation will any whit avail You (since Your skill in the native Language is sufficiently known to all that have the honour to be acquainted with You) but may be compendious to You for such as You shall employ in these operations. Furthermore, I have herein also satisfied Your vast desire of communicating knowledge to others, who, though intelligent of the Language, could not procure Copies in the Original. And, lastly, the candor of your genius, no less than that of your intellectuals, ready to excuse the errours and slips whatsoever of,*

Sir, Your most humble,

And most regardful Servant,







TO THE  
INGENUOUS READER.

Courteous Reader,

I AM to advertise thee of some things concerning the Translation of this Book. You may take notice, that I had first Translated it word for word; but, finding that the Author had, thorowout the whole, so often repeated the same thing, by advice of some ingenuous persons, I left out those repetitions, and have either before the Books given a general account of these repetitions, or else have referred you to a former process, where the latter hath reiterated the same, and for the most part in the very same words, yet so that I have omitted nothing material in the Author: For what need is there to say, as often as *Manganese* is boiled with the metall, you must do thus and thus, lest it run into the fire, &c. ? or to repeat the same process and rules in each new colour for Pastes or Glass of Lead? Though you may find some needless repetitions too, in this Translation not omitted. I confess these reiterations caused a nausea in myself, and believe they would in thee, and therefore I passed them over. Then observe, that there being many words peculiar to this Art, I was compelled to have recourse to the workmen, and for such things and materials not used nor known here, to take them upon trust from such workmen as have wrought at *Muran* and other parts of *Italy*. As for other things I have carefully survicid them my self. Now for the observations I have been more large, especially in a business wherein so little hath been said, and therefore have delivered whatsoever is material that I have met with in any good Author concerning whatsoever *Neri* treats of, that thou might'st have together all that is substantially written upon this unusual subject, and have supplied some things defective in our Author, or very fit to be known to curious persons. Lastly, I doubt not, but our workmen in this Art will be much advantaged by this publication, who have within these twenty years last past much improved themselves (to their own great reputation, and the credit of our nation) insomuch that few foreiners of that profession are now left amongst us. And this the rather I say, because an eminent workman, now a Master, told me the most of the skill he had was gain'd by this true and excellent Book (they were his own words). And therefore I doubt not but 'twill give some light and advantage to our Countrey-men of that profession, which was my principal aim. And, lastly, for the exotick words you'l meet with in reading this Book they are now current with us, or else expounded in my Observations.

*Fruere & utere.*

C. M.

To avoid our Author's Repetitions, observe,

1. **A**LL the fires must be made with dry and hard wood.

2. When the Glass is coloured, before you work it, mix the colours well (which otherwise sink to the bottom of the pot) with the metall, that the glass may be coloured throughout. This must be observed all the time you work the glass into any vessels,

3. The sign that Brass or Copper are well calcined, is, that they being put into the metall, make it swell, and suddenly rise; if they be calcined too much or too little, those signs are wanting, and glass made thereof will be black and foul.

4. *Manganese* consumes the natural greenness of Glass.

5. Copper, Brass, Lead, Iron, and all compositions of them, as also *Manganese*, must be put into the metall but a little at a time, and at convenient distances, and the pot must be large, and not filled too full, because they all swell and rise much, and so are apt to run over into the fire to your loss.



## TO THE CURIOUS READER.

**THERE** is no doubt that Glass is one of the true fruits of the Art of fire, since that it is very much like to all sorts of minerals and middle minerals, although it be a compound and made by Art. It hath fusion in the fire, and permanencie in it; likewise as the perfect and shining Metall of Gold, it is refined and burnished, and made beautiful in the fire. It is manifest, that its use in drinking vessels, and other things profitable for man's service, is much more gentile, graceful, and noble, then any metall or whatsoever stone fit to make such works, and which besides the easiness and little charge wherewith it is made, may be wrought in all places; it is more delightful, polite, and sightly, than any other material at this day known to the world. It is a thing profitable in the service of the Art of distilling and *spagyricall*, not to say necessary to prepare medicines for man, which would be impossible to be made without the means of Glass; so that herewith are made so many sorts of instruments, and vessels, as Bodies, Heads, Receivers, Pelicans, Lutes, Retorts, Athenors, Serpentine, Vials, Cruces, square and round Vessels, Philosophical Eggs, Globes, and infinite other sorts of Vessels, which every day are invented to compose and make Elixars, Arcana, Quintessences, Salts, Sulphurs, Vitriols, Mercuries, Tinctures, separation of Elements, all Metalline things, and many others, which every day are found out; and besides there are made others for Aqua-fortis and Aqua-regia, so necessary for Refiners, and Masters of Princes Mints, to refine Gold and Silver, and to bring them to their perfection; indeed so many things profitable for man's use are made, that seem impossible to be made without the use of it: and the great Providence of God, as is well known, by this, as in every other thing, who hath made the matter of which Glass is compounded (a thing so needful and profitable to man) so abounding in every place and Region, which with much ease may be every where made. Glass is also a great ornament to the Churches of God, for herewith (besides many other things) are made so many beautiful Glass vessels, adorned with fair pictures, wherein the Metalline colours are in such sort advanced, and so lively, that they seem to be so many Oriental Gems; and in the Glass Furnaces the Glass is coloured with so many colours with so much beauty and perfection, that it seems no material on the earth can be found like it. The invention of Glass (if it may be credited) is most ancient, for the holy Scripture in the Book of Job, chap. 28. saith, *Gold and Glass shall not be equal to it*, &c. which gives clear testimony, that Glass was anciently invented, for Saint Hierom saith, that Job descended from Abraham, and was the son of Zanech, who descended from Esau, and so was the fifth from Abraham himself. Some will, and perhaps with some reason, that the invention of Glass was found out by the *Alchymists*; for they, desiring to imitate Jewels, found out Glass: a thing perhaps not far from truth; for, as I shew clearly in the fifth Book of the present work, the manner of imitating all Jewels, in which way is seen the vitrification of stones, which of themselves will never be melted nor vitrified. Pliny saith, that Glass was found by chance in Syria, at the mouth of the river Bellus, by certain merchants driven thither by the fortune of the Sea, and constrained to abide there, and to dress their provisions, by making fire upon the ground, where was great store of this sort of herb which many call *Kali*, the ashes whereof make Barillia and Rochetta; this herb burned with fire, and therewith the ashes and Salt being united with sand or stones fit to be vitrified is made Glass: A thing that enlightens mans understanding with the means and manner of making not only Glass, but Crystall and Crystalline, and so many other beautiful things which are made thereof. Many assert that in the time of Tiberius the emperour was invented the way of making Glass malleable, a thing afterwards lost, and to this day wholly unknown; for if such a thing were now known without doubt it would be more esteemed for its beauty and incorruptibility than Silver and Gold; since from Glass there ariseth neither rust, nor tast, nor smell, nor any other quality: Moreover it brings to man great profit, in the use of prospective Glasses and Spheres.

And



And although one of them may be made of natural Crystall, called that of the mountain, and the other with the mixture, called Steel, a composition made of Brass and Tin, notwithstanding, in both, Glass is more profitable and of less charge, and more beautiful and of greater efficiency, especially in sphears, which, besides the difficulty and expences in making them, they present not to the life as Glass doth, and, which is worse, in a short time they grow pale, not representing any thing. Wherefore, for these and many other reasons, you may well conclude, that Glass is one of the most noble things which man hath at this day for his use upon the earth. I have laboured a long time in the Art of Glass, and therein seen many things, I was moved to make known to the world a part of that which I had seen and wrought therein. And although the manner of making Salt, Lees, and Frittaes, is known to many, yet, notwithstanding it seemed to me, that this matter requires to be handled, (as I do) clearly and distinctly, with some observations and diligence, which, if well considered, will not be judged altogether unprofitable, but perhaps necessary and known to few: besides, in my particular way of extracting Salts, to make a most noble Crystall, that if the workmen shall be diligent in making it, as I do publish and teach it, with clear demonstrations he shall do a thing as beautiful and noble, as happily is made in these days, or can be done in any other way; and in this thing, and in every other matter that I treat of in this present work, the diligent and curious operator shall find that I have wrote and shewn truth, not told me, or perswaded me by any person whatsoever, but wrought and experimented many times with my own hands. I having always had this aim to write and speak the truth. And if any one, trying my receipts, and manner of making colours, Paste, and Tinctures, doth not speed to do so much as I write thereof, let him not be amazed thereat, nor believe that I have writ untruths, but let him think that he hath erred in something, and especially they which have never handled such things: For it is impossible that they at the first time should be masters; therefore let them repeat the work, which they shall always make better, and at the last perfect as I describe it. I warn them in particular to have consideration in colours whose certain and determinate dose cannot be given: but with experience and practice one must learn, and with eye and judgment know, when Glass is sufficiently coloured conformable to the work for which it ought to serve; and in Paste, made in imitation of Jewels, conformable to the size whereof they will make them, observing, that those which are to be set in Gold, with Foyls, as in Rings, or other where, must always be clear, and of a lighter colour. But those that are set in Gold to stand hanging in the air, as Pendants, and the like, must be of a deeper colour: all which things it is impossible to teach, but all is left to the judgement of the curious operator. Observe likewise, and with diligence, that the materials and colours be well prepared, and well ground, and that he who will make an exquisite work may be the securer, let him prepare, and make all the colours himself as I teach, for so he shall be sure that his work must happily succeed. The fire in this Art is of notable importance, as that which makes every thing perfect, and without which nothing can be done: Wherefore consideration is to be had in making it in proportion, and particularly with hard and dry wood, taking heed of its smoak, which always hurteth and endamageth it, especially in furnaces, where the vessels and pots stand open, and the Glass will then receive imperfection and notable foulness. Moreover, I say, that if the operator shall be diligent, and shall do like a diligent and practised person, and shall work punctually as I have set down, he shall find truth in the present work, and that I have onely published, and sent out to the world as much as I have tried and experimented. And if I find my pains acceptable to the world, as I hope, I shall be encouraged perhaps to publish my other labours wrought for many years in divers parts of the world in the Chymical and Spagyricall arts, than which I think there is no greater thing in nature for man's service known and perfect in ancient times, which made men expert in it to be held for Gods, which then were held and reputed for such. I will not enlarge myself any further, because I have in the work set down every particular so clear and distinct. I rest secure, that he which will not err wilfully, it is impossible he should do so having thereof once made experience and practice. Therefore let all be taken of me in good part, as I have candidly made this present work, first, to the glory of God, and then to the just benefit and profit of all.



# THE ART OF GLASS.

## BOOK I.

To extract the Salt of Polverine, Rochetta, and Barillia, wherewith Crystall Fritt called Bollito is made.

### CHAP. I.

*The foundation of the Art of Glass-work, with a new and secret way.*

*Polverine*, or *Rochetta*, which comes from the *Levant* and *Syria*, is the ashes of a certain herb growing there in abundance: there is no doubt but that it makes a far whiter salt than *Barillia* of *Spain*; and, therefore, when you would make a Crystall very perfect and beautifull, make it of salt extracted from *Polverine* or *Rochetta* of the *Levant*. For though *Barillia* yield more salt, yet Crystall made therewith alwaies inclines to a blewness, and hath not that whiteness and fairness as that made of *Polverine* hath.

The way often by me practised to extract the salt perfectly from both of them, is this which follows:

Powder these ashes, and sift them with a fine sieve, that the small pieces go not thorow, but onely the ashes; the finer the sieve, the more salt is extracted. In buying of either of these ashes, observe that they abound in salt; this is known by touching them with the tongue, and tasting what salt they contain: but the safest way of all is, to make an essay of them in a melting-pot, and to see whether they bear much sand, or *Tarso*, a thing common in this Art, and which the Conciators very well know.

Set up brass coppers with their furnaees like those of the Dyers, greater or lesser, according as you have occasion to make a greater or lesser quantity of salt: fill these coppers with fair and clear water, and make a fire with dry wood, and when the water boileth well, put in the sifted *Polverine* in just quantity and proportion to the water, continue the fire and boyling till a third of the water be consumed, alwaies mixing them at the bottom with a scummer, that the *Polverine* may be incorporated with the water, and all its salt extracted; then fill the coppers with new water, and boyl it till half be consumed, and then you have a lee impregnated with salt. But that you may have salt in greater quantity, and whiter, put into the coppers when they boyl, before the *Polverine* is put in, about 12 pound to a copper of *Tartar* of red wine, calcined only to a black colour, dissolve it well in the boyling water, mingling it with a scummer, then put in the *Polverine*. This way of *Tartar* is a

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secret, and makes more, and whiter salt, and a more beautiful Crystall. When two thirds of the water is evaporated, and the lee well impregnated with salt, slaeken the fire under the copper, and have in order many earthen pans, at first filled with common water for six daies, that they may imbibe less lee and salt, and then with great brass ladles, take the lee out of the copper, and put it into the said pans; take out also the ashes from the copper, and put them all into the same pans, and when they are full, let them stand so ten daies, for in that time the ashes will be all at the bottom, and the lee remain very clear, then with brass ladles take gently (that the bottom be not raised, and troubled) the clear lee, and put it into other empty pans, and so let the lee stand two daies, which by the setting of more terrestriety at the bottom, becomes very clear and limpid; let this be thrice repeated, and you shall have the lee most limped, and discharged of all that terrestriety, wherewith a very fine and perfect salt is made. Let the coppers be filled again, and boyl with the same quantity of *Tartar*, and then the *Polverine*, as before: continue this work till you have materials enough.

To strain the said lees, and extract the salt, first wash the coppers well with clear water, then fill them with the said refined and clarified lees, and make them boyl softly, as before, and observe that you fill the coppers with the said lee, till you see it thicken, and shoot its salt, which is wont to be about the beginning of 24 hours, for then in the superficies of the copper, you will begin to see white salt appearing like a spider's web, or white thread, then hold a scummer full of holes at the bottom of the copper, and the salt will fall upon it, and now and then take it out, suffering the lees to run out well off into the copper, then put the salt into tubs, or earthen pans, that the lee may be better drained, the liquor that drains must be saved, and put into the copper, then dry the salt. Continue this work till all the salt be gotten out of the copper: but you must observe, that when the salt begins to shoot, to make a gentle and easie fire, for a great fire makes the salt stick to the copper, and then the salt becoming strong, alwaies breaks the copper, which thing hath sometimes hapned to me; whereof observe this chiefly, using great patience and diligence. The salt in the pan, or tubs, being well drained,

drained, must be taken and put into wooden tubs, or vats, the better to dry out all the moisture, which happens in more, or fewer daies according to the season in which it is made. The secret then of making much and good salt, consists in the *Tartar*, as is before demonstrated. From every three hundred pound of ashes, I usually get from 80 to 90 pound of salt. When the salt is well dried, beat it grossly, and put it into the *Calcar* to dry, with a most gentle heat, and with an iron rake it must be broken, and mixed as the Fritt is; when it is well dried from all its moisture, (observing alwaies that the *Calcar* be not very hot, but temperate,) take it out of the *Calcar* and pound it well, and sift it so, that the greatest pieces which pass thorow, exceed not the bigness of a grain of wheat.

This salt, thus pounded, sifted, and dried, must be kept by it self, in a place free from dust, for to make Fritt of Crystall. The way to make this Fritt is this which follows.

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## CHAP. II.

*The way to make Fritt for Crystall, otherwise called Bollito.*

WHEN you would make fair and fully perfect

Crystal, see you have the whitest *Tarso*, which hath not black veins, nor yellowish, like rust in it. At *Moran*, they use the pebles from *Tesino*, a stone abounding in that River. *Turso* then is a kind of hard, and most white marble, found in Tuscany, at the foot of the *Verucola* of *Pisa*, at *Saraveza*, and at the *Massa* of *Carara*, and in the River *Arnus*, above and below *Florence*, and it is also well known in other places. Note, that those stones which strike fire with a steel, are fit to vitrifie, and to make glass and Crystall, and those which strike not fire with a steel, will never vitrifie, which serves for advice to know the stones that may be transmuted, from those that will not be transmuted into glass.

Take then of the best *Tarso*, pounded small, and serced as fine as flower, 200 pound; of salt of *Polverine* pounded, and sifted also, about 130 pound; mix them well together, then put them into the *Calcar*, which at first must be well heated, for if they be put into the *Calcar* when it is cold, Fritt will never be made of them. At first for an hour, make a temperate fire, and alwaies mix the Fritt with the rake, that it may be well incorporated, and calcined; then the fire must be increased, alwaies mixing well the Fritt with the rake, for this is a thing of great importance, and you must alwaies do thus for 5 hours, still continuing a strong fire.

The *Calcar* is a kind of calcining furnace; the

rake is a very long instrument of iron, wherewith the Fritt is continually stirred: both these are very well known, and used in all glass furnaces. At the end of 5 hours, take the Fritt out of the *Calcar*, which in that time (having had sufficient fire, and being well stirred) is made and perfected. Then put this Fritt in a dry place on a floor, and cover it well with a cloath, that no dust nor filth may fall upon it: for herein must be used great diligence, if you will have good Crystall. The Fritt thus made becomes as white as snow from Heaven. When the *Tarso* is lean, you must add somewhat more than ten pound of the salt to the quantity aforesaid. Wherefore let the experienced Conciators always make tryal of the first Fritt, by putting it into a chrysilbe, which being put into the furnace, if it grow clear, and suddenly, they know whether the Fritt be well prepared, and whether it be soft or hard, and whether the quantity of salt is to be increased or diminished. This Crystall Fritt must be kept in a dry place, where no moisture is, for from moist places, the Fritt suffers much, the salt will grow moist, and run to water, and the *Tarso* will remain alone, which of itself will never vitrifie: neither is this Fritt to be wetted, as others are. And when it is made, let it stand 3 or 4 months, and it will be much better to put into the pots, and sooner waxes clear. This is the way to make Crystall Fritt, with the dose and circumstances, which I have oft times used.

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## CHAP. III.

*Another way to extract the Salt of Polverine, which makes a Crystall as fair and clear as natural Crystall: This was my invention.*

TAKE *Polverine* of the *Levant*, well serced, and put it into great glass bodies, luted at the bottom, with ashes, or sand, into the furnaces, filling them at first with common water, give them a temperate fire for some hours in the furnace, and let them stand till half the water be evaporated; the furnace being cold, gently decant off the water into earthen pans glazed, putting new water upon the remainder of the *Polverine*, and let it boil, as before. This is to be repeated till the water hath extracted all the salt, which is known, when the water appears to the tast not at all saltish, and to the eye when it is void of colour. Take of these Lees what quantity you will, let them be filtered, and stand in glazed pans four or six days to settle, which by this means will leave a great part of their terrestriety, then put them to filtre anew; thus will they be purified, and separated from a great part of their terrestriety, then let these Lees be set to evaporate



porate in great glass bodies, luted at the bottom, in furnaces, in ashes, or sand, at a gentle fire, and at last, when the stuff is dryed, observe that y<sup>e</sup> fire be very gentle, that the salt be not burned, nor wasted. When the salt is dried, take out the glass bodies and see if they be broke at the bottom, which is wont to happen often, in which case, put the said salt into other good glasses, well luted at the bottom, and fill them at the top with common pure and cleau water, which set in the furnace, in ashes or sand, at a gentle fire, and always evaporate an eighth part of the said water, then, the furnace being cold, empty this water, fully impregnated with salt, into earthen pans glazed, and when the water is settled 24 hours, filtre it with diligence, that the salt may be separated from the rest of the terrestriety and dregs, let this lee be evaporated in glass bodies with a gentle fire, and at last more gentle, that the salt be not burned; put this salt again into glass bodies to be dissolved in common water, in every thing as before repeat this work, till the salt yields no more terrestriety, or dregs, then shall you have a pure and perfect salt wherewith a Fritt made with *Tarso* as before, will make a Crystall, which, in fairness, whiteness, and cleerness, will excel natural Crystall.

Although this process be somewhat laborious, and a small quantity of salt made therewith, yet notwithstanding it will make a Crystall worthy of all great Princes, being fit to make all sorts of vessels and works. This was my invention, whereof I have many times made trial with happy success, and my great content.

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#### CHAP. IV.

*An observation for Gold Yellow, in Crystall.*

**OBSERVE**, that when salt of *Tartar* is mixed with salt of *Polverine*, Fritt made of the said salt is not good to make, nor can make, a Gold yellow, although it makes all other colours. But to make your gold yellow, you must make Fritt with salt taken from *Polverine* alone, first purified as above, for otherwise this yellow will not arise.

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#### CHAP. V.

*The way to make Salt of Fern, which makes a very fair Crystall.*

**I**N *Pisa* I made experience of Fern ashes, which groweth in great abundance in *Tuscany*, which herb must be cut from the earth when it is green, from the end of May to the midst of June, and in

the Moon's increasing, when it is near its opposition with the Sun; for then the said herb is in its perfection, and will then make more salt, and of a better nature, strength, and whiteness, than at other times: for when it is suffered to dry of it's self upon the ground, it yields little salt, and of little goodness. This herb, being thus cut and laid together, soon withereth, then let it be well burned to ashes; with these ashes, and with the rules, observations, and diligence given before for the salt of the *Polverine* of the *Levant*, is extracted a pure and good salt, wherewith I have made Fritt with good and well serced *Tarso*, the which Fritt melts well in the pot, and yieldeth a fair Crystall, and much better than the ordinary Crystall, because it had more strength and bended much better, which the ordinary Crystall doth not, it is drawn into fine threds, such as I caused to be drawn, and to this Fritt may be given a wonderful yellow Gold colour, observing that there be in it no salt of *Tartar*, for neither from this will the Gold yellow arise; and the Gold yellow which is given to this Crystal is much fairer and pleasanter than can be wrought with the Crystall made with the salt of the *Levant Polverine*, and with that Crystall cannot be made all sort of works, as with the other.

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#### CHAP. VI.

*The way to make another Salt, which will produce a marvelous and wonderful Crystall.*

**LET** there be made ashes after the manner aforesaid, of the Cods and Stalks of Beans, dried in the summer, when y<sup>e</sup> husbandmen have thrashed and separated the Beans, with which ashes, with the rules and pains abovesaid in the salt of *Polverine*, a marvellous salt is extracted, wherewith is made a very noble Fritt with white and well serced *Tarso*, which in pots will make most beautiful Crystall. The same may be done with the ashes of Coleworts, Bramble-berry Bush, and also with stalks of Millet, Rushes, and fen Reeds, and many other herbs which yield a salt, wherewith (making Frits after y<sup>e</sup> accustomed manner) will be made most beautiful Crystall, as every noble and curious spirit may try by experience, for thereby more is learned than by long study.

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#### CHAP. VII.

*A Salt that will make a very fair Crystall.*

**TAKE** the salt of Lime which serves for building, and this salt purified and mixed with the ordinary salt of *Polverine* of the *Levant*, about two pound

pound to a 100, that is, two pound of salt of Lime to a 100 pound of the salt of *Polverine* purified and well made (as abovesaid); with this salt so mixed, is usually made ordinary Fritt, and is put in the pot to clarify, refine the Glass as shall be hereafter declared in the way of making of Crystalline, Crystall, and common glass: and so thus is made a very fair and beautiful Crystall.

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### CHAP. VIII.

*The way to make ordinary Fritt, to wit, of Polverine, Rochetta, and Barillia of Spain.*

**FRITT** is nothing else but a calcination of those materials which make glass; and although they may be melted, and make glass without calcination, yet this would succeed with length of time and weariness, and therefore this calcination was invented to calcine the Fritt in the Calcar, which, when it is calcined, and the proportion of the materials is adjusted agreeable to the goodness of the *Barillia*, presently melts in the pot, and wonderfully clarifies.

Fritt made of *Polverine* makes ordinary white glass; Fritt from *Rochetta* of the *Levant* makes the fairest glass called Crystall; *Barillia* of *Spain*, though it be usually fatter than the former, yet it makes not a glass so white and fair as that of the *Levant*, because it always inclines a little to an azure colour.

To make then Fritt, serce the *Polverine* thorow a fine serce, the small pieces which pass not, let them be pounded in stone mortars; the like is done with the *Rochetta* and *Barillia*, to wit, every one by it's self; and be sure that they be well pounded, and serced thorow a fine serce; for, as the common proverb in this art saith, *A fine serce, and dry wood, bring honour to the furnacc.* Now whatsoever the quantity of the *Barillia* be, for example, a 100 pound of it commonly requires from 30 to 90 lb. of *Tarso*, which must be finely beaten, and then finely serced, more or less, according to the goodness of the *Barillia* and it's fatness, whereof you need not make an essay, how much it holds as is known by art. Then with sand, and especially with that from *Tuscanic*, found in the vale of *Arms*, being much fatter, and having in it more plenty of salt than *Tarso* hath. There is never added more than 6 or 8 pound to the hundred. Now this sand must be washed from all it's unprofitable terrestriety, and serced, and then this will make a white and good glass; for *Tarso* always makes much fairer glass than any sand that is in *Tuscany*. The due quantity of sand or *Tarso*, being found out, mix and unite them, first well together with the *Barillia* or *Polverine* well sifted, and so put them into the

Calcar when it is hot, and at first mix and spread them well in the Calcar with a rake, that they may be well calcined, and continue this till they begin to grow into lumps, and come into pieces as big as small nuts. The Fritt will be well and perfectly wrought in the space of 5 hours, being stirred all that time, and a sufficient fire continued; and when you would see whether it be well made, take a little of it out when cold, if it be white, yellowish and light, then 'tis made. The calcining of it more than 5 hours is not amiss; for by how much more it is wrought and calcined, the better it is, and the sooner it melteth in the pot; and by standing a little longer in the Calcar it consumeth and loseth the yellowness and foulness which glass hath in it self, and it becomes more clear and purified. When the Fritt is taken out of the Calcar thus hot, let there be thrown upon it 3 or 4 pails of cold water, then set it under ground in a moist and cold place, and the filth which arose when the salt was made (as is abovesaid) is wont to be put into the same pans, with the lee from *Polverine*; fill them with common water, having tubs under the pans to receive the water, which by little and little drops thorow the said filth and settlings, and hence comes a very strong, pure, and clear lee, to be kept apart, and herewith now and then water the Fritt abovesaid, which being heaped together in a moist place the space of 2 or 3 moneths or more (the longer the better) then the said Fritt grows together in a mass as a stone, and is to be broken with mattocks. Now when it is in the pot it soon melteth stupendiously, and maketh glass as white as Crystall. For this lee leaves upon the Fritt it's salt which worketh this effect. When this lee is not to be had, it must be watered with the common water, which, although it doth not work this great effect as the said lee, yet it doth well, and maketh it easier for melting. Wherefore Fritt should stand, when made, some moneths, which thus made, always causeth less wood to be consumed, and the glass clear and sweeter to work.

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### CHAP. IX.

*To make Crystall in full perfection, the way I always practice.*

**TAKE** Crystall Fritt, diligently made, set it in pots in the furnacc, where there are no pots with colours, for the fumes of metall, whereof the greatest part of colours are made, make the Crystall pale and foul; but that it may come forth white, shining, and fair, when you put the Fritt into the pots in the furnace, then cast in such a quantity of *Manganese* prepared as is needful, according as the pots are, greater or less. For this lieth in the practice



practice of the able and diligent Conciatore, and belongs to his office. The quantity of the *Manganese*, and of all other colours to be put into the Fritt and metalls cannot be precisely determined either by weight or measure, but must be wholly left to the eye and judgement, tryal and experience, of the Conciatore. To make a fair Crystal, when it is well melted take it from the pots, and cast it into great earthen pans, or clean bowls full of clean water (for it requireth to be cast into water), to this end, that the water may take from it a sort of salt called *Sandever*, which hurteth the Crystall, and maketh it obscure and cloudy, and whilst it is a working still easteth forth *Sandever*, a thing very foul. Then put it again into a clean pot, and cast it into water, which is to be repeated as often as is needful, until the Crystal be separated from all this salt, but this is to be left to the practice of the Conciator, then set it to boil 4 or 6 days, and let as little iron be mixed therewith as is possible, for it gives it always a blackish tincture. When it is boiled and clear, see whether it hath enough *Manganese*, and if it be greenish, give it *Manganese* with discretion. Wherefore to make good Crystall, put in the *Manganese* by little and little at a time, for it makes the Crystall of a murrey colour, which afterwards inclines to black, taking from it it's splendor; mix the *Manganese*, and let the glass clarify till it becomes of a clear and shining colour. The property of *Manganese* is, being put in just quantity, to take away the foul greasiness which Crystall always hath, and to make a resplendent white; when the Crystall is clear, limped, and fair, work it continually into vessels and works that most please you, but not with so great a fire as common glass is wrought with. Be careful that the Irons wherewith you work, be clean, and that you put not the necks of the glasses where the Irons touch (for there always remaineth iron) into the pots of Crystall, for they make it become black. But this glass where the iron rods touch may be put in to make glass for vulgar works.

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#### CHAP. X.

*To make Crystall-glass, and White, call'd otherwise Common glass.*

FRITT of *Polverine* makes a white and fair common glass, Fritt of *Rochetta* makes the fairest glass called Crystall, which is between ordinary glass and Crystall. As much *Manganese* prepared must be used in common glass as in Crystalline; east the Crystalline or common glass once at least into water, that you may have them fair, clear, and in perfection. Although glass may be made without this easting into water, yet to have it fairer than ordinary, this is necessary to be done,

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and may be repeated according to your pleasure, as you would have them more resplendent and fairer, and then you may work them into what vessels you need. And to make them yet whiter, Calcine them that they purifie well and have but few blisters. And above all observe, that if to each of them, by themselves, you put upon the Fritt, the proportion of 10 pound of salt of *Tartar* purified to 100 weight of Fritt, it makes them without comparison fairer, and more pliable to work than ordinary. The salt of *Tartar* must be put in when the Fritt is made, and then be mixed with *Tarso*, or sand, together with the *Polverine* or *Rochetta*, sifted, and then make thereof Fritt as before.

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#### CHAP. XI.

*To make Purified Salt of Tartar, for the work abovesaid.*

TAKE *Tartar* of red wine in great lumps, and not in powder, calcine it in earthen pots between live coles till it become black, and all it's unctuousity be burned away, and till it begins to grow white, but let it not become white, for then the salt will not be good. Put the said *Tartar* thus calcined, into great earthen pans full of common water heated, as also into earthen pots glazed, and make it boil with a gentle soft fire in such sort, that a quarter of the water may be exhale in two hours, then take them from the fire, and suffer the water to cool, and become clear, which decant off, and it will be a strong lee, then put in more common water into the said pans after the same manner, and upon the remainder of the *Tartar*, and let them boil as before, repeat this until the water become no more saltish, then filtre these waters, impregnated with salt, and put the clean filtered lee into glass bodies to evaporate in the ashes of the furnace at a gentle heat, and in the bottom there will remain a white salt, dissolve this salt in warm water, let it settle two days, then evaporate it in glass bodies at a gentle heat, and there will remain at the bottom a salt much whiter than at the first time, dissolve this salt again, and after two days setting, filtre and evaporate it in every thing as before. Repeat this manner of dissolving, filtering, evaporating, this salt of *Tartar* four times, which then will be a salt much whiter than snow, and purified from the greatest part of its terrestriety, which salt, mixed with *Polverine* or *Rochetta*, sereed, with a dose of *Tarso* or sand, will make a Fritt, which in the pot will yield Crystalline and common glass much fairer than that that is made without the addition of this salt of *Tartar*, and although a fair Crystalline may be made without it, yet notwithstanding a much fairer may be made with it.

CHAP.



## CHAP. XII.

*To prepare Zaffer which serves for many colours.*

TAKE *Zaffer* in gross pieces, put into earthen pans, let it stand half a day in the furnace, and then put it into an Iron ladle to be heated red hot in the furnace, take it thence thus hot and sprinkle it with strong vinegar, as soon as 'tis cold grind it fine on a porphyrie stone, wash it in earthen pans glazed, with much warm water, always suffering the *Zaffer* to settle to the bottom, then decant it gently off; this will carry away the foulness and terrestriety from the *Zaffer*, and what is good, and the tincture thereof will remain at the bottom, which thus prepared and purified will tinge much better than at first, making a limpid and clear tincture, which dry and keep in vessels closed for use.

## CHAP. XIII.

*To prepare Manganese to colour Glass.*

TAKE *Manganese* of *Piemont*, for this is the best of all *Manganeses* at this day known in the art of glass. At *Venice* there's not alwayes plenty, and at *Moran* none other is used. In *Tuseanie* and *Liguria* there's enough; but that holds much iron, and makes a black foul colour. That of *Piemont* makes a very fair murry, and at last leaves the glass white, and takes away the greenness and blewness from it. Put this *Manganese* in pieces into iron ladles, and proceed thorowout as in preparing *Zaffer*.

## CHAP. XIV.

*To make Ferretto of Spain, which serves to colour Glass.*

TO make *Ferretto* is nothing but a simple Calcination of Copper, that the metall, being opened, may communicate its tincture to glass; which Calcination, when it is well made, without doubt, makes divers and very beautiful colours. This Calcination is made many ways; I shall set down two of them, not only easie, but of times used by me, with effects very fair, in glass, whereof the first is that that followeth, to wit, Take thin copper plates of the bigness of a *Florentine*, and have one or more melting-pots of the Goldsmiths, and in the bottom of these pots make a layer of brimstone powdered, then a layer of the said plates, and over them another layer of powdered brimstone, and another of copper-plates, as before, and in this order fill the pot, which is otherwise said to make a SSS. cover and lute well, and dry this pot, and put it into an open wind furnace amidst burning

coals, and a strong fire must be given to it for 2 hours, let it cool, and you shall find the copper calcined, and it will be broke in pieces by the fingers as if it were dry earth, and will be raised into a black and reddish colour. This copper, being beaten small, and serced in a fine serce, is kept well closed for use.

## CHAP. XV.

*Another way to make Ferretto of Spain:*

THIS second way of making burnt copper, though it be more laborious than the first, yet it will do it's effects in glass more than ordinary.

The copper then (instead of making a SSS with brimstone) must make a SSS with vitriol, and then calcine it, letting it stand three days in the floor of the furnace, neer the occhio, then take it out and make another SSS with new vitriol, keep it in reverberation as before, and this calcination with copperas must be repeated six times, and then you shall have a most noble burnt copper, which in colours will work more than ordinary effects.

## CHAP. XVI.

*To make Crocus Ferri, otherwise called Crocus Martis, to colour Glass.*

CROCUS MARTIS is nothing else but a subtilising and calcination of iron, by means whereof it's tincture (which is most red in glass) is so opened that it communicateth it's self to glass, and not only manifesteth it self, but makes all other metalline colours (which ordinarily are hidden and dead in glass) appear fair and resplendent. I will set down four ways to make it, and the first is—

Take filings of iron (if you can have them, those of steel are better) mix them well with three parts of powdered brimstone, and keep them in a melting pot in a furnace to calcine, and burn well off all the brimstone, which soon succeeds, let them stand four hours in burning coals, then take and powder and serce them thorow a fine serree, and put them into a crysible covered and luted at the top, and set them in the lcer of the furnaee neer the occhio or the cavelet 15 days or more, which then gains a reddiss Peacock-like colour, as if it were purple; this is kept in a close vessel, for the use of glass colours, for it worketh many fair feats.

## CHAP. XVII.

*The second way to make Crocus Martis.*

THIS second way of making *Crocus Martis* with so much ease ought to be much esteemed of, since the *Crocus* made in this manner makes appear  
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in glass the true red colour of blood, and the manner of making it is thus :

Take filings of iron, (steel is better) mix them well in earthen pans with strong vinegar, onely sprinkling them so much that they may be wet thorowout, spread them in pans, and set them in the sun till they be dry, or in the open air when the sun is cloudy. When dry, powder them, and if they be any whit in lumps, sprinkle them with new vinegar, then dry and powder them as before; repeat this work 8 times, then grind and serce them fine, and you have a most fine powder of the colour of brick powdred, which keep in vessels to colour glass.

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### CHAP. XVIII.

*A third way to make Crocus Martis.*

**THIS** third way of making *Crocus Martis* is a way by which the deep colour of Iron is made more manifest than may seem credible, and in glass is seen the truth and proof thereof. Sprinkle filings of steel with *Aqua-fortis*, in glazed pans, set them in the sun to dry, powder them, wet them again with *Aqua-fortis*, and dry them; repeat this several times, and you shall have a red powder, as is said of *Crocus* made with Brimstone, then powder, serce, and keep it for your use to colour glass.

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### CHAP. XIX.

*A fourth way to make Crocus Martis.*

**THIS** is the fourth and last way to make *Crocus Martis*, and perhaps, the best of all, though each of the ways shown by me are not only good and perfect in their operation, but necessary also for divers colours necessarily and daily made in glass; and to make this, dissolve in *Aqua-fortis* made *Aqua-Regis*, with *Sal Armoniack* (as shall be said in our rules of *Calcidony*) filings of Iron or steel in a glass vessel well closed, keep them so 3 days, & every day stir them well. Observe, when the said water is put upon the filings, that it be done leasurly and warily, because it riseth much, and endangereth the breaking of the glass, or else all to run out: at the end of 3 days let the water be gently evaporated away, and in the bottom will be found a most noble *Crocus Martis*, for the most stupendious tinctures of glasses, which keep for use.

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### CHAP. XX.

*To Calcine Brass called Orpello, or Tremolante, which in glass makes a skie colour, and sea green.*

**BRASS** (as it is well known) is copper, which, by *Lapis Calaminaris*, becomes of the colour of gold, the which *Lapis Calaminaris* doth not only

colour the copper, but also, incorporating with it, increaseth much its weight; the which augmentation gives a colour to glass when it is well calcined, which is a thing very delightful to see, keeping the medium between a sea-green and skie-colour when the skie is clear and serene; wherefore be diligent in well calcining it. To make it punctually, this is the way.

Take Brass, and to save charges, buy that which is in works, and festoons, cut it in small peeces with a pair of Scisers, then put it into a chrysilbe covered and luted at the top in coals on a strong fire. I put it in the burning coals of the furnace, where they are stirred, there let it then stand four days in a great, but not in a melting fire, for if it be melted, all the labour is lost, in that time it will be well calcined, powder it into a most subtil powder, and serce it, and grind it fine upon a porphyrie stone, and there will come forth a black powder, which spread on tiles, and keep it on the burning coals in the leer, near to the round hole four days, take from it the ashes that fall upon it, powder, serce, and keep it for use. The sign that it is well calcined is, that if it be put into glass it makes it swell, and when it makes not the glass arise and boil well, it is a sign, either that it is not well calcined, or that it is too much burnt; in which two cases it makes not the glass boil, neither doth it colour well.

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### CHAP. XXI.

*To Calcine the said Brass, after another manner, to make a transparent red, a yellow, and a calcidony.*

**TAKE** Brass and cut it small with sheers, and put it in a melting pot, make a SSS. with powdered brimstone, and set it on kindled coals, put it in the burning coals of the furnace to Calcine for 24 hours, then powder, serce, and put it covered upon tiles of earth into the furnace, for 12 days, to reverberate, then grind, powder, and keep it for use.

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### CHAP. XXII.

*Sea-green in glass, a principal colour in the Art.*

**SEA-green** is one of the principal colours given to glass, and if you would have it fair, and to hold at all trials, you must always make it in glass called Artificial Crystal; for in ordinary metal it ariseth not fair: and though in Crystalline it ariseth fairer than in common glass, yet in the said Crystal onely in perfection. Observe, that whenever you would make this colour, you in no wise add any *Manganese* at first, because this being added (although the fire afterwards consumes it), yet it leaves a quality in the Glass which makes the colour black, and gives it great imperfection and foulness. Now, to make a fair Sea-green, take of Crystall Fritt and put it in a pot, not allowing it any

*Manganese*

*Manganese* at all, and as soon as it is melted and clear, it yields a salt which swims at the top like oyl, let this be taken off with iron ladles by the Conciators, take it out with much diligence, for what remains thereof will make a foul and oyl colour, and when the glass is well and perfectly clarified, take a pot of about twenty pound of Crystal, six ounces of Brass prepared as is afore-said, and to this brass calcin'd, add a fourth part of *Zaffer* prepared, and let these two powders be well mixed, and put to the said Crystal at three times, but at first this powder will make the metall swell very much, and you must well mix the glass with the long squares. Then let the metall settle, that the colour may be incorporated for three hours, then mix them again with the long square, then take a proof thereof, in doing whereof, put in rather too little than too much, for the colours may be easily heightned, which is to be done according to the works for which it is to be employed, for gross tubes for counting-houses require not so deep and full a colour, and tubes to make beads of, must not have too light a colour. At the beginning of twenty four hours (after it hath had the due colour) it may be wrought, and before you work it, mix well the metall from the very bottom of the pot, that the colour may be well united, mixed, and spread thorrow all the metall, otherwise it settles to the bottom, and the metall at the top becomes clear. This manner of making Sea-green I have tried at *Florence* in the year 1602, and made pots for tubes for counting-houses, always of a most fair colour. At *Moran* for the said tubes, they take half Crystall Fritt, and half *Rochetta* Fritt, fromwhence notwithstanding proceeds a fair Sea-green, although in Crystall alone it ariseth most fair.

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CHAP. XXIII.

*Skie Colour, or Sea-green.*

SET in the furnace a pot of pure metall of Fritt from *Rochetta*, or *Barillia* of *Spain*. The *Rochetta* of the *Levant* does best. As soon as the metall is well purified, then take to a pot of 20 pound six ounces of brass calcin'd of it's self, as in 20 *Chap.* put it into the metall as is said in the Skie colour in every particular; observing, that this metall be scummed very diligently with a ladle. At the end of two hours the metal must be very well remixed; take thereof a proof, and leave it so 24 hours, then it is mixed and wrought, and this will be a most fair and marvellous Skie-colour, varied with other colours, which are made in the art of glass. This colour tinged many pots in *Pisa*, in the year 1602, and there came out a fair colour bearing all proofs.

CHAP. XXIV.

*A Red colour from Brass for many colours.*

TAKE Brass in small plates, and put them on the arches of the furnace, leave them there closed until they are well calcined of themselves with a simple fire, but not to melt. As soon as it is calcin'd and powder'd, it will become a red powder for many, and those all necessary, uses in the art of glass.

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CHAP. XXV.

*Brass thrice calcined to colour glass.*

PUT the said Brass into the *Fornello*, or on the *Lere* of the furnace neer to the *occhio*, into earthen-tiles, or pans baked, calcine it four days together, and it will become a black powder, and stick together; powder it again, serree it fine, and recalcine it as before four or five days, for then it will not stiek together, nor become so black, but russet, and powders of itself, wherewith is made a Sea-green, and Emerald-green, the *Arabian* colour called *Tureois*, a very beautiful skie colour, with many others. Wherefore observe that it be not too much nor too little calcined at the third calcination, for in this case it colours not the glass well, and the sign that it is done perfectly is, that being put upon purified metal, it makes it swell and boil suddenly, and when it doth not so, it is not good, nor well calcined.

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CHAP. XXVI.

*A Sea-green in Artificial Crystal.*

TO a pot of Crystal Fritt containing 40 pound, not charged with any *Manganese*, but well scummed, for when you would make a sea-green, never cast the Crystal into water, but ouely seum it carefully; when this Fritt is melted and well purified, take 12 ounces of thrice calcined brass, and therewith mix half an ounce of *Zaffer* prepared, unite these two powders well together, and put this mixture into the pot at four times, for so the glass receiveth it better. Mix the glass and powder with diligence, let them stand two hours, then remix them, and take a proof, and if the colour be full enough, let them stand; and although the Sea-green appears too full, yet the salt which is in the glass will eat up and consume the said greeness, and will always incline to a blewishness. And at the beginning of 24 hours it may be wrought.

I have many times experimented this way of making Sea-green without ever erring. And if a moytie of *Rochetta* first be mixed with Crystal Frit, there will arise a fair Sea-green, and in Crystal alone 'tis marvellous fair.

CHAP.



## CHAP. XXVII.

*General observations for all colours.*

THAT the colours may arise in full beauty and perfection, observe, that every pot, great or small, that is new, and put the first time into the furnace, leaves a foulness in glass from it's terrestriety, so that all the colours that are made in them appear bad and foul: wherefore those pots that are very great may be glazed with white melted glass, as the Conciators well know, but the second time the pots lose this foulness. Observe, secondly, that those pots which serve for one colour must not be used for another; for example, a pot which hath been used for yellow, is not good to make a grain colour, and that which makes a grain colour is not good to make a green colour, and that which serves for a red is not good to make a blew, and so of all other colours. Therefore, every colour must have its own pot, for in this manner the colours will become more perfect. Thirdly, that the powders be well calcined, (that is) neither too much, nor too little; for in either of these cases they do not colour well. Fourthly, that a due proportion and dose be used, and the mixture be made in proportion, and the furnaces be hot, and fed with dry and hard wood. Fifthly, that the colour must be used dividedly; to wit, one part in the Fritt, and the other in the metall when it is melted and purified. There are other observations also which shall be treated of in their places, when we treat particularly of colours.

## CHAP. XXVIII.

*To make Copper thrice Calcin'd with more ease and less charge than the former.*

TAKE the scales which the Brasiers make when they hammer pans, kettles, or other works of brass, which being often put into the fire, the workmen hammer them, and these scales fall off, which cost much less than solid brass, wherewith is made the stuff hereafter described. And to calcine it, you need not open and shut again the arches of the furnace (as in the aforementioned way), a thing of much disadvantage and disturbance to the furnace. Take then those scales that are clean, and free from all earth and foulness, wash them with warm water many times from their filth and uncleanness, and then let them be put into pots and pans of baked earth, and be kept in the leer near the oecchio, or in furnaces made for this purpose. I made at *Pisa* a little furnace in the fashion of a little calcar, where were calcin'd 20 or 25 pound of these scales in few hours. Now let them stand in the said place four days, then renew them, powder and serce them fine, then again put them in the pans and pots of earth as before, with the same fire and heat as aforesaid, for four days more, and they will come into a black powder, and run into lumps; beat, and serce those lumps fine, and repeat this process again, and a third time, then the

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scales will be prepared with much less charge than the former, and will thorowly have the same effect as the former. These scales rise much, wherefore use the prescribed care.

## CHAP. XXIX.

*A fair Sea-green in Crystall Metall, with the above-said Scales.*

TAKE a pot of sixty pound of Crystall Fritt well scummed, and not east into water. I made a Sea-green without wetting the Crystall metall, and thought that it came out better. But we may make trial of both ways, and stiek to the best. Then take of metall well purified the said 60 pound, and one pound and a half of the said scales made with less charges, four ounces of *Zaffer* prepared, mix well these two powders together, put them to the Crystall at four times, mixing well the powder with the metall for two hours, then put it again to be well remixed as 'tis usual, and take a proof. Herewith I have made many times a most fair Sea-green with happy success. Mix half Crystall with *Rochetta*, and you shall have a Sea-green every way beautiful.

## CHAP. XXX.

*A Sea-green of lesser Charge.*

TAKE the same Brass prepared (as before) with the same quantity of *Zaffer*, put them in the same manner and form to the *Rochetta* of the *Levant*, and also to that of *Spain*, neither of which hath had any *Manganese*, and which hath been well skummed, and not passed thorow water, using the rules as abovesaid in Crystall; for by this means it will receive a very fair Blew for all sorts of works, and will cost much less than Crystall: for the *Rochetta* is of much less value than the Crystall, as it is known. In this manner have I often made it at *Pisa*, and always with good success.

## CHAP. XXXI.

*A marvellous Sea-green, above all Sea-greens, of my invention.*

LET the *Caput mortuum* of the spirit of *Vitriol* of *Venus*, Chymically made without corrosives, stand in the air some few days; draw from it of it self without any artifice a green pale colour; this material being pulverised with the addition of *Zaffer* prepared, and with the same proportion (as is said in the other prepared Brass) the metall being added (as in the other Sea-green,) it will make a Sea-green so fair and marvellous, that 'twill seem a very strange thing: I have often made it at *Antwerp* to the wonder of all the spectators that saw it. The manner of making *Vitriol* of *Venus* without corrosives, *spagirically*, is, to take little thin pieces of Brass of the bigness of half a *Florentine*, and to have one or more pots (as it

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is needful) and in the bottom of them to put a layer of common Brimstone powdered, and above it little pieces of the brass aforesaid, and then a layer of Brimstone, and after that pieces of brass; work in this manner till all the brass that you have be set to work, this being done, let the brass be baked as followeth in the 140 Chap. then prove it, and to your content you may see a thing of astonishment. I know not whether any have tried this way, which I have found wonderful, wherefore I say 'tis my own invention.

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CHAP. XXXII.

*A green emerald colour in glass.*

IN making Green you must observe that the metall have not much salt, with metall that hath much salt as Crystall and *Rochetta* have, you cannot make a fair Green, but onely a Sea-green, for the salt consumes the Green, and always inclines the colour to a Blew. Wherefore when you would make a fair green, put common metall made with *Polverine*, into small or great pots, and in no wise have any *Manganesec*. When it is melted and well purified, add to this metall a little *Crocus Martis* calcined with vineger, about three ounces thereof to a hundred weight, let the metal be well mixed, and remain so an hour, until the glass incorporate the same tincture of the metall *Crocus*, which will make the glass come out yellowish, and takes away the foulness and blewness, which the metal always hath. This proecess will give the metall a fair green. Put of thrice calcined brass, made with scales (as before) two pound to every hundred pound of metall, and this must be added at six times, mixing well the powder with the metall, then let them settle two hours, and the metall incorporate with it, then mix again the metall, and take a proof, and if the green inclines to a blew, add a little more *Crocus Martis*, so you shall have a very fair Sea-green, called Leek green, which, at the end of twenty-four hours, may be wrought: This green I have many times made at *Pisa*, which came forth sufficiently fair. And so it will to every one that shall observe punctually what is abovesaid.

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CHAP. XXXIII

*A Green fairer than the former.*

BUT if you would have a Green much fairer and shining than the former, put into a pot of Crystalline which hath not had any *Manganesec*, and which hath passed thorow water once or twice, till all the saltness be gotten out; and to this Crystalline, let half of common white metall made of *Polverine* be put in at several times: as soon as this metall is well mixed and purified, take to every hundred pound, two pound and a half of thrice calcin'd brass, made with plates of brass in the arches of the furnaee, and with

this mix two ounces of *Crocus Martis* calcin'd with Brimstone, and reverberated, put these two powders well mixed together to the abovesaid metall, using the rules as before in the said green; if the metall hath any blewness, give it a little of the said *Crocus Martis*, which takes it away, and then work it as the other greens, and there shall be made the wonderfull Green of the *Burnet*. I have thus made it many times at *Pisa* with very good success, for works more exact than ordinary. If you will have a fair colour, see that the brass be well prepared.

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CHAP. XXXIV.

*A marvellous Green.*

TAKE Brass thrice calcined as before, then in stead of *Crocus Martis*, take the scales of iron which fall from the Smiths anvils, powder them finely, sift them clean from the coals and ashes, and with the quantity aforesaid, mix them well with the Brass, and put them to the common glass metall of *Polverine*, without any *Manganesec*, with the rules aforesaid in Green, and with this *Crocus Martis*, or scales, you shall doubtless have a more marvellous emerald-green colour, which will have wholly lost its azure and sea-colour, and will be a yellowish green, after the emerald, and will have a shining and fairer lustre than the aforesaid Greens. The putting in of scales of iron was my own invention. In the rest of the work let the rules and doses as in other greens be observed, and you shall have a strange thing, as experience hath often shown me.

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CHAP. XXXV.

*Another Green, which carries the Palm from all other Greens, made by me.*

TO a pot of 10 pound of metall, to wit, half of Crystalline passed thorow water several times, and half of common white metall of *Polverine*, take four pound of the common Frit of *Polverine*, where-with mix three pound of red lead, unite them well together, and put them into the same pot, and in few hours all of them will be well purified, then cast all this metall into water, and take out the lead, then return the metal which hath passed thorow the water into the pot, and let the metall purifie for a day, then if you put in the colour made Chymically with the powder of the *Caput mortuum* of the Spirit of *Vitriolum veneris*, adding a very little *Crocus Martis*, there will arise a marvellous Green, fairer than ever I made any, which will seem to be a very emerald of the ancient Oriental roek.

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CHAP. XXXVI.

*A Blew, or Tureois, a principal colour in this art.*

PUT sea salt, which is called black or gross salt, (for the ordinary white salt which is made at *Volterra*



*terra* is not good) into the Calcar or Fornello till all the moisture be evaporated, and it becomes white, then pound it well to a small white powder. This salt so calcined, keep to make a blew or *Turcois* colour. Put it into a small or great pot of Crystal metall died with the colour of Sea-green (made, as hath been said many ways.) But let the colour be fair and full (for this is of great importance to make a fair skie colour), according as you would have the Sea-green fair and excellent. To this metall so coloured, put of the said salt calcined into the pots, mixing it well with the metall, and this is to be put in by little and little until the Sea-green loses its transparencie, and diaphanietie, and takes opacity, for the salt, being vitrified, makes the metall lose its transparencie, and gives it a little-paleness, and so by little and little, makes the said skie colour, which is the colour of a *Turcois-stone*; when the colour is enough, it must be wrought speedily, for the salt will

be lost and evaporated, and the metall returns again to be transparent and foul-coloured. But when the colour is lost in working, add new burnt salt (as before) that the colour may be reduced, and so you shall have your desired colour. Let the Coneiators well observe, that this salt always crakles when it is not well calcined, therefore let him have a care of his eyes and sight, for it endangers them. The quantity of salt must be put in by little and little, leaving some distance between each time, till he see the desired colour. But in this I used neither dose nor weight, but my eye onely. I have often made this colour, for it is very necessary in counting-houses, and the most prized and esteemed colour that is in the art. Wherefore, to make a Blew for counting-houses, take the Green of Crystal metall, and half Sea-green made of half *Rochetta*, which will become a fair colour, although it be not all Crystall metall.

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## The Second Book.

*Wherein are shown the true ways of making Calcidony of the colour of Agats, and oriental Jaspers, with the way to prepare all colours for this purpose, and also to make Aqua-fortis, and Aqua-Regis, necessary in this business.*

### CHAP. XXXVII.

*And the Manner of calcining Tartar, and uniting it with Rosiehiero, made Chap. 123, which produceth pleasant toys of many colours, with undulations in them, and gives it an opacity such as the Natural and Oriental stones have.*

SINCE I am to shew the manner how to make *Calcidonics*, *Jaspers*, and *Oriental Agats*, it is necessary first to teach the preparation of some mineral things for such compositions; and although some of them may be publicly bought, yet notwithstanding, I being desirous that the work should be perfect, judged it pertinent to my purpose to shew the most exquisite Chymical way, that the skilful may make every thing of themselves, both more perfect and with lesser charge. For there is no doubt that when the materials are well prepared, and the colour of the metalls is well opened, and separated from their impurity and terrestriety which usually hinder the ingress of their tincture into glass, and their union in their smallest parts, that then they colour the glass with lively, shining, and fair colours, which very far surpass those that are vulgarly and usually made in the furnace. And because the colour of *Calcidony*,

or rather its compound (which is nothing else, but as it were a reuniting of all the colours, and toys that may be made in glass, a thing not common nor known to all) if they be not well prepared, and subtilised as is necessary, they give not the beauty and splendor to glass as is required. Wherefore it is necessary that the metalls be well calcined, subtilised, and opened with the best *Aqua-fortis*, *Sulphurs*, *Vitriols*, *sal Armoniack*, and the like materials, which in length of time, and at a gentle heat, are opened and well prepared, but a violent fire herein hurteth much. *Tartar* and *Rosichicro* (besides their being very perfect and well calcined) must be also put in proportion, and in fit and due time; and you must also observe, that the metall be well boiled, purified, and perfected, and in working of it some such care is to be used, as the diligent masters are wont to use, and by thus doing, the true *Jaspar* and *Agat*, and *Oriental Calcidonics*, with the fairest and beautifullest spots of wavings, and toys, with divers lively and bright colours. Hence it truly appears, that nature cannot arrive so high in great pieces; and although it is said, and may be made to appear true, that Art cannot attain to Nature, yet experience in many things shews, and in particular in this art of the colours in glass, that

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Art doth not onely attain to and equal Nature, but very far surpasses and excells it. If this were not seen, hardly would you believe the beauty, the toys and wavings of divers colours, variously disjoyned one from the other with a pleasing distinction, which is seen in this particular of the *Calcidomy*. When the medicine is well prepared, and the glass wrought at a due time, the effect that cometh thence passeth all imagination and the conceit of man. In the three ways to make it, which I teach, I believe you may see how far the art of glass ariseth in this particular, where I demonstrate every particular so distinctly, that any practitioner, and skilful person, may understand and work without error, and he that works well, may find out more than I set down.

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CHAP. XXXVIII.

*How to make Aqua-fortis, call'd Parting-water, which dissolves silver and quick-silver, with a secret way.*

TAKE of Salt-peter refined one part, of Roch-alum three parts; but first exhale in pans all the humidity from it. To every pound of this stuff add an ounce of Crystalline Arsnick (this is a secret and no ordinary thing) which besides it's giving more strength to the water, helps to extract better the spirits from the materials, which are the true nerves and strength of the *Aqua-fortis*, without which the water perhaps would be no better than well water. Powder and mix them well together, adding thereunto the tenth part in the whole of Lime, well powdered, mix them well, and put so much of this stuff into glass bodies, that about three quarters of them may be full; let them be luted with strong lute, which I remit to the Artist as a common thing; but one not vulgar, I will declare: Take some lome for example of the river *Arnus* (which is a fat earth known to all) one part, of sand 3 parts, of common wood-ashes well sifted, of shearings of woollen cloath, of each one half; mix them well together, and incorporate them into a past with common water, work them well together, for the more 'tis wrought the better tis, therefore see that your paste be a little hard; to all these add a third of common salt, which incorporate well with the lute, 'tis a business of importance, then lute the glasses with this perfect lute, and set them in wind furnaces, fitting to their bottoms, baked earth which will bear the fire. Under the bottom of these bodies let there be four fingers of sand, and thick Iron bars to bear the weight, and fill'd round about with sand, put receivers of glass to them, large and capacious within, lute the joints well with lute made of fine flowre and lime, of each a like quantity, powdered, mixed, tempered, and impasted, with the whites of Eggs well beaten, with this lute, binde and lute the joynts with roulers of fine linnen, which, when well dried and rould about three or four times, make a very strong lute, rouling but once at a time, and letting it dry a little before the second rouling.

And then this will bear all the violence, fury, and force of the spirits of the *Aqua-fortis*, and to this end fit exactly a very large receiver to every glass body. And when they are well dried, make a fire in the furnace onely with coal at first, and that a very temperate one, for three hours, for in that time the windy moisture distilleth off, which endangers the breaking of the glasses, and continue for six hours a moderate fire, afterwards encrease it gently, adding billets of dry oaken wood to the coals, and so proceed by little and little, augmenting it for six hours more, and then the head will be tinged with yellow, a sign that the spirits begin to rise; continue this degree of fire until the spirits, beginning to condensate, colour red the receiver and head, which will always grow deeper colour'd like a Rubie. Then encrease the fire for many hours, till the head and receiver become red, which sometimes lasteth two whole days. Continue the fire by all means till all the spirits of *Aqua-fortis* be distilled off, which is known when the head and receivers by little and little begin to grow clear, and become white as at first, and wholly cold; yet notwithstanding continue the fire one hour more. Then let the furnace cool of it's self. Observe, that when the head and receivers are Red, and the fire strong, you admit no wind, nor cold air into them, nor touch them with any cold thing, for then they will easily crack, and your pains, cost and time will be lost; wherefore, when they are in this state, let them be kept hot in the fire. Now, when all is cold, put upon the head and receiver linnen cloaths wetted and well soaked in cold water, that the spirits which are about the head and receiver may the better sink into the *Aqua-fortis*; leave them thus for 12 hours, then bath the joynts and lutings with warm water, till they being moistned, you may take off the bandage and the head from the receiver, which usually are safe. The bodies may be broke and thrown away, for they will serve no more, powder the dregs and residences of the *Aqua-fortis*, to wit, about their third part, and to every pound of them add four ounces of Salt-peter refined, and put them into another body luted, & pour on them the said *Aqua-fortis*, lute and distill them as before in every thing. Keep the *Aqua-fortis* in earthen jugs well stopt that the better spirits may not evaporate. This parting water is good for the following uses. Some there are that instead of *Roch Alum* take as much more of the best *Vitriol*, such as the *Roman* or the like is. The sign that *Vitriol* is good for this use, is, that being rub'd upon polished iron it colours it with a copper colour. This *Vitriol* purified after the following manner, will make a stronger *Aqua-fortis* than *Alume*.

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CHAP. XXXIX.

*To purifie Vitriol to make the strongest Aqua-fortis.*

DISSOLVE the best *Vitriol* (the better, the stronger the *Aqua-fortis*) in common warm water; let the solution stand three days being impregnated with salt,



salt, then filtre and evaporate in glass bodies two thirds of the water, and put the remainder into earthen pans glazed, which set in a cold place, in 12 hours the *Vitriol* will shoot into pointed pieces, appearing like natural Crystall, of a fair Emerald colour. Dissolve this same *Vitriol* again, and do as before, and repeat it thrice, at each solution there will remain at the bottom of the glass a yellow substance, which is it's unprofitable sulphur, and is to be cast away. At the third time the *Vitriol* will be purified, and fit to make a good and strong *Aqua-fortis*, much stronger than the ordinary, especially if the Nitre be well refined.

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CHAP. XL.

*How to make Aqua-Regis.*

TO every pound of the said *Aqua-fortis* put two ounces of *sal Armoniack* powdered, into a glass body, which set in a pan full of warm water, and let the *Aqua-fortis* be often stirred, which will soon dissolve the *sal Armoniack* with it's heat, which will be tinged with a yellow colour; put in more *sal Armoniack* as long as the *Aqua-fortis* will dissolve any: when it dissolves no more, let it settle a little; when it is clear decant it leisurely off, and in the bottom there remains the unprofitable terrestriety of the *sal Armoniack*. Now this *Aqua Regis* is strong, and fit to dissolve Gold, and other metalls, but silver it toucheth not at all.

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CHAP. XLI.

*To burn Tartar.*

PUT *Tartar* of Red-wine which is in great pieces, and appears full of spots, (lay by that which is in powder, for it is not good) into new earthen pots, and let it burn in kindled coals until it smoaks no more, and when it is calcin'd, and in lumps of a black purplish substance, then it is burned, and prepared.

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CHAP. XLII.

*How to make a Calcidony in Glass very fair.*

PUT of *Aqua-fortis* two pound into a glass body not very great, but with a long neck, four ounces of fine silver, in small and thin pieces, and set them near the fire, or in warm water, which, as soon as the *Aqua-fortis* begins to be hot 'twill work and dissolve the silver very quickly, and continue so until it hath dissolved and taken it up; then take a pound and a half of *Aqua-fortis*, and in it dissolve (as you have before done with silver) six ounces of *Quick-silver*; when all is dissolved, let these two waters be well mixed in a greater body, and powr upon them six ounces of *sal Armoniack*, and dissolve it at a gentle heat. When it is dissolved, put into the glass one ounce of *Zaffer*, and half an ounce of *Manganese*, each

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prepared, and half an ounce of *Ferretto* of *Spain*, a quarter of an ounce of *Crocus Martis* calcined with Brimstone, thrice calcined copper, blew smalts of the painters, and red-lead, of each half an ounce, powder all these well, and put one after another into the body, which then stir gently that the *Aqua-fortis* may be incorporated well with the said powder, keep the body close stopped for ten days, every day stirring it well several times, and when they are well opened, then put it into a furnace on sand, and make a most temperate heat, so that in 24 hours all the *Aqua-fortis* may be evaporated. Observe that at last you give not a strong, but a gentle heat, that the spirits of the *Aqua-fortis* may not evaporate, and in the bottome there will remain a Lion colour, which, being well powdered, keep in a glass vessel. When you would make a *Calcidony*, put into a pot very clear metall and made of broken pieces of Crystall vessels, and Crystalline, and white glass which hath been used. For with the virgin Fritt which hath never been wrought, the *Calcidony* can never be made, and the colours stick not to it, but are consumed by the Fritt. To every pot of about 20 pound of glass put two ounces, or two ounces and a half, or three ounces of this powder, or medicine, at three times, and incorporate and mix them, that the glass may take in the powder, in doing whereof it raiseth certain blew fumes, as soon as it is well mixed, let the glass stand an hour, then put in another mixture, and so let it alone 24 hours, then let the glass be well mixed, and take thereof an essay, which will have a yellowish azure colour, this proof being returned many times into the furnace, and taken when it begins to grow cold, will shew some waves, and divers colours very fair. Then take *Tartar* eight ounces, soot of the Chimny well vitrified two ounces, *Crocus Martis* calcin'd with Brimstone half an ounce, put by little and little all these well powdered and mixed into this glass at six times, expecting a little while at each time, still mixing the glass that the powder may be well incorporated. As soon as all the powder is put in, let the glass boil, and settle 24 hours at least, then make a little glass body of it, which put in the furnace many times, and see if the glass be enough, and if there be any on the outside toys of Blew and Seagreen, Red, Yellow, and all colours with toys, and it hath some waves, such as *Calcidony*, *Jaspars*, *Oriental Agats* have, and that the body kept within be as to the sight as red as fire. Now, as soon as it is made and perfected, it is wrought into vessels always variegated, which are not to be remade, for they do not arise well. These vessels may be made of divers sorts, and drinking glasses of many fashions, broad drinking cups, salts, flower pots, and the like toys, still observing, that the master workman pinch off well the glass (that is wrought) with pincers, and anneal it sufficiently, that it make waves and toys of the fairest colours. You may also make with this pot dishes, pretty large in *oval*, *triangular*, *quadrangular*



*gular* form, as you will, and afterwards work it at the wheel (as Jewels) for it takes polishing, and a fine lustre, and it may serve for little tables and cabinets; so that those little Jewels will represent the Oriental *Calcidony*, and when it happens that the colour fadeth, and the glass becomes transparent, and no more Opacous as it ought to be for these works, then cease from working, put to it new *Tartar* calcin'd, soot and *Crocus*, for thus (as before) it takes a body and Opacousness, and makes the colours appear; set it then to purifie many hours, that the new powder put in may be incorporated, as 'tis usual, then work it. This was my way to make *Calcidony* in the year 1601 in *Florence*, at *Casino* in the glass furnaces; at which time I caused to work in the furnace the brave Gentleman *Nicolao Landiamo* my familiar friend, and a man rare in working Enamels at the lamp, in which furnace I made many cups of *Calcidony* at the same time, which always were fair to all essays, never departing from the aforesaid rules, and having the materials well prepared.

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### CHAP. XLIII.

#### *The second Calcidony.*

1. [IN a pound of *Aqua-fortis* dissolve three ounces of fine silver cut small in a glass body well closed, set this aside.

2. In another glass body put one pound of *Aqua-fortis*, wherein dissolve 5 ounces of *Mercurie* well purified, close the body well, and set that aside.

3. In another little glass body, put one pound of *Aqua-fortis*, wherein dissolve two ounces of *sal Armoniack*, then put into this dissolution of *Crocus Martis* made with *Aqua-fortis*, *Ferretta* of *Spain*, copper calcin'd red, as in Chap. 24. brass calcin'd with sulphur, of each half an ounce, put all these materials well ground and powdered by themselves, and then one by one, into the bodies by little and little, with patience, because they all arise much.

4. In another little glass vessel let there be put one pound of *Aqua-fortis*, and therein dissolve one ounce of *sal Armoniack*, and in the dissolution of crude *Antimony* powdered, *Vitriol* purified, of *Azure*, or *Blew Smalts*, of each half an ounce, one ounce of *Red-lead*, grind them all well and set the vessel by.

5. In a like body, dissolve in one pound of *Aqua-fortis* two ounces of *sal Armoniack*, then put in one ounce of *Zaffer* prepared, and a quarter of an ounce of *Manganese* prepared, and half an ounce of thrice calcined copper, and one ounce of *Cinabar*, put in warily every one of these things (well powdered) by themselves into the body, avoiding those things that swell up, arise, and fume; set this aside.

6. In another small glass body, dissolve in one pound of *Aqua-fortis* two ounces of *sal Armoniack*, and then add of *Cerus*, painters red-lake, *Verdigrease*, the skales of iron that fall from the anvil, of each half

an ounce, these swell very much. Let all these 6 bodies stand 12 days, and shake them well six times every day, that the water may penetrate and subtilise the ingredients and metals, to communicate their tincture to the glass.

After this time take a great glass body, luted at the bottom, into which you shall empty all the materials of these six bodies by little and little, that they may not run out, nor make the glass crack, in this great body mix well the waters, that the materials may be well united and mixed together; set this glass in ashes at a very gentle heat for twenty-four hours, that the water may evaporate. Observing, that the fire be gentlest at last, lest the powder be wasted with too much heat. He that will regain the *Aqua-fortis* may joyn the head & receiver, and lute the joints (as is usual) and the water being evaporated, there remains at the bottome a reddish powder, which is kept in a glass closed for use.

Put this powder or medicine into metall made of broken pieces of glass, and old glass, but not made of virgin *Fritt* of *Crystall*, or *Crystalline*, as in the first *Calcidony* hath been said. Give the metall the same quantity, and use the said distance of time as in the other, then give it the body of burnt *Tartar*, and soot of the chimney vitrified, and *Crocus Martis* made with vinegar, then let them settle twenty-four hours, and cause a vessel to be made thereof, and put it in the fire, and observe whether it take body and opacity, and if it shew the variety of colours with toys and wavings, work all of it into vessels of divers sorts, framing therewith all sorts of workmanship, and variety of toys.

With this sort of *Calcidony*, I made many cups, all which were fair, and besides, with this past of *Calcidony*, may be made many hundred crowns for gentlemen, as fair as can be uttered. These were seen by *Ferdinando* the great Duke, of blessed memory, and by many other Princes and Lords; and this was done by me in *Flanders*.

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### CHAP. XLIV.

#### *The third way of Calcidony.*

1. [IN a glass body in strong *Aqua-fortis*, dissolve four ounces of fine leaf silver, that is to say, round cuttings of leaf silver, stop the body and set it aside.

2. In another body of like glass, dissolve in one pound of *Aqua-fortis* five ounces of *Quick-silver* purified with vinegar and common salt, in a wooden dish with a wooden pestle, stir the *Mercury* sufficiently round with strong vinegar, and wash it with clear common water, until it is dissolved, and carry away all the common salt, together with the blackness of the *Mercurie*, repeat this many times. Then strain this *Mercurie* through canvas, and dissolve it in the abovesaid *Aqua-fortis*, as before, close the glass vessel, and set it aside.

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3. In another glass body, dissolve in a pound of *Aqua-fortis*, three ounces of fine Silver calcined after this manner, to wit, amalgamate the silver with *Mercurie*, mix the amalgama with as much more common salt well prepared from all it's terrestriety, by dissolving it in common water, and boyling it a little, and then let it settle two dayes that the terrestriety mixed with the salt may sink to the bottome, then filtre the water, and in the bottome will remain the grossness and terrestriety of the salt, evaporate this water filtered from the terrestriety of the salt in a glass vessel, and dry it well, repeat this till the salt sends no more dregs to the bottom, and then it will be perfect and fit for the work. This purifying of the salt is made that it may be more efficacious to open the silver, otherwise it will be hard to separate them. Put all these things amidst the coals in a pot, that all the *Mercurie* may be evaporated away, and the silver remain at the bottome calcined and powdered, and add unto it it's weight of new common salt prepared, (as before) mix them well, and put all in a chrysilbe or a pot to calcine six hours in the fire. Wash this stuff in a glased pot many times with warm water till all the saltiness be well gone; then put this silver into a glass body full of common water, boil it till a quarter of it be evaporated, then let the silver grow cold and settle, and decant the water, repeat this fresh water thrice, and the fourth time put it in a body of *Aqua-fortis*, stir it well, and set it aside.

4. In another like body, dissolve in a pound of *Aqua-fortis*, three ounces of *sal Armoniack*, decant off the clear solution, the remainder at the bottome cast away. In this water dissolve a quarter of an ounce of gold. Keep this last solution apart.

5. In another glass body, dissolve in one pound of *Aqua-fortis*, three ounces of *sal Armoniack*; then put into the solution, of *Cinaber*, of *Crocus Martis*, of *Ultramarine*, of *Ferretto of Spain*, of each half an ounce, put them (well powdered) leasurly into the body, which being done, close the vessel, and set it aside.

6. In another body, dissolve in a pound of *Aqua-fortis*, three ounces of *sal Armoniack*. Then put in *Crocus Martis* calcin'd with vinegar, calcined Tin, a thing common in potters furnaces, *Zaffer* prepared, and *Cinabar*, of each half an ounce. Put gentle each of them (ground by themselves) into the *Aqua-fortis*, then keep this in a vessel and set it aside.

7. In another body of glass, dissolve in a pound of *Aqua-fortis* two ounces of *sal Armoniack*. Then put leasurly into the solution, Brass calcin'd as in chap. 23. *Manganese* prepared, and the scales of iron which fall from the Smiths anvil, of each half an ounce. Put each of these well ground by themselves, by little and little, then close the vessel, and set it aside.

8. In another body, dissolve in a pound of *Aqua-fortis* two ounces of *sal Armoniack*, whereto put of *Verdigreas* one ounce, Red-lead, crude *Antimony*, and

the *Caput mortuum* of *Vitriol* purified, of each half an ounce, put these powdered leasurly in, close the vessel, and set it aside.

9. In another body, dissolve in a pound of *Aqua-fortis* two ounces of *sal Armoniack*, then put in leasurly *Orpiment*, white *Arsnick*, painters lake, of each half an ounce, each powdered, and ground by itself, close the vessel, and set it aside.

Keep these nine bodies (well closed) in the furnace fifteen days, and every day stir it well many times, that the *Aqua-fortis* may work, and the materials be subtilised, and their tinctures well opened, else they will not work well, then put all the materials with their waters into a great and strong body, by little and little; the things being united together, let alone the great body, (whereinto you have powred the materials of all the lesser bodies) closed for six dayes, and every day stir it, then put it in ashes, giving it a gentle heat for twenty-four hours, that the water may onely evaporate, observing, that the body must be well luted at the bottome, even unto the midst of the body, and at the last of all the heat must be made so gentle, that it only evaporate the water; and that the better spirits of the *Aqua-fortis* may remain inelosed in the same powders, for so the powder will work fair and strange things in glass. In the bottome of this body will remain a powder of a purplish Green, whereof I gave the glass such a dose and quantity as is said in the first *Calcidony*. Then in due times (as is said in the first *Calcidony*), give it it's body, to wit, *Tartar* burnt, the soot of the Chimny, and *Crocus Martis* made with vinegar, using the same dose and diligence, times and intervals throughout, as is said in the first *Calcidony*; then at the end of twenty-four hours, work it with diligence, and according to art, and set it to the fire again, as hath been most punctually said in the first *Calcidony*.

This third way of making *Calcidony* I performed at *Antwerp*, a city of *Brabant*, A<sup>o</sup> 1609, in the Moneth of *January*; at which time, and for many years, there was in the house Signor *Emamel Nimenses*, a Knight of the Noble Religion of Saint *Steven*, a *Portughes*, and Citizen of *Antwerp*, a gentile spirit, and universal in all knowledge, as any in the *Low Countries*, whom I saw or knew. With this powder I made a *Calcidony* in the furnace of *Antwerp*, which I caused Signor *Philippo Ghiridolpho*, a very Courteous Gentleman to work, which *Calcidony* came forth so fair and beautiful, that it imitated the true *Oriental Agat*, and in fairness and beauty of colours far surpassed it. Many *Portughes* Gentlemen well skilled in Jewels admired it, saying that nature could not do more. This was the fairest *Calcidony* that ever I made in my life, which although it be laborious, and long a working, yet notwithstanding it doth real things. Of this *Calcidony* two vessels were given to the most Excellent Prince of *Orange*, which pleased him very well.



### The Third Book.

*This Book shews the wayes to make the colour of Gold Yellow, of the Amethyst, Saphyre, Granat, Velvet Black, Milk White, Marble, and Deep Red: As also to make Fritt with natural Crystal, and to colour Glass of a Pearl colour, and other particulars necessary in this Art.*

#### CHAP. XLV.

THIS third Book teacheth various wayes, and one better than another, to make all the abovesaid colours: As also a particular way to make Fritt of natural Crystal, which will melt as ordinary Crystal metall, and will make vessels very white, beautiful, and sightly. There is no doubt but some of those colours are known to Artists, though not to all persons; for few they are that know how to make well Gold Yellow, and a deep Red, being hard and nice colours in this Art, since in making them, 'tis necessary you be punctual in dose, time, circumstances, and materials; for if you err but a very little in any of them whatsoever, all the whole labour and business is lost and comes to nothing. I describe these two colours, and all other, in so clear and intelligible a stile, that every body may understand, and make them to their gust and satisfaction.

1. *You must be exact in the time, quantity, circumstances, purifying, powdering, sereing, fire, materials; if you err but a little in any of them whatsoever, all the labour is lost, and the colours come to nothing.*

2. *Tartar must be of Red-wine well vitrified in the vessel, in gross pieces, not in powder, vitrified naturally of themselves. That of white wine is not good.*

3. *To Manganese our author still subjoyns of Piemont.*

4. *The colour must be made fuller or lighter according to the works you employ them for; and to heighten them, put in more of the colour, but to make them lighter put into the pot more Fritt. Take some metall out of the pot, and you shall see whether you have your desired colour. Put in your colours by little and little, lest they overdo.*

5. *Put your colour to the Fritt, and not to the metall, when melted; for then it neither takes the colour so well, nor so good a colour.*

6. *Mix the colours well with the metall in the pots when 'tis melted, that both may be well incorporated; and this is to be done as often as you work the metall.*

#### CHAP. XLVI.

*To make a Gold Yellow in Glass.*

TAKE Crystal Fritt two parts, *Rochetta Fritt* one part, both made with *Tarso*, (which is much bet-

ter than sand) mix and remix well these two *Frits*, and to every hundred pound of this composition, take of *Tartar* in lumps well beaten and serced fine, of *Manganese* prepared, of each one pound, mix these two powders well first together, and then with the *Frits*. Then put them into the furnace, and let them stand four days at an ordinary fire, because they rise much. When the metall is purified and well coloured (which usually is at the end of four days) work it into vessels and works. This quantity of the materials makes a most fair colour, which you may make deeper or lighter by adding or diminishing the powders or *Frits*. You must put the powder in at several times, and not into the metall, for then it colours not. With these rules and observations you shall make a very fair Gold Yellow. But if you would have it fairer, and a more graceful Yellow, take all Crystall *Fritt*. And thus I have frequently made this colour and alwayes very fair.

#### CHAP. XLVII.

*Garnat Colour.*

TAKE of Crystall and *Rochetta Fritt*, of each a like quantity, mix them well, and to every 100 weight, add of *Manganese* one pound, *Zaffer* prepared an ounce, mix well these two powders together first, then with the *Frits*, then put this powder into the pot by little and little. Mix well the *Manganese* with the *Zaffer*, for this quickens the colour, making it shining, beautiful, and fair. At the end of 24 hours (when 'tis pure and well coloured) work it.

#### CHAP. XLVIII.

*Amethyst Colour.*

TAKE onely Crystal *Fritt* made with the most perfect *Tarso*, *Manganese* prepared one pound, *Zaffer* prepared one ounce and a half, mix these two powders well together, and then with the *Fritt*, and not with the metall in the pots. The proportion is one ounce of the mixed powder to one pound of the *Fritt*. When the metall is pure and well coloured, work it into vessels, &c.

CHAP.



## CHAP. XLIX.

*Saphyre colour.*

TO every hundred weight of *Rochetta Fritt*, add one pound of *Zaffer* prepared, and to every pound of *Zaffer* one ounce of *Mauganese*, mix these two well together first, and then with the *Fritt*, put them all mixed into the furnae to melt and purifie, and when 'tis pure and well coloured, work it, &c. This small quantity of *Mauganese* makes a most fair colour, of a double violet, which I have often made at *Pisa*, and always well.

## CHAP. L.

*A fairer Saphyre colour.*

INSTEAD of *Rochetta Fritt*, take crystall *Fritt*, whereto add the same quantity of the foresaid powder with the same rules, and you shall have a fair and shining *Saphyre* colour.

## CHAP. LI.

*A Black colour.*

TAKE pieces of broken glasses of many colours, grind them small, and put to them *Mauganese* and *Zaffer*, to wit, not more than half of *Mauganese* to the *Zaffer*. This glass purified will be of a most fair Black, shining like velvet, and will serve for tubes and all kinde of works.

## CHAP. LII.

*A much fairer Black.*

TAKE of the *Frits* of Crystal and *Polverine* of each 20 pound, Calx of Lead, and Tin four pound, mix all together, set them in a pot in the furnae well heated, and when the metall is pure, take steel well calcined and powdered, seales of iron which fall from the Smiths anvil, of each a like quantity, powder and mix them well, put six ounces of this powder to the said metall, that they may both strongly boil, let them settle 12 hours, and sometimes mix the metall, and then work it. This will be a most fair velvet Black, and pleasant, to make all sorts of works.

## CHAP. LIII.

*Another fairer Black.*

TO a hundred weight of *Rochetta Fritt*, give two pound of *Tartar*, and of *Mauganese* six pound, both pulverised, mix them and put them in the furnae leasurly, let the metall purifie, which will be about the end of four dayes, then mix and wash the said metall, which will make a more marvellous black than all the former.

## CHAP. LIV.

*A fair milk White, called Lattimo.*

TAKE of Crystal *Fritt* twelve pound, of calcined Lead and Tin two pound, mix them well, of *Mauganese* prepared half an ounce, unite them all together, and put them into a pot heated, let them stand twelve hours that the materials may be melted, and at the end of eight hours you may work it. This will be a fair white which I have often made.

## CHAP. LV.

*A fair White, much whiter than the former.*

TAKE 400 weight of Crystal *Fritt*, and 60 pound of calcined Tin, and two pound and a half of *Mauganese* prepared, powder and mix them all with the *Fritt*, and set them in a furnace in a pot, let them refine, and at the end of eighteen hours this stuff will be purified, which cast into water, purifie it again in the furnace, and make a proof, and if it be too clear add 15 pound of the aforesaid calcined Tin, mix well the metall many times, and at the end of one day it becoms marvellous white, and in whiteness surpasseth any snow, then work it. I have often made it, and always with good success. This white may be also made with *Rochetta*, but not so white as with Crystal.

## CHAP. LVI.

*To make a Marble colour.*

PUT Crystall *Fritt* in a pot, and when 'tis melted (before 'tis purified) work it. This is a fair Marble colour.

## CHAP. LVII.

*A Peach colour in White.*

MANGANESE prepared will make in *Lattimo* the colour of a Peach flower. But work it in time because it loseth colour.

## CHAP. LVIII.

*A Deep Red.*

TAKE of Crystall *Fritt* 20 pound, broken pieces of white glass one pound, calcined Tin two pound, mix these well together, put them into a pot to run and purifie; when these are melted, take steel calcined, scales of iron from the anvil, both well ground, of each a like quantity, mix them together, put leasurly of this mixture about an ounce to the aforesaid metall when purified, and mix them well, and let them incorporate, which succeeds commonly in five or six hours. Too much powder makes the metall black, whereas the colour ought to be transparent and

not opacous, of an obscure yellow; when 'tis so, put in no more powder, but then put about three quarters of an ounce of Brass calcined to redness (as in the 24 Chap.) and ground to this metall, and mix them many times, and at about three or four times it will become as red as blood, wherefore make essays often, and see whether this colour be good, and when so, work it speedily, else 'twill lose its colour, and become black. Besides, leave the mouth of the pot open, else the colour will be lost. Let not the pot stand above 10 hours in the furnace, and suffer it not to cool as much as is possible. When you see the colour fade (which sometimes happens) put in some scales of Iron, which reduceth the colours. And, because this is a nice colour, use all diligence in making it, by putting in the steel and scales, as also in working it.

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CHAP. LIX.

*Fritt of natural Crystall.*

CALCINE natural Crystall in a Chrysilbe, extinguish it in common cold water eight times, cover

the Chrysilbe that no ashes nor filth get in, dry the calcined Crystall, and grind it to an impalpable powder, mix this powder with sait of *Polverine* made in a glass body, as in Chap. III. with these make a *Fritt*, observing the quantities, rules, and portion of *Manganese*, setting it in the furnace, and at due and often times casting it into the water, purifying and working it as in other Crystal. And thus you will make a marvellous thing.

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CHAP. LX.

*A Pearl colour in Crystal.*

PUT at three or four times to Crystal melted and purified, of *Tartar* well calcin'd to whiteness, and continue to put in the *Tartar* 4 or 6 times, always mixing it well with the metall, till the Crystal hath gotteu a Pearl colour. Then work it speedily, for this colour fadeth. This I have often practised and experimented.

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The Fourth Book.

*Wherein is shown the true way to make Glass of Lead, to calcine Lead, and extract from it the colours of green Emerald, Topaz, Skie-colour, or Sea-green, Granat colour, Saphyre, Gold Yellow, and of Lapis-lazuli.—With the way to colour natural Crystal (without melting it) into the permanent colours of Rubies, Balas, Topaz, Opal, Girasale, and other fair colours.*

CHAP. LXI.

THE Glass of Lead, known to few in this Art, as to colours, is the fairest and noblest glass of all others at this day made in the furnace: for in this glass the colours imitate the true oriental gems, which cannot be done in Crystal, nor any other glass. 'Tis very true, that unless great diligence be used, all sorts of pots will be broken, and this metal will run into the coals of the furnace. Observe my rules in all these glasses made of Lead exactly, and you shall avoid all danger. This business principally consists in knowing well how to calcine Lead, and to recalcine it also a second time; for by how much 'tis better and more calcined, by so much the less it returns to Lead again; and, by consequence, the less breaks out the bottom of the pot. Secondly, cast the metall into water, and separate carefully the Lead from the glass, even the least grains of it. This glass of lead must be cast into the water by little and little, to make

a better separation; for the least lead remaining breaks out the bottom of the pots, and lets all the metal run into the fire.

*These two rules our Author repeats almost in every Chapter of this Book, and these following also:*

The pots and lead must not have too much heat in the furnace, neither must the metall be wrought too hot, and the marble whereon 'tis wrought must be of the hardest stone, and must be wetted, else the marble will break and scale.

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CHAP. LXII.

*To calcine Lead.*

AT first calcine Lead in a Kil as the potters do, and in great quantity. Usually in two days they calcine many a hundred pound of Lead. In calcining observe that the Kil be not too hot, but sufficiently heated onely to keep the Lead in fusion, for otherwise



it will not be calcined. When the Lead is melted, it yields at the top a yellowish matter. Then begin to draw forwards the calcined part with an iron fit for the purpose, always spreading it in the internal extremity of the Kils bottom, which should be of soft-stone, which will bear the fire. And the Kil must have a declivitie towards the mouth, which I pass by as a thing well known. When 'tis calcined once, it must be put and spread a second time in the Kil, to reverberate in a convenient heat, always stirring it with an iron, and that for many hours, till it come by this second calcination to a good yellow, and be calcined. Then serce all in a fine serce, and what passeth not the serce, recalcine it with new lead. This is the way to calcine lead in great quantity to make thereof store of Potters ware.

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CHAP. LXIII.

*To make Glass of Lead.*

TAKE of this calcined Lead 15 pound, and Crystal or *Rochetta* or *Polverine Fritt*, according as you would make the colours, 12 pound, mix them as well as possibly you can, put them in a pot, and at the end of 10 hours, cast them into water, for by that time they will be all well melted, separate the Lead, and return the metal into the pot, which in 12 hours at most you shall have most fit to work.

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CHAP. LXIV.

*The manner how to work the said Glass.*

TO work glass of Lead into divers drinking or other vessels, 'tis necessary, before 'tis taken upon the iron, to be a little raised in the pot, and then take it out, and suffer it to cool a little, and then work it on the Marble, being clear. At first, let the Marble be well wetted with cold water, that this glass may not draw away with it the marble, and seal it, which it always doth when the Marble is not wetted, and incorporates it into its self. This sticking of the Marble makes a foul colour in the works. Wherefore continually wet the Marble whiles this glass is wrought, otherwise all the fairness and beauty will be taken from it. Do thus as often as you take the metall out of the pot. This sort of glass is so tender, that if it be not cooled in the furnace, and taken a little at a time, and held on the irons, and the Marble continually wetted, 'tis impossible to work it. Which proceeds from the calcined Lead, which makes it most tender as a caudle.

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CHAP. LXV.

*Glass of Lead of a wonderful Emerald colour.*

TAKE of *Polverine Fritt* 20 pound, Lead calcined 16 pound, serce these two powders first by themselves, then, when well mixed, put them in a pot not too hot, and at the end of 8 or 10 hours they will be

melted, then cast them into water, and separate the Lead. Put them a second time into the pot, and in 6 or 8 hours they will be melted, then cast them into water and separate the lead. This being twice done, the metal will be freed from all the Lead, and all the unctuosity which calcined Lead and *Polverine* give it, and will acquire a most bright and shining colour, and in few hours 'twill run and become very clear, then give it brass thrice calcined (made as in chap. 28.) six ounces, and therewith mix a penny weight of *Croeus Martis* made with *Vniuger*; put in this mixture at six times, always mixing well the glass, and taking at each time the intervall of saying the Creed. Let this glass settle an hour, then mix and take a proof thereof. When you like the colour, let them incorporate 8 hours, then work them into drinking-glasses, which will appear in a colour proper to the Emerald of the old Oriental rock, with natural shining and glittering.

Let this glass stand in a pot when sufficiently coloured, till it hath consumed all the dregs, and till it be perfectly refined, and then 'twill be so like the natural Emerald, that you can hardly know one from the other.

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CHAP. LXVI.

*Another wonderful Green Emerald beyond all other Greens.*

THIS is made in every thing as the Emerald-green, in Chap. 65, but with this difference, that this only takes six ounces of the powder of the *Caput mortuum* of *Vitriolum Veneris*, made as in Chap. 131. 132, and the other the same quantity of Brass prepared. This happily is the rarest green that can be made any way whatsoever, which I have often made to my content.

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CHAP. LXVII.

*Topaz colour in Glass of Lead.*

TAKE Crystal *Fritt* instead of *Polverine Fritt* 15 pound, Lead calcined 12 pound, mix and serce them both together, set them in the furnace not too hot, at the end of eight hours cast them into water, separate the Lead from the pot and glass, and repeat this twice, then hereto add half glass of a gold yellow colour, let them incorporate, and purifie for an Oriental Topaz.

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CHAP. LXVIII.

*A Sky or Sea-green in Glass of Lead.*

TAKE Crystall *Fritt* 16 pound, Lead calcined 10 pound, mix and serce them well together, set them in the furnace, in 12 hours the stuff will be melted; east both it and the pot into water, separate the lead, let them stand in the furnace 8 hours a second time, then cast them into water a second time, and separate the



the lead, put them in the furnace, and in 8 hours your metall will be most clear, then take of brass calcined 4 ounces, of *Zaffer* prepared a quarter of an ounce, mix these well, and put in this mixture at 4 times to the glass of lead, and at the end of two hours mix well the glass, and take a proof, then let the glass stand 10 hours, in which time the colours will be well incorporated, and the glass be very well perfected, and be fit to be wrought in any works.

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CHAP. LXIX.

*The colour of a Granat in Glass of Lead.*

**MIX** 20 pound of Crystall *Fritt* with 16 pound of calcined lead, serce and put them into a pot, add to them of *Manganes* three ounces, of *Zaffer* half an ounce, both prepared, let them stand 12 hours, cast them into water and separate the lead, put them again into the furnace, and let them purifie 10 hours, then mix them and take a proof, when the colour is perfect and of a fair Granat, work the glass as before.

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CHAP. LXX.

*Saphyre colour in Glass of Lead.*

**TAKE** 15 pound of Crystal *Fritt*, and lead calcined 12 pound, mix and serce them well together, then add to them two ounces of *Zaffer*, and of *Manganese* a peny weight, both prepared, let them stand in the furnace 12 hours, cast them into water, and separate the lead; repeat this a second time, and you shall have the colour of an Oriental Saphyre, very beautiful and fair, with the mixture of a double violet colour.

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CHAP. LXXI.

*A Yellow Gold colour in Glass of Lead.*

**TAKE** of Crystal *Fritt* and calcined lead of each 16 pound, mix and serce them well, and add to them of brass thrice burned six ounces, *Crocus Martis* made with Vinegar 2 peny weight, put them well mixed in the furnace, let them stand 12 hours, then cast them into water, separate the lead, set them in the furnace other 12 hours, and in that time 'twill be clear, mix them, and take a proof. If it wax green, give it a little *Crocus Martis* (which takes away the greeness) till it become a most fair Gold Yellow colour, often made by me.

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CHAP. LXXII.

*The colour of Lapis Lazuli.*

**MELT** the fairest Lattimo made (as in Chap. 55.) with the whitest Crystall, and most tender, in a pot, when 'tis well melted, give it of Blew Painters smalts, by little and little, and when the colour is good, let it stand in the fire two hours, and make a

proof, and when 'tis good, let it stand 12 hours, mix them, and work them. If the metall rise, put in a piece of leaf Gold to diminish the rising. This will be very like the natural *Lapis Lazuli*.

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CHAP. LXXIII.

*The way to colour natural Crystal of a Viper colour, without melting it.*

**TAKE** natural Crystal of a good water, and very clear, free from Terrestricty, in several pieces of divers magnitudes, crude Antimony, Yellow Orpiment, of each powdered two ounces, *sal Armoniac* one ounce, powder and mix well these three last, put this mixture in the bottom of a chryisible that will bear the fire, and above this mixture the Crystals in pieces, then cover this Chryisible with another, mouth to mouth, lute them well, and when they are dry, set them in coals, which kindle by little and little, and when they begin to fire, let them flame of themselves, and then they will smoak much; do this operation in a large Chimney, and avoid the dangerous and deadly fumes, when all these fumes are gone, let the Chryisible stand till the pot cool, and the fire go out of its self. Then unlute the Chryisibles, and take out the pieces of Crystal, and those which are at the top will be tinged with a good yellow colour, with a red Rubie and Balass colours, with fair spots, those which lay at the bottom upon the powder, and the residence, into the wavie colour of a Viper. These pieces of Crystall may be wrought as Jewels at the wheel, and will receive a good polishing lustre, and shewing beauty, such as is in the Topaz, Rubie, and Balass, if you give them foils suitable to their colour they make a fair shew, being set in Gold. Of these Crystalls you may colour a good quantity, since the charges and labour is but small, and in colouring a competent quantity, there always come forth some beautiful and fair.

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CHAP. LXXIV.

*The colour of a Balass, Rubie, Topaz, Opal, and Girasole, in Natural Crystall.*

**TAKE** Orpiment of a yellow-oringe-tawney colour in powder, Crystalline white Arsnie, of each two ounces, crude Antimony, *sal Armoniac*, of each one ounce, put this powder, well mixed, into a very capacious Chryisible. and upon the powder, scales and little pieces of Crystall, and upon these small pieces larger and grosser pieces of Crystall, of a fair water, without spots, if you would have a pleasing thing, let them be very large. And so fill the Chryisible, to which lute well another mouth to mouth, make a hole at the bottom of the uppermost of the bigness of a Tare, that the air may draw thorow this hole the fumes of the materials which pass thorow the pieces of the Crystal, which tingeth the Crystall well, and better



better than when they pass thorow the joynts of the Chrysibles. When the lute is dried, set them in the coals, so that all the lowermost, and half the uppermost be buried in the coals. Then kindle the fire by little and little, do as in the former, and avoid the deadly fumes. The materials fume long, keep constantly a strong and good fire. See you let not in any wind or cold air by windows or other places, for the pieces of Crystall being then hot, will become brittle, will split, and not be good. When the fire is gone out of it's self, unblite the Chrysibles, and you shall find the greatest part of the Crystall tinged with the

true colours of Topaz, Chrysolite, Balass, Rubies, Girasole, and Opal, with wonderful beauty. Those of the best colour may be wrought by the Jewellers at the wheel, and appear natural jewels, and the Crystall holds its natural hardness, which is great. At *Antwerp* I made good store, and amongst them some of them were of a fair Opal colour, and some of the Girasole. You may set them in Gold with foiles. Be sure the Orpiment be good, for therein consisteth all the secret. If the work proceeds not well the first time, repeat it a second, and with practice you shall always do it without failing.

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### The Fifth Book.

*Wherein is shown the true way to make Pasts for Emeralds, Topas, Chrysolite, Iacinth, Saphyre, Garnat, Egmarine, and other colours, of so much pleasantness and beauty, that they surpass the same natural stones in all things, except hardness.—With a new Chymical way (never yet used) to make the said Pasts, taken out of Isaac Hollandus, and far excelling all other Pasts that have been hitherto made, both in beauty and colour.*

#### CHAP. LXXV.

I BELIEVE there are few who desire, and seek not with all earnestness the knowledge to imitate perfectly Emeralds, Topaz, &c. And in a manner all sorts of Jewels, which in colour, splendor, pleasantness and clearness, excepting hardness, excel the natural and Oriental, a thing very delightful and pleasant.

Wherefore, in this present Book, I describe the means to make them, with the circumstance and diligence necessary to be used. There is no doubt but he who shall set himself to the work with diligence, shall do much more than what I publish. The way lately practised by me, and taken from *Isaac Hollandus*, maketh pasts of incredible, and seemingly impossible beauty and perfection. 'Tis true, the work is somewhat long and wearisome, yet I that have many times performed it, say 'tis very facil and plain, and (that which is above all) this way is true. Wherefore, all pains, expences, and charges employed in such a like work, ought to seem small and light.

#### CHAP. LXXVI.

*The way to prepare natural Crystall.*

TAKE natural Crystall, the clearest that is possible, and put by firestones, Calcidonies, and Tarso, and other hard stones, which, though they vitrifie, yet they

make not so clear, lucid, and shining stones as natural Crystal doth. The said stones used to make counterfeit Jewels, though they take polishing wonderfully, yet they always have something earthy and obscure in them. But Crystall hath always something that's aërial and transparent, and draweth near to the quality and nature of Jewels, especially those which are natural and oriental. For they work far greater effects, than the *Italian* or *Dutch*. Take then works made of Crystal, put them in Chrysibles covered at the top, set them in burning coals till they be both well heated and fired, then suddenly cast the Crystall into a very large pan, full of cold clear water. When the Crystall is cold, recalcine, and heat, and cast it into fresh clean water; repeat this twelve times, and be sure the ashes and filth be kept out of the Chrysible, and that the water be always very clean. When the Crystal is well calcined, grind it to an impalpable powder, as fine as the best wheaten flour, and that on a Porphyrie-stone, with a muller of the same, and then 'twill crumble and come to a flour, like refined Sugar. If you powder the Crystall in Brass mortars, with an iron pestle, you can make nothing therewith but a green Emerald colour. Grind not above a spoonful at a time, and this grinding and sercing must be often repeated, so long till no roughness remains, nor can be felt in the powder. For otherwise a past made thereof will give onely a durty and imperfect work, and will never be like natural Jewels. But if the

Crystall

Crystall be well ground, 'twill make artificial gems far excell'g true natural stones in beauty, colour, clearness, splendor, and polishing. Make a good quantity of this material that you may make all colours, for this is the prime material to make all Artificiall jewels, and shall be called hereafter Crystal prepared.

*These rules, often repeated by the Author, take together :—*

1. That the whole be done cleanly; to this end, lute all the pots wherein the Crystall is calcined, and wherein the pasts are baked with lute well dried, before they be set to calcine or bake.

2. Take pots that will bear the fire

3. Grind all on Porphyrie-stone, and not in metal, to a most impalpable powder, first singly, and then together.

4. Keep a just proportion in the dose of the Ingredients.

5. Mix the materials well before you bake them, and if the past be not sufficiently baked the first time, bake it again a second time in the potter's furnace, and never break the pot till you see 'tis baked, for if you do, the pasts will be foul and full of blisters.

6. Leave the vacuity of a finger's thickness in the top of the pot, especially where 'tis said it swells much, or that you must put it in leasurely, lest the materials run out into the fire, or stick to the cover, and so make a foul colour.

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#### CHAP. LXXVII.

*How to make Oriental Emeralds.*

TAKE of Crystall prepared two ounces, ordinary red-lead four ounces, mix and incorporate them well together, good *Verdigreas* two penny weight, *Crocus Martis* made with vinegar eight grains, mix all well, and set them in a potters furnace, in the hottest place thereof, as long as the fire lasts. To see whether the past be sufficiently baked and purified, clear and transparent, take only off the cover made of lute, and if the past be pure and transparent to the bottom 'tis a sign 'tis baked enough. Otherwise, relute and bake it again, without breaking the pot, for then the past will be full of points and blisters. Let the fire be continued 24 hours with dry wood.

I set up a furnace at *Antwerp* a purpose, wherein I kept 20 pots of divers colours, and with a fire in 24 hours melted and purified all of them; and, to be the more secure, continue the fire six hours more, and by this means the past will be very well baked, and little wood wasted. These pasts may be cut and wrought in every thing as ordinary Jewels, they wholly receive the same polishing and lustre, and are set in gold with foils, as the other commonly are. This past is harder than ordinary.

#### CHAP. LXXVIII.

*To make a deeper Emerald colour.*

TAKE of Crystal prepared an ounce, of ordinary red-lead six ounces and a half, mix them, and add of *Verdegreas* about three penny weight and 13 grains, of *Crocus Martis* made with vinegar 10 grains. Proceed according to the rules, and you shall have a marvellous Emerald colour for small works, and to be set in Gold. This past must be baked more than ordinary, to wast that imperfection which lead usually gives. This past is britler, but fairer than the former.

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#### CHAP. LXXIX.

*To make a more beautiful Past for Emeralds.*

TAKE of Crystal prepared two ounces, ordinary red-lead seven ounces, mix and add to them of *Verdegreas* about 10 grains to every ounce, and of *Crocus Martis* made with Vinegar ten grains only at a time, mix them and proceed according to rule, and you shall have an Emerald past for small works, very fair and beautiful, but not hard, by reason of the plenty of lead. Wherefore bake it more than ordinary to take away the blackness, and unctuousity lead naturally yields.

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#### CHAP. LXXX.

*Another most fair Emerald.*

TAKE of Crystal prepared two ounces, ordinary *Minium* six ounces, mix them, and add of good *Verdigreas* well ground 80 grains, mix and bake them for a most fair Oriental Emerald.

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#### CHAP. LXXXI.

*An Oriental Topaz.*

TAKE Crystal prepared two ounces, ordinary *Minium* seven ounces, mix them, and bake them, for a marvellous Oriental Topaz, to work any kind of work you please.

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#### CHAP. LXXXII.

*An Oriental Chrysolite.*

TAKE of prepared Crystall two ounces, ordinary *Minium* eight ounces, mix them, and add of *Crocus Martis* made with vinegar 12 grains, mix and bake them more than ordinary, by reason of the great quantity of lead.

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#### CHAP. LXXXIII.

*Sky-colour.*

TAKE of Crystal prepared two ounces, ordinary *Minium* five ounces, mix them, and add 21 grains of *Zaffer* prepared and ground, remix and bake them for a most beautiful Sky-colour.

CHAP.



## CHAP. LXXXIV.

*A Sky with a Violet colour.*

TAKE of Crystall prepared two ounces, ordinary  
*Minium* four ounces and a half, mix them, and  
 add about four grains of Painters blew smalts, mix  
 and bake them. This past will be a most fair Violet,  
 and pleasant sky-colour.

## CHAP. LXXXV.

*An Oriental Saphyre.*

TAKE of Crystall prepared two ounces, ordinary  
*Minium* six ounces, mix them well, and add of  
*Zaffer* prepared five grains, mix with the *Zaffer* of  
*Manganese* prepared seven grains, remix and bake  
 them for an Oriental Saphyre, which will have a most  
 beautiful violet colour.

## CHAP. LXXXVI.

*A deep coloured Oriental Saphyre.*

TAKE of Crystall prepared two ounces, ordinary  
*Minium* five ounces, of *Zaffer* prepared about  
 42 grains, add to the *Zaffer* of *Manganese* prepared  
 eight grains, mix and bake them well, and they will  
 make a deeper Oriental Saphyre, with a violet colour  
 of notable fairness.

## CHAP. LXXXVII.

*An Oriental Garnet.*

TAKE of Crystall prepared two ounces, ordinary  
*Minium* six ounces, mix them, and add about 16  
 grains of *Manganese* prepared, wherewith mix three  
 grains of *Zaffer* prepared, mix them all together, and  
 bake them for a most fair and sightly Garnat.

## CHAP. LXXXVIII.

*A deeper Oriental Garnat.*

TAKE of Crystall prepared two ounces, ordinary  
*Minium* five ounces and a half, of *Manganese*  
 prepared 15 grains, wherewith mix four grains of  
*Zaffer* prepared, mix them all, this swells much, bake  
 them for an oriental Garnat, which hath in it a very  
 fair Violet colour.

## CHAP. LXXXIX.

*Another fair Garnet.*

TAKE of Crystall prepared two ounces, ordinary  
*Minium* five ounces, mix them, and add 52 grains  
 of *Manganese* prepared, wherewith mix six grains of  
*Zaffer* prepared, mix them all well, and bake them  
 for an Oriental Garnat, fairer than any of the former.

## CHAP. XC.

*Observations for Pastes and their Colours.*

OBSERVE, that the colours in the aforesaid Pastes  
 may be made deeper, or lighter, according to the  
 works they are to be used for, and also the will and  
 humour of the maker. Small stones for rings, pen-  
 dants, and ear-rings, require a fuller, but greater  
 stones a lighter colour. No rules can be herein given,  
 though those given by me will give some light to the  
 curious Artist, to whose judgement it must be left,  
 and who may find out and invent more and better  
 colours. Besides, I set down here onely colours from  
*Verdigrease*, *Zaffer*, and *Manganese*. But a curious  
 person and practical Chymist, may extract a wonder-  
 ful Red from Gold, and another fair Red from Iron,  
 from Brass an exceeding fair Green, from Lead a  
 Gold colour, from Silver a Sky-colour, and a much  
 fairer from Granats of *Bohemia*, which are low prized,  
 for, being small, you may draw a tincture from them,  
 as I have often done in *Flanders*, and this doth nota-  
 ble effects. The same may be done with Rubies,  
 Saphyres, and other Jewels. To write of these things  
 would be a business too long for me, who speak so  
 clearly in this present work. But the colours above-  
 said will make pleasant works.

## CHAP. XCI.

*The way to make the abovesaid Pastes, and to imitate  
all sorts of Jewels, marvelous and never used.*

THIS way, which I have taken from *Iaac Hollandus*  
 when I was in *Flanders*, to imitate Jewels, is not  
 much used, and known perhaps to few persons; and  
 though it be somewhat laborious, yet by how much 'tis  
 more laborious, 'tis so much the fairer and beautiful  
 than any made in any place whatsoever to this day, or  
 at least not shewn to me by any person. Wherefore  
 I will shew the manner to make them so clearly, and  
 with so many observations, that any one versed in  
 Chymistry will be easily capable thereof, and will do  
 the work perfectly. Take Ceruss, otherwise called  
 white-lead, grind it very fine, and put it into a great  
 glass body, and pour therein as much distil'd Vine-  
 ger as will rise a palm above it. Observe, that at  
 first the Vineger boils and swels, wherefore put it in  
 by little and little, till all the fury and noise is gone.  
 Then set the Vineger on a hot furnace in sand, and  
 evaporate away the eighth part of it, take it from the  
 fire, and when the body is cold, decant leasurly the  
 Vineger coloured enough, and impregnated with salt,  
 which set aside in a glass vessel, then pour more fresh  
 distild Vineger on the Ceruss, and evaporate and de-  
 cant as before. Repeat this till you have extracted  
 all the salt from the Ceruss, which is, when the Vine-  
 ger is coloured no more, nor hath any more taste of  
 sweetness, which usually succeeds the sixth time.—

Then

Then filtre these coloured Vinegers mixt together, evaporate and dry them in a glass body, and the salt of Lead will be at the bottom of a white colour, which set in sand in a glass body from the neck downwards well luted, but the mouth of the glass must be open, and the furnace heated for twenty-four hours continuance. Then take the salt out of the receiver, powder it, and if it be yellowish and not red, set it 24 hours in the fire, till it become as red as *Cinaber*. Make a good fire, but not to melt it, for then all your labour and pains will be lost. Pour distilled Vineger on this Red-lead calcined, repeating this work as before till you have extracted all the salt from it, and separated all the dross and terrestriety in whole or in part. Keep these coloured Vinegers in earthen pans glazed six days, that all the terrestriety and imperfection may sink to the bottom. Then filtre them, leaving the grosser part at the bottom as unprofitable, then cover the Vinegers in a glass body, and there will remain at the bottom a most white salt of lead, and sweet as Sugar, which dry well, and dissolve in common water, let the solution stand six days in glazed pans, separate the terrestriety at the bottom, filtre and evaporate as before, and there will remain at the bottom of the glass, a salt as white as snow, and sweet as sugar. Repeat this solution, filtration, and evaporation, thrice. This salt is called *Saccharum Saturni*. Which put into a furnace into a body of glass in Sand, and at a temperate heat for many days, and it will appear calcin'd into a colour much redder than *Cinaber*, and as subtile and impalpable as the finest serced wheaten flour. This is called the true Sulphur of Saturn purified from all terrestriety, foulness, and blackness which *Saturn* had at first in itself. Now, when you would make pasts for Emeralds, Saphyres, Garnats, Topaz, Chrysolite, Sky, or any other colour, take the same materials, colours, and quantities as abovesaid in the former receipts, except, that instead of ordinary Red-lead, you shall take Sulphur *Saturni*, working exactly in every thing as before, and you shall have Jewels of marvelous fairness in all colours, which very far surpass the fore-mentioned made with ordinary Red-lead. For this

true Sulphur *Saturni* outgoeth all others, more than I write thereof, as I have seen and often made it at *Antwerp*. Pasts made with this Sulphur, have not that unctosity and yellowness, as the other ordinary ones have, which in time shew their foulness, and the moisture and sweatiness which coming from within men much soil them, which happens not to those made with the said Sulphur. Wherefore think not that pains much, which will be well recompensed with the work and effect.

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 CHAP. XCII.

*How to make very hard Past of all colours.*

TAKE of prepared Crystall ten pound, salt of *Polverine* six pound, made as in Chap. 3. well dried and ground on a Porphyrie, mix and serce them well together, Sulphur *Saturni* two pound, mix these three powders in earthen pans glazed and clean, and with a little common water make with them a hard Past, and of the Past little cakes, each weighing three ounces, with a little hole in the midst of them, dry these in the sun, and then calcine them in the highest part of the potters furnace, or in other like fires, then powder and grind these cakes on a porphyrie, and serce them fine, then set them in pots in glass furnaces, to purifie three days, and cast them into water, and return them to the furnace for 15 days to purifie, that all the foulness and blisters may vanish, and the past remain most pure, like natural Jewels. And moreover, this sort of purest glass will be tinged into all colours you desire. For example into an Emerald with Brass thrice calcin'd, as is done in ordinary glass, into a Sea-green, with Brass calcined to redness, made as in Chap. 24. and with *Zaffer* into a Topaz, into a Saphyre with *Manganese* and *Zaffer*, into yellow with *Tartar* and *Manganese*, putting them in by parts, and into a Garnat also with *Manganese* and *Zaffer* dividedly put in. And indeed this Past imitates all Jewels and colours, and hath a wonderful shining and lustre, and in hardness too it imitates the jewels, especially the Emerald, which will be made most fair and almost as hard as the true.



## The Sixth Book.

*Wherein is shown the way to make all the Goldsmiths Enamels, to Enamel upon Gold in divers colours, with rules, and the materials which colour, and what fires make those Enamels, with exact diligence and clearest demonstration possible.*

*ENAMELLING on Gold and other metalls is a fair and pleasing thing, and in it's self not only laborious, but necessary, since we see metalls adorned with Enamels of many colours make a fair and noble shew, enticing beyond measure the eyes of the beholders. And because 'tis one of the most principal, and a most necessary part of glass, and it appearing to me to be a thing grateful and pleasing to all, I set my self to describe many ways to make several sorts of Enamels, as a thing not vulgar, and belonging to this Art, and one of it's most noble appurtenances. And that this Work might not be deprived of a matter so pleasant, profitable, and necessary, I have made this sixth Book for the delight and benefit of all.*

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### CHAP. XCIII.

*The Material wherewith all Enamels are made.*

**TAKE** of fine Lead 30 pound, of fine Tin 33 pound, Calcine them together in a Kil, and serce them, Boil this Calx a little in clean water in clean earthen vessels, take it from the fire and decant off the water by inclination, which will carry with it the finer part of the Calx, put fresh water on the remainder, then boil and decant as before; repeat this as long as the water carries off any Calx. Recalcine the gross remaining Calx, and then draw off again the more subtle parts as before. Then evaporate the waters which carried off the finer Calx at a gentle fire, especially at the last, that the Calx may not be wasted, which will remain at the bottome much finer than the Ordinary. Take then of this fine Calx, of Crystal *Fritt* made with *Tarso*, ground and serced fine, of each 50 pound, of white salt of *Tartar* eight ounces, powder, serce, and mix them well: Then put this stuff into a new earthen pot baked, giving it a fire for ten hours, then powder and keep it in a dry covered place. Of this stuff are made all the Enamels of whatsoever colours. This shall be called, The Stuff for Enamels.

*To avoid our Author's Repetitions, observe—*

1. The pots wherein Enamels are made must be glazed with white glass, and bear the fire.
2. Mix and incorporate well the colours and stuff for Enamels.
3. When the Enamel is refined, and the colour good, and well incorporated, take it from the fire with a pair of tonges for the Goldsmith's use.
4. The way to make Enamels is this: Powder,

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grind, and serce well the colours and mix them first well one with another, and then with the stuff for Enamels, then set them in pots in the furnace. When they are all melted and incorporated, cast them into water, and when dry, set them in the furnace again to melt (which they soon do), make a proof, and if the colour be too high, take out some of it and add more of the stuff for Enamels, and if too light, add more of the colour at pleasure to your content, then take it out of the furnace.

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### CHAP. XCIV.

*A Milk-White Enamel.*

**TAKE** of the stuff for Enamels six pound, of *Manganese* prepared 48 grains, cast it thrice into water when refined and melted.

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### CHAP. XCV.

*An Enamel of a Turcois colour.*

**TAKE** of the stuff for Enamels six pound, melt, refine, and cast it into water, set it in the furnace again; when 'tis melted and refined, put in of thrice calcin'd Brass three ounces, *Zaffer* prepared 96 grains, wherewith mix well 48 grains of *Manganese* prepared, mix them well and put them into the stuff at four times, mixing them well every time, let them incorporate, make a proof with your eye that you may know by the eye when the colours are good, as I have always done, because sometimes the powders colour more, and sometimes less. Thus I did at *Pisa*, and by mine eye, without weights, coloured all sorts of Glass.

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### CHAP. XCVI.

*Another Azure Enamel.*

**TAKE** of the stuff for Enamels four pound, where- with mix of *Zaffer* prepared two ounces, and mix with it at first of thrice calcin'd Brass 48 grains, mix these two powders well with the stuff for Enamels, set them in the furnace, and work according to the rules.

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### CHAP. XCVII.

*A Green Enamel.*

**TAKE** of the stuff for Enamels four pound, put it in the furnace, and in ten or twelve hours 'twill be melted and refined, cast it into water, and put it again into

into the furnace into its own pot, when 'tis refined, give it of Brass thrice calcin'd two ounces, wherewith mix of scales of iron well ground two ounces, put them in at three times, mixing and incorporating them every time, and ever and anon see whether the colour please, when 'tis well take it from the fire.

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CHAP. XCVIII.

*Another Green Enamel.*

TAKE of the stuff for Enamels six pound, wherewith mix well *Ferretto of Spain* well ground three ounces, and mix with it 48 grains of *Croens Martis*, put them into the furnaee, &c. These furnaces are made from about four to six inches for all Enamels.

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CHAP. XCIX.

*Another Green Enamel.*

TAKE of the stuff for Enamels four pound, which in few hours will be refined, then cast it into water, and put it again into the furnace, and let it refine, then add these two powders well mixed at three times, to wit, of Brass thrice calcined two ounces, of *Croens Martis* made with Vineger 48 grains, put them in the furnace, and when they are well incorporated, take them from the fire. This is a fair and good Enamel.

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CHAP. C.

*A Black Enamel.*

TAKE four pound of the stuff for Enamel, of *Zaffer* and *Manganese*, of each two ounces prepared and well mixed, incorporate the stuff and colours, put them in the furnace in a large pot, and when refined, cast them into water, then put them in the furnaee again, and they will soon refine, and make a velvet Black.

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CHAP. CI.

*Another Black Enamel.*

TAKE of the stuff for Enamels six pound, of *Zaffer* prepared, of *Croens Martis* made with Vineger, of *Ferretto of Spain* of each two ounces, grind and mix well together these three powders with the stuff for Enamels, put them into the furnaee, and when refined, cast them into water, put them in the furnace again, and take the Enamel out when 'tis incorporated and the colour pleaseth you. This is a fair Black.

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CHAP. CII.

*Another Black Enamel.*

TAKE of the stuff for Enamels four pound, *Tartar* four ounces, *Manganese* prepared two ounces, grind and mix these two powders well with the stuff for Enamels, set them in the furnace in a large pot,

when melted and refined, cast them into water, and put them into the furnace again, let them refine. This is a most fair velvet Black to Enamel upon metalls ordinarily.

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CHAP. CIII.

*A Red Enamel.*

TO four pound of the stuff for Enamels, add two ounces of *Manganese* prepared, mix them well, and set them in the furnace in a large pot, when 'tis refined and melted, cast them into water, set them again in the furnace, and when refined take them out. This is a fair purplish Enamel.

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CHAP. CIV.

*A Purplish Enamel.*

TAKE of the stuff for Enamels six pound, of *Manganese* prepared three ounces, of Brass thrice calcined six ounces, mix them all well together, set them in a furnace, and let them refine, then cast them into water, and put them into the same pot, let them boil, and when refined take them from the fire. 'Tis a good Enamel.

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CHAP. CV.

*A Yellow Enamel.*

TAKE of the stuff for Enamels 6 pound, of *Tartar* three ounces, of *Manganese* prepared 72 grains, grind and mix well these powders together, and then with the stuff for Enamels, put them into the furnace in a large pot, when refined cast them into water, and set them again in the furnace. This Enamel is of a fair yellow to enamel on Gold, where it shews not well, if you add not Enamels of other colours.

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CHAP. CVI.

*A Sky-coloured Enamel.*

TAKE of the stuff for Enamels 4 pound, Brass calcined to make a Sky-colour, as in Chap. 21. of Sea-green made as in Chap. 23. of each two ounces, of *Zaffer* prepared 48 grains, mix first these powders well together, then with the stuff for Enamels, when they are refined cast them into water, return them into the pot, let them melt and refine. This is a very fair and beautiful Sky-colour.

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CHAP. CVII.

*A Violet-coloured Enamel.*

TAKE six pound of the stuff for Enamels, of *Manganese* prepared three ounces, of thrice calcined Brass 48 grains, mix these two powders well together, then remix them with the stuff for Enamels, put them into the furnace, and cast them into water, put them into the furnace again, and do as before.



### The Seventh Book.

*Wherein is shown the manner how to extract Yellow Lake for Painters from Broom flowers, and all other colours; with another way to extract Red Lake, Green, Azure, Purple, and all colours from all kinds of Herbs and Flowers.—And to make Blew, Ultramarine, and Lake, from Cochneel, Brasill, and Madder for Painters; and also to colour discoloured Turcoises. Another way to make a transparent Red, and a fair Red to Enamel upon Gold and Metals, things neither vulgar nor common.*

IN this Book is shown the way to extract all colours from Flowers and Herbs, for the use of Painters, which may serve also for glass; and Lakes of many colours, and *Ultramarine* from *Lapis Lazuli*, all which things, though in particuler useful for Painters, may notwithstanding, serve to colour glass in the superficies, and also in the fire of the furnaces, such is the *Ultramarine*, and also the way to make a transparent Red in glass, which seems at this day to be wholly lost, as a thing not profitable, and to make a fair Red to enamel upon gold all materials in the Art of glass, and at this day much conceal'd, and known to few, and many other things which I judged meet to be put in this present work, which I believe will be acceptable to curious and ingenious Spirits.

#### CHAP. CVIII.

*A Yellow Lake to Paint, from Broom Flowers.*

MAKE a Lee of Barillia and of Lime, reasonable strong; and in this Lee boil at a gentle fire fresh Broom Flowers, that the Lee may draw to it all the tincture of the Flowers, which you shall know by taking the Flowers out and seeing them white, and the colour well taken out, and the Lee will be yellow like good *Trebian* wine: then take out these Flowers, and put this Lee in earthen dishes (glased) to the fire, that the Lee may boil, and put into it so much *Rochalum*, that with the fire, all the Alum may be dissolved; then make a fire, and empty this Lee into a vessel of clean water, and it will give a yellow colour at the bottom: then let them settle, and decant off all the water, and again put upon them other fresh water, and decant it off; let the tincture first sink to the bottom, and do this so long, till you have taken out all the salts of the Lee and Alum from the tincture; observing, that by how much the more you wash this tincture from the salt of the Lee and Alum, by so much more will the tincture of the colour be fairer, and more beautiful, washing it always with water to carry away the salt of the Lee and Alum, and at each time before you decant the water, let the Yellow tincture settle to the bottom. Repeat this process, until

you perceive the water run out sweet and without saltiness as 'twas first put in, and then at the bottom will remain a beautiful and fair Lake; which spread, when wet, upon pieces of white cloath, and dry it upon new baked Bricks in the shade, and you shall have a beautiful Lake of a Yellow colour for Painters, and also for glass.

#### CHAP. CIX.

*To extract Lake from wilde Poppies, Flower-deluces, Red Roses, Red Violets, and from all sorts of Green Herbs.*

GET what quantity of the leaves of Flowers, of what colour soever they be, let every colour be by itself, fair Green Herbs by themselves: proceed with them as in Chap. 108. and you shall have a Lake and true tincture and colour from every Flower and Herb, which will be a fair and beautiful thing for Painters, and without doubt worthy to be much esteemed.

#### CHAP. CX.

*To extract a Lake, and colour to Paint, from Orange Flowers, Red Poppies, Flower-deluces, ordinary Violets, Carnation and Red Roses, Borage and Cabbage Flowers, Gilli-Flowers, from all Flowers whatsoever, and Green from Mallows, Pimpernels, and all other Herbs.*

TAKE of whatsoever Herb, or Flower, of whatsoever colour you will, which, being bruised green upon a leaf of white Paper, tinges it with it's colour, these are good, but the Herbs and Flowers which do not so, are not good; then put into a glass body ordinary *Aqua Vitæ*, the head must be as large as possible, and in the top thereof put the leaves of whatsoever Flower or Herbs from which you would draw a tincture, then lute the joynts of the head, and thereto fit a receiver, then give a temperate heat, that the thinner parts of the *Aqua Vitæ*, ascending to the head, and falling upon the leaves and Flowers, may suck out the tincture, and distill thence into the Receiver coloured Red,

Red, and full of the tincture of the Flowers, making all the subtile part of the *Aqua Vitæ* to ascend so long as it comes coloured, and then distill this *Aqua Vitæ* coloured in a glass vessel, which will come over white, and may serve at other times, and the tincture will remain at the bottom, which must not be dried too much, but moderately: and thus you shall have the tincture or Lake from all Flowers and Herbs, singular for Painters.

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CHAP. CXI.

*A Blew to make.*

TAKE Quick-silver two parts, flour of Brimstone three parts, *sal Armoniack* eight parts, grind them all upon a Porphyry, and with the Quick-silver, put them in a glass with a long neck luted at the bottom in sand, make a gentle fire till the moisture rise, then stop the mouth of the glass, and increase and continue the fire, as in sublimation, till the end, and you shall have a Blew most fair and excellent.

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CHAP. CXII.

*How to colour natural Tureoises discoloured.*

PUT *Tureoises* discoloured, and become white, into a glass, pour upon them oil of sweet Almonds, keep this glass upon temperate ashes, and warm, and in two days at most the stones will have acquired a most beautiful colour.

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CHAP. CXIII.

*A Mixture to make Sphears.*

TAKE of Tin well purified and purged three pound, Copper well purified one pound, melt these two metals, first the Brass, then the Tin, and when they are well melted, east upon them six ounces of *Tartar* of red wine onely burnt, and one ounce and a half of Salt-peter, then a quarter of an ounce of Alun, and two ounces of Arsnick, let them evaporate, then east it into the form of a sphear, and you shall have a good material, the which you shall cause to be burnished and polished, which will shew well, and this is the mixture called steel to make sphears.

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CHAP. CXIV.

*The manner how to colour within Balls of Glass, or other Vessels of White Glass, with all sorts of colours, which will imitate natural stones.*

TAKE a Ball, or other sort of Glass that is white and fair, and Isinglass which must be infused two days in common water, then put this infusion into a white pan with fair water, and boil it till all be well tempered, observing, that the Isinglass will be very tender with much water, then take it from the fire, and

when it is warm, put it into a Ball of Glass, and turn the glass round, that the Isinglass may fasten and wet every where the Glass within; this being done, let the moisture drain and run out, then have in order these colours powdered, to wit, Red-lead; and easting it into the glass it will make the said colour stiek, (which will run in waves), east it into many places through a tube, then throw in blew smalts, making it stiek in waves within the Ball. Then do the same with Verdigrease, then with Orpiment, next with Lake, all well ground, always easting the colours in many places in waves, which by means of the Isinglass which hath moistned the glass within, those powders will every where stiek to the glass; and so shall you do with all colours. Then take Gesso well powdered, and put enough thereof into the Ball, and suddainly turn it about, that it may stiek every where to the glass within. Do this work nimbly, whilst the moisture of the Isinglass lasteth, that the powder may stiek well, then empty by the hole of the glass the Gesso which is within the Ball, which shall then appear of divers colours with a most fair appearance like the natural Toies of hard stones, and at last these colours (when the Isinglass is well dried,) stiek, so that afterwards they will not fall off, and alwayes their colour is most fair without. Fit to these Balls a foot of wood, or of other stuff painted, and they are held for beauty before Cabinets, and for Merchants counting-houses very fair,

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CHAP. CXV.

*Ultra-marine.*

TAKE fragments of *Lapis Lazuli*, found plentiful at Venice at a low price, let these fragments be well coloured with a fair Skie-colour, lay aside those that are not coloured, ealcine them well in a Chrysil, and so heated, east them into cold water, repeat this twice, then grind them upon a Porphyrie to an impalpable powder, as fine as wheaten flour sifted.

Take then three ounces of the Rosin of the Pine, Blaek Pitch, Mastiek, new Wax, Turpentine, of each three ounces, Linseed Oyl, Frankineense, of each an ounce, dissolve them in a new earthen Pipkin at a gentle heat, stir and incorporate them with a Spatula, then east them into cold water, that they may cleave in a lump for your need.

Take, for every pound of *Lapis Lazuli* ground as before, ten ounces of the aforesaid past of gums, which dissolve in a Pipkin at a gentle fire, and when it is well dissolved, east in by little and little the said powder of *Lapis Lazuli*, and incorporate it with the gum with a Spatula; I east all the materials thus hot, being incorporated, suddenly into cold water, and bathing my hands with Linseed Oyl, made a round pastill hereof long and proportionally thick. Of these pastills you may make one, or more, according to the quantities of the materials, keep these pastills fifteen days in a great vessel full of cold water, changing the



water every two days, then shall you boil in a kettle common clean water, the pastils in clean and well glazed earthen pans, and cast upon them warm water, and so serve them till the water is cold, the said water being emptied out, cast upon them new warm water, and when it is cold empty it out, putting in again warm water, and when it is cold, empty it out, putting in again warm water, repeat this so many times till the pastils be dissolved by the warmth of the water, then put in new warm water, and you shall see the water will be coloured of a Sky colour, decant the water into a pan well glazed and cleansed. This casting on of warm water upon the pastils must be repeated till it be no more coloured, but observe that the water be not over hot, but luke warm onely, for too much heat makes the *ultramarine* grow black. All these coloured waters strained into pans, have in them the unctuousity of the gums, therefore they must be left to settle 24 hours, that all the colour may sink to the bottom, then the water with its unctuousity must be leasurably decanted off, put upon the pastils clear water, and then strain the cold water through a fine strainer, stirring the colour that it also may pass the strainer, and by this means a great part of the foulness and unctuousity will remain in the strainer, wash the strainer always with fair water. And with new water pass the *ultramarine* thrice through the scree, washed every time, and then usually all its filthiness will remain in the strainer. Put the *ultramarine* into clean pans, decant the water softly off, which dry of itself, and you shall have a most beautiful *ultramarine*, as I have often made it at *Antwerp*. The quantity from a pound of *Lapis Lazuli* shall be more or less, according as the stone is of a fuller and fairer colour. Then grind it to an impalpable powder on a *Porphyrie* (as is above said), and 'twill arise most beautiful. If you take common blue smalts, ground on a *Porphyrie* to an impalpable powder, and incorporate it with the gum pastils with the foresaid quantities, keeping them in digestion in cold water 15 days with *Lapis Lazuli*, and work throughout as in *Lapis Lazuli*, you shall have a very fair and sightly Blue Bice, which will seem to be an *Ultramarine*. These blues not only serve for Painters, but to colour glass excellently.

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 CHAP. CXVI.

*A Lake from Cochineel for Painters.*

**INFUSE** one pound of the shearings of the finest Woollen Cloath in cold water a day, then press them well to take away the unctuousity the Wool hath from the skin, then alum these shearings after this manner:—

Take four ounces of roch-alum, two ounces of crude tartar powdered, put them into a small pipkin with about three flagons of water, when it begins to boil put in the flox, and let them boil half an hour at a gentle fire, then take them off to cool for six hours,

after take out the flox and wash them with fair water, let them stand two hours, then press the water well from them, and let them dry.

---

 CHAP. CXVII.

*A Magistry to extract the Colour from Cochineel.*

**COLD** water four gallons, wheaten bran four pounds, saline of the *Levant*, fenugreek, of each a quarter of an ounce, put them into a pipkin over the fire, till the water become so hot one may not hold his hand it; take them from the fire, cover the pipkin with a cloth for twenty-four hours, to preserve well the colour, then decant the Magistry for use.

Put into a clean pipkin three gallons of cold water, and one of the said Magistry, when it boils, of Cochineel powdered, after this manner, in a brass mortar, and serce one ounce of Cochineel, so many times, till all pass the serce, at last take a little crude tartar, pound it in the mortar, and 'twill take up all the tincture sticking to the bottom of the mortar, and to the pestle; mix this tartar with the Cochineel serced, and as soon as the water in the pipkin boils put in the Cochineel, and let it colour the water whilst you can say a *Miserere*.

Then take the flox alumed as before, which must first stand in a pan of cold water for half an hour, and when the water is well coloured, press well the water from the flox, put it into a pipkin, and stir it about very often, with a little stick, that the flox may be well tinged; let it stand half an hour over the fire that it may boil gently, then take the pipkin from the fire, and take out the flox, mixing it with a clean stick, put it into pans full of cold water, and in half an hour let all the water drain off, and put more cold water, let that drain, and press it well, and set it to dry in a place where no dust falls; spread it abroad that it may not become musty and heat again. Take heed that the fire be always very gentle, for with too strong a fire the colour becomes black. Then shall you make a Lee in this manner, to wit,

Take ashes of vine branches or of willows, or of other soft wood, put them upon double canvas, and pour gently on them cold water, let the water run into a pan, pour twice this strained liquor upon the ashes, and let the lee settle 24 hours, that the ashes may sink to the bottom, and when 'tis pure and clear, decant it off into other pans, putting by the terrestriety which is not good.

Put the said coloured flox into a clean and cold pipkin, with the Lee; boil them at a most gentle fire, for so the lee will be tinged with a red colour, and will draw the tincture from the flox; and at first take a little flox and press it well, and if the colour be discharged, take the pipkin from the fire, and this is a sign that the lee hath drawn the tincture of the Cochineel from the flox.

Hang an *Hypocras* bag of linen over a great and capacious pan, strain through this bag all the tincture



from the pipkin, and let the Flox also go into the bag, when the Lee is drayned, press the bag where the Flox are, that you may have all the tincture. Then wash the bag from the hairs of the Flox, turning them inside outwards, that they may come forth pure and clean.

Then take 12 ounces of Roch-alum powdered, put it into a great glass of cold water, let them stand till all the alum is dissolved, then fitly place the said bag, well washed from the hairs of the Flox, betwixt two sticks in the air. The bag must be large at the mouth, and narrow at the bottom, sowed in the manner of a round pyramid, and under the bag set a clean pan, then cast all the Alum water into the pan where the tincture of Cochineel is, and you shall see the alum water suddenly separate the tincture from the Cochineel like as a coagulum doth. Then with a clean dish cast into the bag all the said tincture and Lee, which will run clear out of the bag, but the tincture will stick to the bag. And when all the water is well neer out, if haply any strain through somewhat coloured, pour it again into the bag, and then this second time 'twill leave all the tincture in the bag, and the Lee will then run white, and discharged of tincture. Then take clean sticks, and therewith mix the tincture which sticks on the bag in gross pieces, and have in readiness new baked bricks, whereon spread little pieces of linnen, and on the linnen small pieces of Lake which you shall take out of the bag, let them dry well, spread them not too thick, that they may soon dry, for when the Lake stands long wet, it grows musty, and makes a foul colour. Wherefore you may, when the Brick hath sucked out much moisture, take another new brick, and so you shall soon dry it. when 'tis dry, take it from the linnen, and this is a good Lake for painters, which I have oftentimes made at *Pisa*. Observe, that if the colour be too deep, you must give it more Roch-alum, but if too light, less Roch-alum, for so the colours are made according to your gust and will.

#### CHAP. CXVIII.

##### *Lake of Brasil and Madder very fair.*

IF you would make a lake of these materials each of them by themselves, you shall do in every thing as is beforesaid of Cochineel, colouring the water with one of these materials, but you shall not use so much Alum by an ounce as you did in Cochineel, for Cochineel hath its tincture deeper than Brasil, and Madder have. Wherefore, you shall give them their proportion, which, you shall find by practice. And also to one pound of Flox you shall use more Brasil or Madder, for they have not so great a tincture weight to weight as Cochineel hath. And in this manner you shall have a very fair lake for Painters, and with less charge than that from Cochineel, and that from Madder in particular will arise most fair and very sightly.

#### CHAP. CXIX.

##### *Lake from Cochineel, after another and more easie manner.*

IN this way invented by me at *Pisa*, you meet not with Flox nor Magisterie, nor Lee, nor dying the Wooll, nor so many things as do the former, which indeed is a very laborious way, though most true. But this way is most easie, and worketh the same effect. And 'tis this which followeth.

In a pottle of *Aqua Vitæ* of the first running, put one pound of Roch-Alum, well powdered, when it is all dissolved put in an ounce of Cochineel powdered and sifted in every thing as before, put all this in a glass body with a long neck, and shake it well, and the *Aqua Vitæ* will be wonderfully coloured, let them stand four days, then empty this stuff into a clean earthen glazed pan, then dissolve four ounces of Roch-alum in common water, cast this into the pan of *Aqua Vitæ* coloured with Cochineel, and put this into the *Hypocras* bag, and so proceed throughout as in the 117 chap. This is a most noble Lake from Cochineel, made with small pains, and in much greater quantity. All this was tryed at *Pisa*.

#### CHAP. CXX.

##### *A transparent Red in Glass.*

TAKE *Manganese*, ground to an impalpable powder, mix it with as much more refined salt-peter, set it in an earthen pan to reverberate and calcine 24 hours, then take and wash it with common warm water from it's saltness, the salt being separated, dry it, and it will be of a red colour, hereto add its weight of *sal Ammoniack*, and grind them together on a *Porphyrie*, wet them with distilled vinegar, let them dry, then put them in a retort which hath a large body, and a long neck, give them a subliming fire in sand for 12 hours, then break the glass, and take all that is sublimed to the neck, and body of the Retort, and mix it with the bottom and remaining residue, weigh them and add as much *sal Ammoniack* as shall be wanting in this first sublimation, grind them all together on a *Porphyrie*, imbibing them with distilled Vinegar, then sublime them in a retort as before, and this sublimation is to be repeated after the same manner so long till the *Manganese* remain all at the bottom fusible.

This is the medicine that colours Crystal and Past into a red diaphanous colour, and into a rubie colour. There are used of this medicine 20 ounces to one of Chrystal or glass, but more or less may be used thereof according as the colour requires. The *Manganese* must be of the best from *Piemont* to colour glass of a fair and very sightly colour.

#### CHAP. CXXI.

##### *A Red as red as Blood.*

PUT six pound of glass of Lead, common glass ten pound, into a pot glazed with white glass, when



the glass is boiling and refined, give it Copper calcined to redness according to discretion; let them incorporate, mixing well the glass, then give it so much *Tartar* powdered that the glass may become as red as blood, if it be not so much coloured, add Copper calcined to redness, and *Tartar*, till it come to this colour.

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CHAP. CXXII.

*The Colour of a Balass.*

PUT Crystall *Fritt* in a pot into a furnace, cast it thrice into water, then tinge it with *Manganese* prepared into a clean purple, then take *Alumen Catinum* sifted fine; put in thereof so much as will make the glass become purple, and this you shall do eight times, and know that Alum makes the glass grow yellow, and a little reddish, but not blackish, and it always makes the *Manganese* flie away; and the last time that you add *Manganese*, give not the glass more Alum, except the colour be too full, and so you shall have a most fair *Ballas* colour.

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CHAP. CXXIII.

*To extract the Anima Saturni, which serves so many things in Enamels and Glass.*

PUT Litharge, well ground, into an earthen pan, well glazed, pour upon it distilled Vinegar, which must be higher than it four fingers; let them stand till the Vinegar is coloured into a milkie colour, which it will suddenly be; decant off this coloured Vinegar, and put new upon the Litharge; repeat this work till the Vinegar becomes no more coloured. Then let these coloured Vinegars stand in earthen pans glazed, that the milkie substance of the Lead may sink to the bottom, decanting off the clear Vinegar: this milkie material is the *Anima Saturni*, to wit, the most noble part, which serves for Enamells, and glass in many things, and if this white stuff precipitate not well, cast upon it cold water, which is wont to make it fall to the bottom, and when it doth not precipitate, evaporate the Vinegars and Waters, and the more subtile part remains at the bottom, good for many things in this Art.

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CHAP. CXXIV.

*A fair Red to Enamel Gold.*

TAKE Crystall *Fritt* made in this manner, to wit, Salt of *Polverine* ten pound, white *Tarso*, finely ground, eight pounds; make a solid paste with this

stuff and water, and make thereof as it were small and thin wafers. Put these on earthen pans in a little furnace made in the fashion of a calcar, that they may be calcined with a good fire ten hours, and in defect thereof put them in the furnace, near the *Occhio*, for three or four days, till they be well calcined. Take calcined Lead, and Tin prepared as in Chap. 93, *Tartar* of white wine calcined, of each two pounds; mix them well together, and put them into a pot glazed with white glass, let them melt and refine well, then cast them into water: do this twice, then put them in the furnace, and when well refined in the pot, give them of Copper calcined to redness ten ounces. Let the colour purifie well, then give it *Crocus Martis* made with *Aqua-fortis*, putting it in by little and little, as you do with *Manganese*, then let it settle six hours, and see whether the colour be good, if not give it *Crocus* by little and little till you have the desired colour.

---

CHAP. CXXV.

*A fair Red for Gold, after another manner.*

TAKE Crystall *Fritt*, made as in Chap. 124, four pounds, melt it in a clean pot, glazed; cast it, when refined, into water, and refine it again in the furnace, cast into water a second time, and refine it again; then put in, by little and little, of calcined Lead and Tin purified, half an ounce at a time, let the Calces incorporate, and, when the Glass becomes of an ash colour, put in no more Calces, for too much of them makes the colour white and not good. Let the glass refine with the Calces, then put into the glass fine Red Lead two ounces, and when incorporated and refined well, cast them into the water, and set them into the furnace eight hours, then take of the Copper calcined to redness and of white crude *Tartar*, of each half an ounce, put them and mix them well in the pot, then add of *Lapis Hæmatites*, wherewith the Cutlers burnish, and of fixed *Sulphur*, of each one drachm; mix and incorporate these powders, and see if the colour be too deep, give it a little *Manganese*, which makes it lighter, and if it be too light a colour give it fixed *Sulphur* and *Lapis Hæmatites*, and a little of Copper calcined to redness, and a little *Tartar* of white wine with discretion, and do this till it come to the desired colour.

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CHAP. CXXVI.

*To fix Sulphur for the Work abovesaid.*

BOIL Flowers of Brimstone in common oil an hour, take them from the fire, and cast upon them the strongest Vinegar, and the Sulphur will suddainly



sink to the bottom, and the oyl will swim upon the Vinegar, and put new oyl upon the Sulphur; repeat this thrice, and then you shall have a fixed Sulphur, for the work abovesaid.

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CHAP. CXXVII.

*Glass as Red as Blood, which may serve for the abovesaid fair Red.*

MELT in a pot of glass of Lead six pounds, Crystall Fritt, ten pounds, cast them, when refined, into water, put them again into the pot; when they are well refined, give this glass four or six ounces of Copper calcined to redness, let them boil and refine well, then give them red Tartar powdered, which incorporate with the glass, let them refine, and see if the colour please you, and if it be not heightened with the Copper and Tartar, put it again to anneal, till it come to be sufficiently red: this is done to heighten the colour.

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CHAP. CXXIX.

*A Transparent Red.*

CALCINE Gold with Aqua-regis, many times, pouring the water upon it five or six times, then put this powder of Gold in earthen pans to calcine in the furnace till it become a red powder, which will be in many days, then this powder, added in sufficient quantity, and by little and little, to fine Crystall glass which hath been often cast into water, will make the transparent Red of a Rubie as by experience is found.

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CHAP. CXXX.

*The way to fix Sulphur for a Rose Red, to Enamel on Gold.*

MAKE a strong Lee of Lime and Oaken ashes, boil sufficiently Sulphur in this Lee, which takes away a certain unctuous and combustibile colour which Sulphur hath in it; by changing the Lee the Sulphur becomes white and incombustibile and fixed, good to make this rose red for the Goldsmiths to enamel upon Gold.

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CHAP. CXXXI.

*Vitriolum Veneris, which was begun at the end of 31 Chap.*

SET Chrysibles luted and covered in an open wind furnace, with burning coals over them; let them

stand two hours, and then at last let the furnace cool of itself, then take out the Chrysibles, and you shall find the Copper calcined to a blackish colour, having an obscure purple, which powder and serce well, then take a round vessel of baked earth, plain at the bottom, which will bear the fire; set these pans in an open wind furnace, on iron bars set across, fill the pans with kindled coals, and put in the aforesaid calcined Brass, wherewith you have first mixed to every pound weight thereof six ounces of common brimstone powdered, and when the fire begins to heat the pans, and the Brimstone to flame and burn, continually stir the Copper with a long iron having a hook at the top, that it may not stick nor cleave to the pans; continue this till all the Sulphur be burnt and smoak no more; then take the pans from the fire thus hot, and all the Copper, with an iron lade or like thing, powder it well in a Brass mortar, and serce it, which will then be a black powder; proceed thrice with the same quantity of Copper and Brimstone in every thing as before. Observe, that at the third calcination you let the pans stand over the fire so long that the Copper acquires a red Lion colour, then take it from the fire and powder it in a Brass mortar, and you shall have the said colour to make the said Vitriol as we are about to say.

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CHAP. CXXXII.

*Vitriolum Veneris without Corrosives, from which is extracted the true and lively Blew, a thing marvellous.*

TO make then the Vitriolum Veneris abovesaid, take one or more very capacious Glass bodies, according to the quantity of the Copper calcined and prepared, to wit, to a pound of Copper take a body which will hold six pints of water; put this common clean water into the body with calcined Copper into a sand furnace, give them a temperate fire for four hours, until of the six pints of water there be evaporated about two, which is seen by the eye; let the furnace cool, and gently decant off the water into earthen pans glazed, and the Copper which remains at the bottom put into pans in a furnace to evaporate all the moisture, and the water which is decanted into the pans will be coloured with a full and wonderous fair blew; let them stand thus in the pans two days to settle, and part of the Copper will sink to the bottome in a red substance, then filtre the said water with usual linguets into glass vessels, and evaporate from the said Copper all the moisture, and with six ounces of Sulphur calcined, powder and serce it to a black powder, as in Chap. 131, and then, as in the beginning of this, pour in water and extract the blew colour. Consider that in this work many pots will be broken, wherefore, as often as the pots are broken or cleft, take a new one, lest they break in the furnace,



and all your labour be lost; when the humidity is evaporated, put the same quantity of Sulphur powdered and serced, and do as before. The reason why the Copper is to be taken out whilst it is hot is, because then it is better separated from the pots, and it is impossible to separate it if you suffer it to be cold, although you break the pots. Repeat this process not onely four, but five or six times in every thing as before; then the Copper will remain as a soft earth, and the better and most noble tincture of it will be in the filtered waters, all which mixed together must be filtered with the usual linqets, and the settlings and dregs may be cast away as unprofitable, then you shall have a most limpid water, and coloured with a most marvellous blew colour.

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CHAP. CXXXIII.

*The way to extract Vitriol from the said coloured Waters.*

SET then a great glass body that will hold three Flasques of liquor in ashes or sand in the furnace, and, with a temperate fire, evaporate the said coloured waters, and neer to the furnace keep other glass bodies full of these coloured waters, that they may be warm, and now and then fill the great body, which is in the sand with glass ladders, do this that the coloured waters may be put in warm, for being put in cold they will make the great glass body break; evaporate the coloured liquor from ten flasques to two and a half or three, then these waters will be deep and full of tincture, which put into earthen glazed pans, in a cold and moist place, for a night, and you shall finde the Vitriol shot into points like Crystals, which will ap-

pear like true Oriental Emeralds; decant off all the water that is in the pans, dry the Vitriol, and let it not stick to them, then evaporate half this water, which will yield you new Vitriol as before. Repeat this till you have gotten all the Vitriol. Put this Vitriol in a retort well luted with a strong lute; see you put no more than one pound of Vitriol in a Retort, which must not be very large, and have a large and capacious receiver; make for four hours together a most temperate fire, for if it be too strong, the moist and windy spirits which first arise from this Vitriol are so powerful, and arise with so great force, that no receiver is able to hold them; let the joynts also be very well luted. At last make a strong fire when the spirits begin to rise in a white form; continue the fire till the receiver begins to wax clear, and to be quite cold, then make no more fire, and in 24 hours let the joynts be unluted, and the liquor which is in the receiver must be kept in glass very well sealed. This is the true lively azure with which marvellous things are done, as you may well perceive by its smell, which is as powerful and sharp as any this day known in nature. Many things might be said which are past over as being not pertinent to the Art of Glass, which happily you may judge upon better occasion; the feces then which remain at the bottom of the Retort will be black, which left some days in the air of themselves, will take a pale blew; powder and mix this with Zaffer, and put it to Crystal metall as before, and with the said quantity will be made a marvellous sea green. Wherefore I have here set down the way to make this powder with much clearness, presupposing that I have not published an ordinary way to make it, but a true treasure of nature, and that to the content of noble and curious spirits.

FINIS.





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