THE

TENTH BOOK

OF

Natural Magick:

Of Distillation.

THE PROEME.

NOw I am come to the Arts, and I shall begin from Distillation, an Invention of later times, a wonderful thing, to be praised beyond the power of man; not that which the vulgar and unskilful men use: for they do but corrupt and destroy what is good: but that which is done by skilful Artists. This admirable Art, teacheth how to make Spirits, and sublime gross Bodies; and how to condense, and make Spirits become gross Bodies: and to draw forth of Plants, Minerals, Stones and Jewels, the Strength of them, that are involved and overwhelmed with great bulk, lying hid, as it were, in their Chests: and to make them more pure, and thin, and more noble, as not being content with their common condition, and to lift them up as high as Heaven. We can by Chymical Instruments, search out the Vertues of Plants, and better then the Ancients could do by tasting them. What therefore could be thought on that is greater? It is Natures part to produce things, and give them faculties; but Art may ennoble them when they are produced, and give them many several qualities. Let one that loves Learning, and to search Natures Secrets, enter upon this: for a dull Fellow will never attain to this Art of Distilling. First, we shall extract Waters and Oyls: then, the Essences, Tinctures, Elixirs, Salts, and such-like: then we shall shew how to resolve mix'd Bodies into the Elements, and make them all more pure, to separate their divers and contrary qualities, and draw them forth, that we may use them as pleasure: and other things, that will never repent us to know and do.

CHAP. I.

What Distillation is, and of how many sorts.

WHether the Art of Distillation were known to the Learned Ancients, or no, I will not undertake to dispute; yet there is another kinde of Art to be read in *Dioscorides*, then what we use. He saith thus: There is an Oyl extracted out of Pitch, by separating the watry part, which swimmeth on the top, like Whey in Milk: and hanging clean flocks of Wool, in the vapor arising from it while the Pitch boyls; and when they are moyst, squeezing them into some Vessel. This must be done as long as it boyleth. *Geber* defineth it thus: Distillation is the Elevation of moist vapors in a proper Vessel: but we will declare the true definition of it elsewhere. He maketh three sorts of it; by Ascent, by Descent, and by Filtration. But I cannot but confess, that Filtration is not properly a species of Distillation. But I say, by Ascent, by Descent, and by Inclination, which is a middle between both, and is very necessary: for when a thing is unwilling to ascend, we teach it by this to rise by degrees, by inclining the Vessel; and raise it by little and little, until it become thinner, and know how to ascend. The Instructions for Distillation shall be these: First, Provide a Glass or Brazen Vessel, with a Belly swelling out like a Cupping-Glass, and sharpened upward like a Top or a Pear: fit it to the under-Vessel like a Cap; so that the neck of that lower Vessel may come into the belly of the upper. A Pipe must run about the Bottom of the Cap, which must send forth a Beak; under which, there must stand another Vessel, called the Receiver, from receiving the distilling water. Stop all the vents close with Straw-mortar, or rags of Linen, that the spirituous Aery matter may not pass out. The fire being put under this Stillatory, the incloſed matter will be dissolved by the heat of the fire into a dewy vapor, and ascendeth to the top; where, meeting with the cold sides of the Head, it sticketh there; being condensed by the cold, swelleth into little bubbles, bedeweth the roof and sides, then gathereth into moyst pearls, runneth down in drops, turneth into water, and by the Pipe and Nose is conveyed into the Receiver. But both the Vessels and the Receiver must be considered, according to the Nature of the things to be distilled. For if they be of a flatulent vaporous Nature, they will require large and low Vessels, and a more capacious Receiver: for when the Heat shall have raised up the flatulent matter, and that finde it self straitned in the narrow cavities, it will seek some other vent, and so tear the Vessels in pieces, (which will flie about with a great bounce and crack, not without endamaging the standers by) and being at liberty, will save it self from further harm. But if the things be hot and thin, you must have Vessels with a long and small neck. Things of a middle temper, require Vessels of a middle size: All which the industrious Artificer may easily learn by the imitation of Nature, who hath given angry and furious Creatures, as the Lion and Bear, thick bodies, but short necks; to shew, that flatulent humours would pass out of Vessels of a larger bulk, and the thicker part settle to the bottom: but then, the Stag, the Estrich, the Camil-Panther, gentle Creatures, and of thin Spirits, have slender bodies and long necks; to shew that thin, subtile Spirits, must be drawn through a much longer and narrower passage, and be elevated higher to purifie them. There is one thing which I must especially inform you of, which is, that there may be a threefold moysture extracted out of Plants: The Nutritive, whereby they live, and all dried Herbs want; it differeth little from Fountain or Ditch-water: The Substantial, whereby the parts are joyned together; and this is of a more solid Nature: And the third is the Radical humor, fat and oyly, wherein the strength and vertue lieth. There is another thing, which I cannot pass over in silence, it being one of the Principles of the Art, which I have observed in divers Experiments; which is, that some mixt bodies do exhale thin and hot vapors first, and afterwards moyst and thick: on the contrary, others exhale earthy and phlegmatick parts first, and then the hot and fiery; which being fixed in the inmost parts, are expelled at last by the force of the fire. But because there can be no constant and certain Rule given for them, some I will mark unto you; others, your own more quick ingenuity must take the pains to observe.

CHAP. II.

Of the Extraction of Waters.

THe Extraction of Waters, because it is common, I will dispatch in a few words. If you would extract sweet Waters out of hot Plants, and such as are earthy, and retain a sweet savour in their very substance; these being cast into a Stillatory, without any Art, and a fire made under them, yield their odors: as you may draw sweet Waters out of

Roses, Orange-flowers, Myrtle and Lavender, and such-like,

either with Cinders, or in Balneo Mariæ; but onely, observe to kindle the fire by degrees, lest they burn. There are also in some Plants, sweet Leaves, as in Myrtle, Lavender, Citron, and such-like; which, if you mix with the Flowers, will no way hinder the savour of them, but add a pleasantness to the Waters: and in places where Flowers cannot be gotten, I have seen very sweet Waters extracted out of the Tendrils of them: especially, when they have been set abroad a sunning in a close Vessel for some dayes before. There is a Water, of no contemptible sent, drawn

drawn out of the Leaves of Basil gentle, (especially, being aromatized with Citron or Cloves) by the heat of a gentle Bath, heightened by degrees, and then exposing it to the Sun for some time. There is an odoriferous Water extracted out of the Flowers of Azadaret, or bastard Sicamore, very thin and full of savor. The way to finde out whether the odor be settled in the substance of a Plant, or else in the superficies or outward parts, is this: Rub the Leaves of Flowers with your fingers; if they retain the same sent, or cast a more fragrant breath, then the odour lieth in the whole substance. But on the contrary, if after your rubbing, they do not onely lose their natural sent, but begin to stink, it sheweth that their odour resideth onely in their superficies, which being mixed with other ill savoured parts, are not onely abated, but become imperceptible. In distilling of these, we must use another Art. As for example,

To extract sweet Water out of Gilliflowers, Musk, Roses, Violets, and Jasmine, and Lillies.

First draw the juice out of some wilde Musk Roses, with a gentle heat in Balneo; then remove them, and add others: for if you let them stand too long, the sent which resideth in the superficies is not onely consumed, but the dull stinking vapour which lieth in the inward parts is drawn forth. In this water, let other Roses be infused for some hours, and then taken out and fresh put in, which the oftner you do, the sweeter it will smell: but stop the Vessel close, lest the thin sent flie out and be dispersed in the Air; and so you will have a most odoriferous Water of Musk-Roses. The same I advise to be done with Jasmine, Gilliflowers, Lillies, and Violets, and Crows-toes, and the like. But if you are not willing to macerate them in their own waters, the same may be done in Rose-water. By this Art, I have made Waters out of Flowers of a most fragrant smell, to the admiration of Artists of no small account. But because it happeneth sometimes by the negligence of the Operator, that it is infected with a stink of burning, I will teach you

How to correct the stink of burning.

Because that part which lieth at the bottom feeleth more heat then the top, whence it cometh to pass, that before the one be warm, the other is burnt, and oftentimes stinketh of the fire, and offendeth the nose; Therefore distil your Waters in Balneo with a gentle fire, that the pure clear Water may ascend, and the dregs settle in the bottom with the Oyl, a great cause of the ill savour.

How to draw a great quantity of Water by Distillation.

Fasten some Plates of Iron or Tin round the top of the Stillatory; set them upright, and let them be of the same height with it, and in the bottom fasten a Spigget. When the Stillatory waxeth hot, and the elevated vapors are gathered into the Cap, if that be hot, they fall down again into the bottom, and are hardly condensed into drops: but if it be cold, it presently turneth them into Water. Therefore pour cold Water between those plates, which by condensing the vapours, may drive down larger currents into the Receiver. When the Cap, and the Water upon it begin to be hot, pull out the Spigget, that the hot Water may run out, and fresh cold Water be put in. Thus the Water being often changed, that it may always be cold, and the warm drawn out by the Spigget, you will much augment the quantity of your Water.

CHAP. III.
Of extracting Aqua Vitæ.

IT is thus done: Take strong rich Wine growing in dry places, as on Viseuvius, commonly called Greek-wine, or the tears or first running of the Grape. Distil this in a Glass-Retort with Cinders, or in Balneo, or else in a long necked Still. Draw out the third part of it, and reserve the rest; for it is turned into a perfect sharp

sharp Vinegar; there remaining onely the carcase of the Wine: for the life and tenuous part is taken out. Then distil the same again, and the third time; alwayes drawing off but a third part. Then prepare a Vessel with a longer and straighter neck, of three cubits, and distil it again in this: at last, put it into the mouth of the Vessel, cover it with Parchment, and set on the Cap of the Stillatory, and kindle the fire: the thin spirits of the Wine, will pass through all, and fall down into the Receiver; and the phlegm, which cannot get passage, will settle to the bottom. The note of perfect depuration from phlegm, will be, if a rag being dipt in it, and set on fire, do burn quite away: or, if some of it, being drope on a plain board, be kindled into flame, doth leave no moysture or mark of it. But all the work dependeth on this, that the mouth of the Vessel be exactly stopped and closed; so that the least Spirit may not finde vent and flie into Air. The fittest thing to stop them with, is an Ox's Bladder, or some other Beasts; for being cut into broad fillets, and while they be wet, rolled and tied about where the mouths of the Vessels meet; it will alone keep in the expiring vapors. You may observe this in the Distillation of it. The Coals being hot, the Vessel boyleth, and a most burning Spirit of the Wine, ascendeth through the neck of the Vessel: it is hot below, and cold on the top, till it getteth up into the Cap, then, encountring with cold, it turneth into water, and runneth down by the nose into the Receiver: and what was a long time ascending, then, in a small interval of time, flows down again to the under-placed Glass. Then, the Cap being cold, sendeth down that quality through the neck into the very belly of the Stillatory, until the Spirit, being separated from the phlegm, worketh the same effect again. I use to suffer the Wine to ascend, so long as the Spirit runneth inviable into the Receiver: for when the phlegm ascendeth, there will appear bubbles in the Cap, and streams, which will run into the water through the nose. Then I take away that dead carcase of the Wine, and pour in fresh VVine, and extract the Spirit out of that the same way.

To do the same a more compendious way.

Those who desire to do this in a shorter time, must make a Brass Vessel, of the bigness of an ordinary Barrel, in the form of a Gourd; but the nose of the Cap must be made of Glass, or Brass of fifteen or twenty foot, winding about with circling Revolutions, or mutual crossings, or as it were with the circling of Snakes, which they must set in wooden Vessels, full of cold water, that passing through, it may be received into the Receiver. For when it hath distilled the third part of the VVine in three hours, they must cast out the residue, and put that which is distilled into the Stillatory again; and the second time distill out a third part: so also the third time in the same day. At length, they put it into a Stillatory with a longer neck, and separate the phlegm from it. Some make the Cap with three or four heads, setting one upon another, all being pervious but the uppermost: and every one having his nose, and his particular Receiver. They fit them to the Vessel with a long neck, set them on, binde them and lute them, that they have no vent: the water which distilleth out of the uppermost head, is cleerest and most perfect: that out of the lowest, more imperfect, and must be reserved asunder; for they will be of different estimation: the highest will be cleere from all phlegm, the lower full of it, the middle in a mean between both.

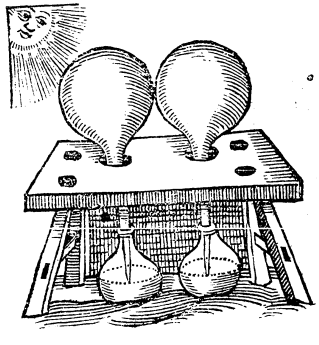
How to make Aqua Vitæ *of new Wine.*

It may be done without the charge of Coals and VVood: for it may worthily be called ἀπὸ σκευῆς ἀκτὸς, neither doth it require the attendance of a learned Artist, but of an ignorant Clown, or a woman: for this Spirit is drawn out meerly by the vehement working of Nature, to free her self without any other help whatever. When the VVine is run out of the press into the Hogshead, and other Vessels, and beginneth to purge, place an earthen neck, or one of wood, being two cubits in length, upon the bung-hole of the Vessel: set the Cap upon the neck, and lute the joynts very close, that there may be no vent: set the Receiver under the nose to take the Water which floweth down. Thus thine exhalations being elevated by the working

Spirits of the Wine, are converted into Water, meerly for the work of Nature, without the help of fire, which therefore hath his particular vertues, which we will paſs over now, and mention them in another place.

CHAP IV.
How to diſtil with the heat of the Sun.

WE may diſtil not onely with fire, but with the Sun and Dung. But the laſt tainteth the diſtilled Waters with a ſcurvy ſent. The Sun extracteth the beſt Water, and very uſeful for many Medicines. The heat of the fire changeth the Nature of things, and cauſeth hot and fiery qualities in them. Wherefore in all Medicines for the eyes, we muſt uſe Waters extracted from the Sun: for others do fret and corrode the eye, theſe are more gentle and ſoft. The Sun extracteth more Water then the fire, becauſe the vapours do preſently condenſe and drop down; which they do not over the fire, becauſe they are driven up with a force, and ſtick to the ſides of the Stillatory, and fall down again into the bottom. There are other advantages which ſhall be explicated in their proper places. Beſides, it is good Husbandry: for the work is done without wood, or coals, or labour. It is but filling the Veſſels with the Ingredients, and ſetting them in the Sun, and all the pains is paſt. Therefore to explain the manner in a few words: Prepare a Form of three foot in height, two in breadth, and of a length proportionable to the number of the Veſſels you intend to ſet to work: if many, make it longer; if a few, let it be ſhorter. Board up that ſide of the Form next the Sun, leſt the heat do warm the Receivers, and make the Water aſcend again. In the middle of the upper plank of the Form, make ſeveral holes for the necks of the Glaſſes to paſs down through. When the Sun hath paſſed Gemini, (for this muſt be performed in the heat of Summer only) ſet your form abroad in the Sun. Gather your Herbs before Sun-riſe, pick them and cleanſe them from duſt and durt of mens feet, from the urine and ordure of Worms and other Creatures, and ſuch kind of filth and pollutions. Then, leſt they ſhould foul and ſoil the Water, ſhake them, and wipe them with clothes; and laſtly, waſh your hands, and then, them, and dry them in the ſhade: when they are dried, put them into the Glaſſes, take ſome wire-Cittern ſtrings, and winde them into round clues; ſo that being let go, they may untwine themſelves again: put one of theſe, into the mouth of each Glaſs, to hinder the Herbs from falling out, when the Glaſſes are turned downwards. Then thurſt the necks through the holes of the Form into the Receivers, which are placed underneath, and admit them into their bellies: faſten them together with linen bands, that there may be no vent: and



place the Receivers in diſhes of water, that the vapor may the ſooner be condenſed. All things being thus provided, expoſe them to moſt violent heat of Sun-beams; they will preſently diſſolve them into vapors, and ſlide down into the Receivers. In the evening, after Sun-ſet, remove them, and fill them with freſh Herbs. The Herb Polygonum, or Sparrows-tongue, bruiſed, and thus diſtilled, is excellent for the inflammation of the eyes, and other diſeaſes. Out of S. *Johns*-wort, is drawn a water good againſt cramps, if you waſh the part affected with it: and others alſo there are, too long to rehearſe. The manner of Diſtilling, this Figure expreſſeth.

CHAP.

CHAP. V.
How to draw Oyl by Expreſſion.

WE have treated of Waters, now we will ſpeak of Oyls, and next of Eſſences. Theſe require the induſtry of a moſt ingenious Artificer: for many the moſt excellent Eſſences of things, do remain in the Oyl, as in the radical moyſture, ſo cloſe, that without the greateſt Art, wit, cunning, and pains, they cannot be brought to light: ſo that the whole Art of Diſtillation dependeth on this. The cheifeſt means is by Expreſſion; which, though it be different from the Art of Diſtillation, yet becauſe it is very neceſſary to it, it will not be unneceſſary to mention here. The general way of it, is this: Take the Seeds out of which you would draw Oyl, blanch them, and ſtrip them of their upper Coats, either by rubbing them with your hands, or picking them off with your nails. When they are cleanſed, caſt them into a Marble-Morter, and beat them with a wooden Peſtle: then ſprinkle them with Wine, and change them into a Leaden-Morter: ſet them on the fire, and ſtir them with a wooden-Spoon. When they begin to yield forth a little Oylineſs, take them from the fire, and prepare in readineſs two plates of Iron of a fingers thickneſs, and a foot-ſquare: let them be ſmooth and plain on one ſide, and heated ſo, that you can ſcarce lay your finger on them; or, if you had rather, that they may hiſs a little when water is caſt upon them, wrap the Almonds in a linen-cloth being wetted, ſqueeze them between theſe plates in a preſs: ſave the Expreſſion, and then ſprinkle more Wine on the preſſed Almonds or Seeds: allow them ſome time to inbibe it: then ſet them on the fire, ſtir them, and ſqueeze them again, as before, until all their Oyl be drawn out. Others put the Seeds when they are bruiſed and warmed, into a bag that will not let the Oyl ſtrain thorow; and by twining two ſticks about, preſs them very hard and cloſe: then they draw the Oyl out of them, when they are a little ſettled.

To draw Oyl out of Nutmegs.

Beat the Nutmegs very carefully in a Morter, put them into a Skillet, and warm them, and then preſs out the Oyl which will preſently congeal. Wherefore, to make it fluide and apter to penetrate, diſtil it five or ſix times in a Retort, and it will be as you deſire: or elſe, caſt ſome burning Sand into it, and mix it, and make it into Rolls; which, being put into the neck of a Retort, and a fire kindled, will the firſt time remain liquid.

To extract Oyl out of Citron-ſeed

we muſt uſe the ſame means. Blanch and cleanſe them: an Oyl of a Gold-colour will flow out: they yield a fourth part; and it is powerful Antidote againſt Poyſon and Witchcraft; and it is the beſt Menſtruum to extract the ſent out of Muſk, Civet and Amber, and to make ſweet Oyntments of, becauſe it not quickly grow rank.

Oyl of Poppy-Seed

is extracted the ſame way, and yields a third part of a Golden-colour, and uſeful in dormitive Medicines. Alſo, thus is made

Oyl of Coloquintida-Seeds.

The faireſt yield a ſixth part of a Golden-colour: it killeth Worms, and expelleth them from Children, being rubbed on the mouth of their Stomach. Alſo,

Oyl of Nettle-Seed.

An ounce and a half may be extracted out of a pound and a half of Seeds, being picked and blanched: it is very good to dye womens Hair of a Gold-colour.

Oyl of Eggs

is made by another Art. Take fifty or ſixty Eggs; boyl them till they be hard: then peal them, and take out the yelk, and ſet them over warm Coals in a tinned Poſnet, till all their moyſture be conſumed; ſtill ſtirring them with a wooden ſpattle: then encreaſe the fire, but ſtir them unceſſantly leſt they burn. You will ſee the Oyl ſwet out, when it is all come forth, take away the fire, and skim off the Oyl. Or, when the Oyl beginneth to ſwet out, as I ſaid, put the Eggs into a preſs, and ſqueeze them very hard: they will yield more Oyl, but not ſo good.

CHAP. VI.

How to extract Oyl with Water.

NOw I will declare how to extract Oyl without Expreſſion: and firſt, out of Spices, Seeds, Leaves, Sticks, or any thing elſe. Oyl being to be drawn out onely by the violence of fire, and very unapt to aſcend, becauſe it is denſe: conſidering alſo, That Aromatick Seeds are very ſubtile and delicate: ſo that if they be uſed too roughly in the fire, they will ſtink of ſmoak, and burning: therefore, that they may endure a ſtronger fire, and be ſecure from burning, we muſt take the aſſiſtance of water. Thoſe kinde of Seeds, as I ſaid, are endued with an Airy, thin, volatile Eſſence; and by the propriety of their Nature, elevated on high; ſo, that in Diſtillation, they are eaſily carried upward, accompanied with water; and being condenſed in the Cap of the Stillatory, the oyly and the wateriſh vapours, run down together into the Receiver. Chuſe your Seeds of a full ripeneſs: neither too new, nor too old; but of a mature age: beat them and macerate them in four times their weight of water; or ſo, that the water may ariſe the breadth of four fingers above them: then put them into a Braſs-pot, that they may endure the greater fire; and kindle your Coals unto a vehement heat, that the Water and Oyl may promiſcuouſly aſcend and flow down: ſeparate the Oyl from the Water, as you may eaſily do. As for example,

How to draw Oyl out of Cinnamon.

If you firſt diſtil Fountain-water twice or thrice, you may extract a greater quantity of Oyl with it: for being made more ſubtile, and apt to penetrate, it pierceth the Cinnamon, and draweth the Oyl more forcibly out of its Retirements. Therefore take CXXXV pound of Fountain-water, diſtil it in a Glaſs-Alembick: when forty pound is drawn, diſtil that until fifteen flow out: then caſt away the reſt, and draw five out of thoſe fifteen. This being done, macerate one pound of Cinnamon in five of Water, and diſtil them in a Retort or Alembick. Firſt, a Milky water will flow out with Oyl, next cleer Water: caſt the Water in over the Oyl, and ſeparate them as we ſhall teach you. Of a pound of Cinnamon, you will ſcarce receive a drachm of Oyl.

How to draw a greater quantity of Oyl out of Cinnamon.

I do uſe to do it in this manner, to the wonder of the beſt and ſubtilleſt Artiſts: Provide a Deſcendatory out of the Bath, (the making of which, I will ſhew hereafter) and put your Cinnamon, being groſsly beaten into a Glaſs-Retort: ſet it in its proper place, and put water into the Bath; the heat of the fire by degrees, will draw a little water in many days: receive it careful, and pour it again into the Cinnamon that it may re-imbibe its own water; ſo let it remain a while: afterwards, kindle the fire, and you ſhall receive a little Water and Oyl. Do this third and fourth time, and you will gain an incredible quanity. You may try the ſame in other things.

Oyl of Cloves

may be extracted in the ſame manner: To every pound of Cloves, you muſt add ten of Water; diſtil them as before: ſo ſhall you have both Water and Oyl. It will yield a twelfth part. The Oyl is good for Medicines, and the VVater for Sawces. So alſo is made

Li-

Liquid Oyl of Nutmegs.

If you bruiſe them, and put them with the VVater into a Veſſel, and diſtil them as before, they will yield a ſixth part.

Oyl of Mace and Pepper

is drawn in the ſame manner, much ſtronger, but in leſs quantity.

Oyl of Aniſeed

may be thus extracted; an ounce out of a pound. It congealeth in VVinter like Camphire or Snow: in the Summer it diſſolveth. Let the Seeds be macerated in the VVater for ten days at leaſt: for the longer they lie there, the more Oyl they will yield.

Oyl of Fennel

is extracted in the ſame quantity: when the Seeds are ripe and freſh, they have moſt Oyl; for they yield as much more.

Oyl of Coriander

yieldeth but a ſmall quantity, and is of very hard extraction: there is ſcarce one drachm drawn out of a pound: new Seeds yield moſt. And to be ſhort; in the ſame manner are extracted the Oyls out of the Seeds of Carrot, Angelica, Marjoram, Rue, Roſemary, Parſely, Smallage and Dill, and ſuch-like.

Oyl of Roſemary and Lavender-flowers, and

ſuch-others, which being dried, afford no Oyl, may be thus extracted: Put the Flowers into a Receiver, and ſet it cloſe ſtopt in the hot Sun for a month: there will they diſſolve into Liquor, and flie up to the ſides of the Glaſs: then being condenſed again, fall down and macerate in themſelves: at a fit time, add VVater to them and diſtil them, as the former: ſo ſhall you draw forth with the VVater a moſt excellent ſweet Oyl.

Oyl of Juniper and Cypreſs-Wood

may de drawn out by the ſame Art, if you macerate the duſt of them in their own or in Fountain-water for a month, and diſtil them in the ſame manner: the Oyl will come out by drops with the water, of a ſtrong ſent, and excellent vertue. Theſe I have tried, the reſt I leave to thee.

CHAP. VII.

How to ſeparate Oyl from Water.

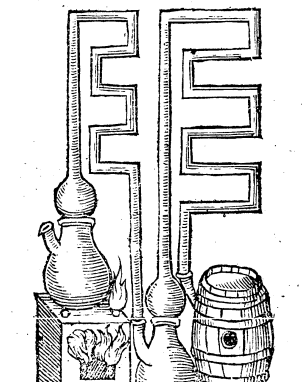
VVHen we extract Oyls, they run down into the Receiver together with the VVater: wherefore they muſt be ſeparated, leſt the flegm, being mixed with the Oyl do weaken the vertue of it: that it may obtain its full vigour, it muſt be purified by Diſtillation and Separation: for being put into a Retort or broad Still, over a gentle fire, the VVater will run out, & the remaining Liquor will be clear Oyl. This work of Separation is very laborious: yet there are very artificial Veſſels invented, by the help of which, all the VVater may be drawn off, and the flegm; onely pure Oyl will remain. Prepare a Glaſs-Veſſel: let it be broad and grow narrower by degrees downwards, until it come to a point, like unto a Tunnel. Put the diſtilled VVater, which conſiſteth of the flegmatick VVater and Oyl into this Veſſel; let it ſtand a while: the Oyl will ſwim on the top, and the VVater will ſink down to the bottom. But ſtop the mouth of it with your finger; ſo that removing it away, the VVater may firſt run out, and the Oyl ſink down by degrees. VVhen it is deſcended into the narrow part, ſo that the Oyl becometh next to your finger; ſtop the hole, and let the Orifice be but half open for the VVater to paſs out: when it

it is all run out, empty the Oyl into another ſmall Veſſel. There is another very ingenious Inſtrument found out for to ſeparate Oyl, with a great belly and a narrow neck, which a little noſe in the middle. Pour the Oyl mixed with Water into the Veſſel, the Water will poſſeſs the bottom, the Oyl the neck. Drop Water gently into it, until the Oyl aſcend up unto the noſe: then enclire the Veſſel downward, and the Oyl will run out pure and unmix'd. When you have emptied out ſome, drop in more Water, until the Oyl be raiſed again unto the noſe: then ſtop it down, and pour out the reſt of the Oyl. But if the Oyl ſettle to the bottom, and the Water ſwim on the top, as it often happeneth, filtrate it into a broad diſh, or any other Veſſel with a cotten-cloth: the Water will run out, and the Oyl will remain in the bottom very pure.

CHAP. VIII.

How to make an Inſtrument to extract Oyl in a greater quantity and without danger of burning.

WE may with ſeveral ſorts of Inſtruments, uſe ſeveral kindes of Extractions: among the reſt, I found out one, whereby you may draw Oyl with any the moſt vehement fire, without any danger of burning; and a greater quantity, then by any other: and it is fit for many other uſes alſo. Prepare a Veſſel in the form of an Egg, of the capacity of half an ordinary Barrel: let the mouth of it, be of a convenient bigneſs to receive in your arm, when there ſhall occaſion to waſh it, or to fill it with ſeveral ſorts and degrees of things to be diſtilled. Let it be tinned within; then ſet a braſs head upon it of a foot high, with a hole in the bottom fit to receive the neck of the lower Veſſel, and ſtop the mouth of it exactly. Out of the top of the head, there muſt ariſe a pipe of Braſs, fifteen or twenty foot long, bended into ſeveral angles, that it may take up leſs room, and be more convenient to be carried. The other end of this Pipe, muſt be faſtened into the belly of another Veſſel, which muſt be of leſs capacity then the former, but of the ſame figure. Fix a head upon this alſo, with a Pipe of the ſame length, and bended like the former; whoſe lower end ſhall be received into another ſtraight Pipe, which paſſing through the middle of a Barrel, at laſt falls into the Receiver. The manner of uſing it is this: Put your Leaves, Stalks, or Seeds, being beaten ſmall, into the Braſs-pot, and pour as much Fountain-water on as will cover them a handful or five large fingers over; then ſet on the head, and ſtop the joynts very cloſe. Put the other end of the Pipe into the other Pot, and joynt them exactly: then ſet on the other head, and faſten the lower end of its crooked Pipe into that ſtraight one; which paſſing through the Barrel, runneth into the Receiver. If the joynts be anywhere faulty, ſtop them with Flax, and paſte them with Wheat-flour, and the white of an Egg; then rowl them about and tie them cloſe with Fillers, cut out of a Bladder: for when the vapors are forced by the heat of the fire, they are ſo attenuated, that they will break forth through the leaſt rime or chink, in ſpite of all your endeavors. Fill the Barrel with cold water, and when it beginneth to grow hot, draw it out through a Cock at bottom, and ſupply freſh water, that the Pipe may always be kept cool. At length, make the Pot boyl, at firſt with a gentle fire; then encreaſe it by degrees, until the vehemency of the heat, doth make the vapor riſe, as it were ready to break the Pipes, as they run thorow them; ſo they will be elevated thorow the retorted Pipes, and leave the phlegmatick water in the lower Veſſel; till paſſing through the cold Pipe, they be condenſed into Liquor, and all down into the Receiver. If the water do conſume away in the boyling, pour in more being firſt warmed, thorow a little Pipe which the Pot muſt have on one ſide with a Spigget to it, for this purpoſe: but be ſure to ſtop the Spigget in very cloſe, that there may be no vent. Afterwards, ſeparate the Oyl from the Water, ſublime and purifie it in another Veſſel. Of all the Inſtruments that ever I law, not any one extracteth a greater quantity of Oyl, and with leſs labour and induſtry then this. Thus you may without any fear of burning, draw Oyl out of Flowers, Leaves, Spices, Gums, and Wood with the vehementeſt fires; as alſo out of Juniper and Laurel-Berries.

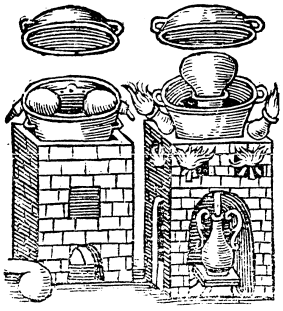


CHAP. IX.

The Deſcription of a Deſcendatory, whereby Oyl is extracted by Deſcent.

I Cannot refrain from diſcovering here an Inſtrument found out by my own private experience, which I hope will be of no ſmall profit to the Ingenious, by which they may draw Oyl out of any the leaſt things without any fear of burning. For there are many tenuous, oyly Flowers, as of Roſemary and Juniper, and other things, as Muſk, Amber, Civet, Gum, and ſuch-like: out of which may be drawn Oyls very ſweet and medicinable: but they are of ſo thin a ſubſtance, that there is a great hazard of burning them, when they are forced by the heat of the fire without which, neither fat things will be elevated, nor Oyl extracted. Therefore to remedy theſe inconveniences, I have invented an Inſtrument, by which Oyl ſhall deſcend without any labour or danger of burning. Let a Veſſel be made of Braſs, in the form of an Egg, two foot high, and of the ſame breadth: let it be divided towards the top, of which the upper part muſt ſerve for a cover, and be ſo fitted to be received into the lower part, that the joynts may cloſely fall in one another, and be exactly ſtopt. In the lower part, towards the middle, about half a foot from the mouth; let there be a Copper-plate fitted, as it were the midriff; ſo that it may eaſily be put and taken out: in which muſt be made three hollow places to receive the bottom of three retorted Veſſels, the reſt of the plate muſt be pervious, that the boyling VVater and hot Spirits may have paſſage to riſe upwards. Out of the ſides of the Veſſel there muſt be three holes, through the which the necks of the Retorts may paſs, being glued and faſtned to their Pipes with Flax, and tied with Fillers of Bladders: ſo that not the leaſt Air, much leſs any VVater may flie out. VVhen you prepare to work, fill the Glaſs-Retorts with the things you intend to diſtil, thruſt the necks thorow the holes outward, and lay their bodies in the prepared hollowneſs of the croſs-plate, ſomewhat elevated. If there remain any void ſpace between the necks, and the ſides of the holes they paſs through, ſtop it with Flax, and tie it about with Fillets of Bladder, and fill the Veſſel with with water, within three fingers up to the croſs-plate. The Veſſel, being covered, and the joynts well ſtopt and glued, and bound about; ſo that the force of the vapours ariſing, may not burſt it open, and ſcald the Faces of the by-ſtanders, kindle the fire by degrees, until it become very vehement: then will the vapors make a great noſe, almoſt ſufficient to terrifie one, and firſt VVater, then VVater and Oyl will diſtil out. I cannot contain my ſelf from relating alſo another Inſtrument invented for the ſame purpoſe. Make an oval Braſs-Veſſel, as I adviſed before, with a hole bored thorow the bottom: to which faſten a pipe that may ariſe up to the mouth of the Veſſel, let the mouth of it be wide, like a trumpet or tunnel; ſo that the long neck of a Gourd-Glaſs may paſs through the Pipe of it, and the wide mouth of the Veſſel under, may by degrees receive the ſwelling parts of the neck. Adapt a cover to this Veſſel that it may be cloſe ſtopt and lured as we ſaid before. You muſt make a Furnace on purpoſe for this uſe: for the fire muſt not be made in the bottom, but about the Veſſel.

The



The uſe is this: Fil the Glaſs with Flowers or other things; put in ſome wire Lute-ſtrings after them, that they may not fall out again when the Glaſs is inverted. Thruſt the neck thorow the Brass-Pipe: ſet the Veſſel on the Furnace, and fill it with Water round about the ariſing Pipe: put on the Cover, and plaiſter it about: ſet the Receiver under the Furnace that it may catch the dropping Water and Oyl: then kindle the fire about the ſides of the Pot, the violence of which, will elevate vapors of burning water; which, beating againſt the concave part of the Cover, will be reverberate upon the bottom of the Gourd-Glaſs, whoſe fervent heat, will turn the Water and Oyl into vapor, and drive it down into the Receiver. I will ſet down ſome examples of thoſe things which I made trial of my ſelf. As,

How to extract Oyl out of Roſemary Flowers.

Fill the Retorts with the Leaves and Flowers of Roſmary, and ſet them in the Braſs-Furnace: the fire being kindled will force out firſt a Water, and afterward a yellow Oyl, of a very ſtrong and fervent odor; a few drops of which, I have made uſe of in great ſicknesſes, and driving away cruel pains. You may extract it eaſier, if you macerate the Flowers or Leaves in their own, or Fountain-water, for a week. In the ſame manner

Oyl of Citron-Pill

is extracted. When Citrons are come to perfect ripeneſs, ſhave off the peal with a groſs Steal-File: put the Filings into a Pot, and ſet them to macerate ten days in dung, being cloſe ſtopt up: then accomodate them to the Furnace, and kindle fire; an Oyl mixt with water diſtils out, of a moſt pleaſant ſent. The ſame may be done with Orange and Lemmon-peal. In places where Flowers and Fruits are not to be had, they cut off the tops of the Branches and Tindrils, and ſlice them into four-inch-pieces, and ſo diſtil them.

Oyl of Roſes, and Citron-Flowers

is drawn after the ſame ſort; a moſt excellent Oyl, and of an admirable ſavour. But becauſe the Oyl is very hardly diſtinguiſhed from the Water, pour the Water into a long Glaſs with a narrow neck, and expoſe it to the Sun being cloſe ſtopt: the Oyl will by little and little, aſcend to the top, which you muſt gather off with a Feather or pour out by inclining the Glaſs.

Sweet Oyl of Benjamin

is to be made, by putting Benjamin into a Glaſs-Retort, and fitting it to the Furnace: then encreaſe the fire without any fear of combuſtion, and you will obtain a fragrant Oyl, to be uſed in precious Oyntments. So Oyl of Storax, Calamite, and Labdanum, and other Gums. So alſo,

Oyl of Muſk, Amber, and Civet

cannot be extracted more comodiouſly by any Inſtrument, Art, or Labour, then by the aforeſaid; for they are of ſo thin a ſubſtance, that they can hardly endure any the leaſt heat, without contracting a ſcurvy baſe ſtink of burning; yet by this Artifice, it may be drawn out very ſafely. I ſee nothing to the contrary, but that we may extract Oyl out of Spices alſo, very ſecurely by the ſame Artifice.

CHAP.

CHAP. X.

How to extract Oyl out of Gums.

THere is a peculiar Extraction of Oyl out of Gums; which, although they require the ſame means almoſt as the former, that is, the mixing them with Waters, and macerating them for many days, then putting them into a Braſs-pot, and by a vehement fire, forcing out the Oyl with the Water; yet doth it come out but in a ſmall quantity of an excellent odor, and free from the ſtink of the fire; as thus they uſually deal with Opoponax, Galbanum, Storax, and others. But they are diſtilled alſo another way, by Aſhes; which doth require the diligent attendance of the Work-man, and a ſingular judgement and provident dexterity in him: for it is rather an ingenious then painful Operation. I will ſet down an example,

How to extract Oyl out of Benjamin.

Macerate the Benjamin in Roſe-water; or omitting that, put it into a Retort: ſet the Retort into a Pot full of Sand; ſo that it may fill up the ſpace between the ſides of the Pot, and bottom of the Retort: put the neck of it into a Receiver with a wide belly: kindle the fire by little and little; and without any haſte or violence of heat, let the Water diſtil: by and by increaſe the fire, that the Oyl may flow out; yet not too intenſely, for fear of burning; but moderately between both: the oyly vapors will ſtraight fill all the Receiver; then will they be condenſed and turn into flakes, like Wool; and ſticking to the ſides and middle of the Glaſs, preſent you with a pleaſant ſpectacle: by and by they are turned into little bubbles, ſo into Oyl, and fall down to the bottom: keep the fire in the ſame temper, until all the Feces are dried; then remove it, for fear of uſtion.

Oyl of Storax

is drawn in the ſame manner; but if the Storax be liquified, it will run with a gentle fire: it is of a ſtrong and quick odor. *Calamites* requires a more lively fire, ſuch as was uſed in Benjamin, and a diligent attendance: for too much fire will cauſe aduſtion in it.

Oyl of Ladanum.

Beat the Ladanum, and macerate it fifteen days in *Aqua Vitæ*, or Greek-Wine; at leaſt ten: for the longer it infuſeth, the ſooner it will run into Oyl: draw it with a gentle fire, it will diſtil out by drops after the Water.

Oyl of Turpentine

is extracted eaſily; for it floweth with a gentle fire: but beware in the operation, that no ſmoak do evaporate out of it; for it preſently will take fire, and with a magnetick vertue attract the flame, and carry it into the Retort, where it will hardly be extinguiſhed again: which will happen in the extraction of

Oyl of Olives, and Linſeed Oyl.

If you diſtil common Oyl, it will hardly run; yet encreaſing the fire, it will come out in ſix hours: you muſt be very careful, that the Aſhes and Pot do not wax too hot: for if the Oyl within take fire, it will break the Veſſels, and flie up, that it can hardly be quenched, and reach the very cieling; ſo that it is beſt to operate upon Oyls in arched Rooms. From hence Artificers of Fire-works, learned to put Oyl in their Compoſitions, becauſe it quickly taketh fire, and is hardly extinguiſhed.

CHAP. XI.
Several Arts how to draw Oyl out of other things.

THe Nature of things being diverſe, do require divers ways of diſtilling Oyl out of them: for ſome being urged by fire, are ſublimed, and will not diſſolve into Liquor; others cannot endure the fire, but are preſently burned. From which variety of tempers, there muſt ariſe alſo a variety in the manner of Extraction. I will ſet down ſome examples of theſe, that ingenious Artiſts may not deſpair to draw Oyls out of any thing whatever.

Oyl out of Honey

is hard enough to be extracted: for it ſwells up with the leaſt heat, and riſeth in bubbles; ſo that it will climbe up thorow the neck of the Retort, though it be never ſo long, into the Head, and fall down into the Receiver before it can be diſſolved into Liquor or Oyl. There are divers remedies found out to help this: Take a Glaſs with a ſhort wide neck, put your Honey into it, and ſtop it in with Flax quite over-laid two fingers thick. This will repreſs the Honey when it ſwelleth and froaths, and make it ſink down again. Clear Water will drop out at firſt: but when it beginneth to be coloured, take away the Receiver, and ſet another in the place; ſo keep the Waters ſeverally. Or put Honey into any Veſſel, ſo that it may fill it up four large fingers above the bottom, and cover it cloſe, as the manner is: then dig a hole in the ground, and ſet the Veſſel in, as far as the Honey ariſeth: then lute it, and plaiſter it about four fingers above the Ground, and drie it well; kindle your Coals round about it; then will the Honey grow hot, and by degrees ſtick to the Pot: but becauſe the heat is above it, it cannot ſwell up, but very eaſily diſtilleth Water and Oyl; firſt, yellow, next reddiſh, until the Honey be turned into a very Coal. There is another way, which may be performed by any Woman: Pour the Honey into a new Pipkin, and cover it; dig a hole, and bury it abroad about a cubit under Ground; there let it putrifie for ten days: then take it up, and there will ſwim on the top of the Honey a Chryſtal Liquor, which you muſt ſtrain out, and ſtop the Pipkin again, and bury it as before. About a week after, view it again, and ſtrain out the over-flowing water; ſo the third and fourth time, until all the Honey be converted into water, which you may ſee by uncovering the Pipkin: diſtil the Water according to Art, and it will yield Water and Oyl eaſily enough.

Oyl of Camphire.

Beat Champhire very ſmall, and put it into common *Aqua Fortis*, made of Salt-Peter, and Coppreſs diſtilled and clarified: ſet the Pot in a Bath or Stove for half a day, and you will ſee a cleer bright Oyl ſwim on the top of the Water: incline the Pot gently, and pour it off, and clarifie it in a Retort; ſo ſhall you have a beautiful, thin and ſweet Oyl.

Oyl of Paper and Rags.

Rowl up your Paper like a Pyramide, as Grocers do, when they lap up any thing to lay by, or ſend abroad: clip the edges even; and taking hold of the top of it with a pair of Pincers; ſet it on fire with a Candle; and while it flameth, hold it downward over a broad diſh half a finger diſtant from the bottom, ſo that the ſmoak may hardly ſtie out: and ſtill as the fire conſumes the Paper, let your hand ſink, that may always keep the ſame diſtance from the Diſh. When it is quite burnt, you will finde a yellow Oyl, ſtinking of burning, upon the bottom of the diſh. Gather it up, and reſerve it: it is excellent to drive away freckles and pimples in womens faces, being applied. Almoſt in the ſame manner

Oyl of Wheat.

Lay your Wheat plain upon a Marble-Morter, being turned with the bottom upwards, and cover it with a plate of Iron, almoſt red hot, and preſs it hard: out of the ſides there will be expreſſed an Oyl of a yellow colour, and ſtinking of burning, which is good for the ſame purpoſes; that which is good to refreſh decayed ſpirits, is prepared another way.

CHAP. XII.
How to extract Oyl by Deſcent.

THe way is common and vulgar to all; for it is done by Uſtulation: but the Oyls are of a moſt offenſive favor, and can be uſed only in outward Medicines; for they are not to be taken inwardly. Prepare a Pipkin made of tough Clay, and able to endure fire, well verniſhed within, that there may be no ſuſpicion of running out: let the bottom be full of holes, ſet upon another earthen Pipkin, whoſe mouth is large enough to receive the bottom of the upper Pipkin; inte them cloſe together. Fill the Pipkin with ſlices of your VVood: cover it, and lute it. Then dig a hole, and ſet the Pipkins into it, and fling in the Earth about it, and tread it down cloſe, and throw Sand over it two inches thick: make a gentle fire juſt over the Pipkin; which you muſt encreaſe by degrees, until the Pipkin have ſtood there a whole day. After this, remove the fire: and when the heat is ſpent, dig up the Pipkins, and you will finde the Oyl ſtrained down into the lower; which you muſt diſtil again in a Retort, to purifie it from filth. To add ſomething to the former invention, I always do thus: I make a Treſſel with Legs of two foot in length. There muſt a hole be bored in the Plank of it, to receive the neck of the Limbeck. Upon the Treſſel faſten an Iron-plate to keep the VVod from burning. Underneath, about the middle of the Feet, faſten a Board, upon which the Receiver may ſtand, and meet with the neck of the inverſed Veſſel; which being filled with the materials to be ſtilled, kindle a fire about it. Therefore if you would extract

Oyl out of Lignum Guaiacum,

fill it with the Duſt of Lignum Guaiacum, and lute it cloſe with Straw-Mortar, twice or thrice double: when it is dried in the Sun, put into the neck, wire Strings, and thruſt it through the hole of the Treſſel into the mouth of the Receiver, and mortar them together. Then kindle the fire on the Plate about the body of the Limbeck, at ſome diſtance at firſt, and by degrees nigher and hotter: but let it not be red hot, until you think it be all burned: then remove the fire, and let it reſt a while, until it be cold, and you ſhall finde in the lower Veſſel a black ſtinking burnt Oyl. In this manner is Oyl drawn out of Juniper, Cypreſs, and Lignum Aloes: but in this laſt, you muſt uſe more Art and diligence, and a gentle fire, becauſe it is mixed in Oyntments.

CHAP. XIII.
Of the Extraction of Eſſences.

VVE have delivered the ſeveral kindes of Extraction of Oyls, now we are come to Quinteſſences, the Extraction of which, we will here declare. The Paracelſians define a Quinteſſence to be the Form, or Spirit, or Vertue, or Life, ſeparated from the groſs and elementary impurities of the Body. I call it the Life, becauſe it cannot be extracted out of the Bones, Fleſh, Marrow, Blood, and other Members: for wanting Life, they want alſo the Quinteſſence. I ſay, ſeparated from elementary impurities, becauſe when the Quinteſſence is extracted, there remaineth only a maſs of Elements void of all power: for the Power, Vertue, and Medicinable qualities, are not the Elements, but in their Eſſences, which yet are Elements, and contain the vertue of the Elements in them, in the higheſt degree: for being ſeparated from the groſneſs of their bodies, they become ſpirituall, and put forth their power more effectually and ſtrongly when they are freed from them

them, then they could while they were clogged with the Elements. They are ſmall in bulk, but great in operation. The ſtrength of Quinteſſences, is not to be judged by the degrees of their qualities, but of their operation: for thoſe which ſooneſt and clearlieſt root out a diſeaſe, are reckoned in the firſt degree. So the eſſence of Juniper, is reckoned the firſt degree of operation, becauſe it cureth the Leproſie by purging the Blood onely. The eſſence of Ambar in the ſecond, becauſe it expelleth poyſon, by purging the Heart, Lungs and Members. Antimony in the third, becauſe (beſide the former vertues) it alſo purgeth the Body. But Gold of it ſelf alone, hath all thoſe vertues, and reneweth the Body. Wherefore the fourth degree and greateſt power, is attributed to it. But how to extract theſe Eſſences is a very difficult work; for they may be either Oyl, or Salt, or Water, or of Extraction: ſome, by Sublimation; others, by Calcination; others, by Vinegar, Wine, Corroſive Waters, and ſuch-like. So that ſeveral kinde of menſtruums are to be provided according to the nature and temper of things. I will ſet down ſome Rules for the chuſing of proper menſtruums. Let the menſtrum be made of thoſe things which are moſt agreeable to the things to be extracted, and as ſimple as may but: for Eſſences ought not to be compounded, mixed, or polluted with any thing; be pure, ſimple and immaculate. But if there be a neceſſity of adding ſome thing let them be ſeparated after extraction. If the Eſſence of any Metal be to be extracted by Corroſives, ſeparate the Salt from the Waters, after the work is done, and uſe thoſe Salts only, which will eaſily be taken out again: Vitriol and Allom are very difficult to be ſeparated, by reaſon of their earthy ſubſtance. Moreover, uſe not a watry menſtruum, for a watry Eſſence; nor an oyly menſtruum, for an oyly Eſſence; becauſe being of like natures, they are not eaſily ſeparated: but watry Menſtruums for oyly Eſſences: and ſo on the contrary. I will ſet before you ſome examples in Herbs, fat of Fleſh, and other things; by which you may learn of your ſelf how to perform it in the reſt. There are an infinite number of Eſſences, and almoſt many ways of Extraction: of them, ſome I ſhall ſhew unto you, whereof the firſt ſhall be

How to extract the Eſſence out of Civet, Muſk, Ambar, and other Spices.

Take Oyl of Ben, or of Almonds, mix Muſk, Ambar, Cinnamon, and Zedoary, well beaten in it: put it in a Glaſs-bottle, and ſet it in the Sun, or in Balneo, ten dayes: then ſtrain from it the Dregs, and the Eſſence will be imbibed into the Oyl; from which you may ſeparate it in this manner: Take *Aqua Vitæ*, and if it be an odoriferous Body, Fountain-water, three or four times diſtilled, mix with the aforeſaid Oyl, and ſtir it about, and ſo let it digeſt for ſix dayes: then diſtil it over Cinders: the hot Water and the Eſſence will aſcend, and the Oyl remain in the bottom without any ſent. Afterwards, diſtil the *Aqua Vitæ*, and the Eſſence in Balneo, until the VVater be evaporated, and the Eſſence ſettle to the bottom in the form of an Oyl. If you will do it with *Aqua Vitæ* alone, ſlice the Roots of Zedoary, beat them and infuſe them in ſo much *Aqua Vitæ* as will cover them three fingers over in a Glaſs Bottle: let them ferment for ten dayes according to Art; then diſtil them over Cinders, or in Sand, until nothing but VVater run out; yet have a care of burning it. Take the diſtilled Liquor, ſet it in Balneo; and with a gentle fire, let the *Aqua Vitæ* evaporate, and the Quinteſſence of Zedoary will ſettle in the bottom, in a liquid form. Next

To extract Eſſence out of Fleſh.

Out of three Capons, I have oftentimes extracted an Eſſence in a ſmall quantity, but of great ſtrength and nutriment, wherewith I have recovered life and ſtrength to ſick perſons, whoſe Stomacks were quite decayed, and they almoſt dead for want of nouriſhment, having not been able to eat any things in three dayes. Take Chickens, or Hens, or Capons; pluck them, and draw their Guts out; beat them very well, and let them boyl a whole day in a Glaſs-Veſſel, cloſe ſtopt, over warm Embers, until the bones, and fleſh, and all the ſubſtance be diſſolved into Liquor: then ſtrain it into another Veſſel, through a Linen-cloth, and fling away the Dregs: for the re-

remaining Bones are ſo bereft of Fleſh, ſent, or any other quality, that a Dog will not ſo much as ſmell to them; which is an aſſured Argument that their goodneſs is boyled out. Pour the ſtrained Liquor into a Glaſs-bottle, and diſſolve it into vapor in a gentle Bath; the Eſſence will remain in the bottom, either hard, or ſoft, like an Oyntment, as you pleaſe, of a moſt admirable vertue, and never ſufficiently to be commended.

To extract Eſſences out of Salts.

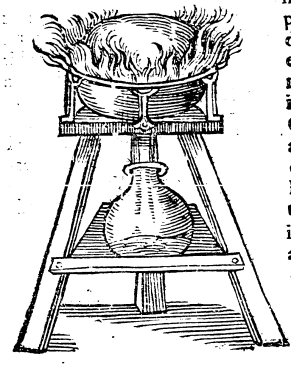
Take Salt and calcine it according to Art: if it be volatile, burn it, and grinde it very ſmall: lay the Powder upon a Marble in a moyſt Cellar, and ſet a Pan under it to receive it as it diſſolveth: let it ferment in that pan for a month; then ſet it in Balneo, and with a gentle fire let it diſtil: caſt away the ſweet Water, that comes from it, and ſet that which remains in the bottom, to ferment another month, then diſtil out the ſweet Water, as before: and do this, while any ſweet VVater will run from it: keep it over the fire until the moyſture be all conſumed; and then what remains ſettled in the bottom, is the Quinteſſence of Salt; which will ſcarcely ariſe to two ounces out of a pound.

To extract Eſſences out of Herbs.

Beat the Herbs, and ſet them to ferment in dung for a month, in a convenient Glaſs-Bottle: then diſtil them in Balneo. Again, ſet them in dung for a week, and diſtil them in Balneo again; and thus macerate them ſo long as they will yield any Liquor: then pour the diſtilled Water upon the Herbs again, and diſtil them in this Circulation for ſix dayes, which will make it of a more lively colour: draw of the VVater by Balneum, and the Eſſence muſt then be expreſſed out in a preſs: ferment it in dung for five days, and it will yield you the ſent, colour and vertues of the Herbs in perfection. A way to extract

The Eſſence of Aqua Vitæ.

It is a thing bragged of by thouſands; but not effected by any. I will not omit the deſcription of it, which I have found out, together with a Friend of mine very knowing in Experiments, by the aſſiſtance of *Lullius*. Provide ſome rich, generous, old VVine, bury it in dung for two months, in large Bottles cloſe ſtopt and luted, that they may not have the leaſt vent. The whole buſineſs dependeth on this: for if this be not carefully look to, you will loſe both your coſt, and your labour: the month being paſt, diſtil it in an ordinary Stillatory, reſerve the Spirits by themſelves. The Dregs and Fæces of the Wine muſt be buried again, and the Spirits be diſtilled out as before, and reſerved by themſelves. Diſtil the Fæces until they ſettle like Honey or Pitch: then pour on the phlegm upon them, waſh them, and lay them to dry: then put them into a Porters, or Glaſs-makers, Furnace, and with a vehement fire burn them into white Aſhes: wet them with a little VVater, and ſet them in the mouth of the Furnace, that they may be converted into Salt. There is no better mark to know the perfection of your work, then by caſting ſome of it on a red hot Plate of Iron: if it melt and evaporate, it is well done; otherwiſe, you muſt rectifie it. Mix the Salt with water, and put it into a Glaſs bottle with a long neck, ſtop it with Cork and Parchment: then ſet on the Head, and kindle the fire; the force of which, will carry it up thorow all the ſtoppage into the Head, and there it ſticks to the ſides like durt; the VVater will remain quiet in the bottom, in which you muſt again mingle the Salt; and ſo by a continual Circulation, draw it out of it ſelf, until it be diveſted of all its Groſneſs, and obtain a more thin and ſubtile Eſſence.



Chap.

CHAP. XIV.

What Magisteries are, and the Extraction of them.

I Said, That Quintessences do participate of the Nature of mixt Bodies; on the contrary, a Magistery taketh the temper of the Elements: so, that it neither extracteth the Spirits nor the Tincture, but a certain mean between both. A Magistery therefore, is what can be extracted out of things without separation of the Elements. Essences do oftentimes keep the colour of the Bodies out of which they are extracted: Tinctures always do it, Magisteries never. The means of extracting Magisteries, is various, according to the diversity of Natures in things. I will set down for an example and pattern

How to extract a Magistery of Gems, Coral and Pearl.

Beat the Gems, and set them in *igne reverberationis*, till they be calcined; mix them with an equal quantity of Salt-Peter, and dissolve them in *Aqua Vitæ*: pour out that which is liquified, and let the remainder of the Powder be calcined better; then lay it in *Aqua Vitæ* again, and do this till it be all dissolved. Set this water in a hot Furnace, until the moysture be all evaporated; and what shall remain in the bottom, is the Magistery of Gems. Pearls must be dissolved in Vinegar; and if possible, in juice of Lemmons. You may augment the strength of the Vinegar by those things, which, as I shewed you in *Aqua Vitæ*, do quicken the Vertue of it, that is, its own Salt, being dissolved and macerated in Balneo, or in Fimo, for a month: then distil the Menstruum, and in the bottom will remain the Magistery of Pearls.

Of Charabes.

I will deliver to you the way that I use; for the Paracelsians do either conceal it, or not know it. Beat your Gum very small, and dissolve it in *Aqua Vitæ*: when it is liquified, pour that out, and put in fresh: let them macerate for a month; and when all is dissolved, mix the waters all together, and let it evaporate over a fire; so in the bottom will remain the Magistery of Charabe. It will take away scars in the Face, and cure the Vertigo.

The Magistery of Guaiacum

is an excellent Remedy against the Pox, and is thus extracted. Take the shavings of Lignum Guaiacum, or the dust of it, which Turners work off: for the File, by continual Frication, heats it, and exhausteth the best Spirits. Lay it in clarified *Aqua Vitæ* a whole day: when the water hath contracted a red colour, which will be when it hath sucked out the oyliness and substance of it, strain it out, and pour in fresh. Then stir it about, until the water become coloured again; strain that out also, and put in as much more, until the water do not alter its colour any more. Then strain it in a press, and distil the juice through Linen-cloth; and then boyl it till the moysture be consumed: the Oyl, or Gum, or Magistery will remain of a bright colour, and most sweet sent, which you would think impossible to reside in such Wood. You may extract the same in a shorter time; but it will not be of the same value: for if you lay the dust of Guaiacum in distilled Fountain-water, boyl it for half a day, strain it, distil it thorow a cloth, and let the moisture evaporate over a fire; the same Gum will settle in the bottom. You must chuse the most Gummy Wood, which being held neer a Candle, will sweat out a kinde of Oyl.

The Magistery of Lignum Aloes.

Take the shavings of the Wood worked off, as the former, with a Turners wheel; lay it in *Aqua Vitæ* till it colour it; then strain it out, and let the moysture evaporate over a fire; and in the bottom of the Glass, you will finde a most odoriferous Oyl, excellent to be used in sweet Oyntments.

The Magistery of Wine, commonly called the Spirit of Wine.

I will first set down the Paracelsian way of extracting it, and afterwards my own; because we cannot use that in our Countries. Pour some strong generous good Wine into a Glass-Bottle: so that it may fill two parts of it; stop the mouth of it very exactly, either with *Hermitis* Sigillum, or a strong Glue, which I shall hereafter describe unto you; and so set it in Fimo three or four months, with an unintermitted fire. In the Winter set it out in the Frost for a month, and let it freeze: the Spirit or Magistery will retire into the Centre, because its fiery Essence maketh it uncapable of congladiation. Break the Vessel, cast away the congealed part, and reserve the liquid; which being circulated in a Pelican for a month, will yield you what you seek for. My way is, to put the aforesaid Wine into a round Glass-Vessel: let it ferment in Fimo, congladiate it, as I shall shew you; and then breaking the Vessel to reserve the unfrozen liquor, in which you will finde a great deal of vertue: but if you desire to have it better, you may perfect it by Circulation.

CHAP. XV.

How to extract Tinctures.

A Tincture is the purest and most active part of a coloured body extracted; the noblest Essence in a Compound. It is extracted out of Gems, Flowers, Roots, Seeds, and such-like. It differeth from a Quintessence in this, that it especially draweth the colour of the Body from whence it is extracted; and requireth Art, and Cunning, and diligent Attendance, more then labour. It is separated by Distillation, clear from any oyliness or matter; free from the commission of other Elements, or any impure substance; it imitateth the clearness and perspicuity of the Air: and in that brightness represents the colour of the Gem or Flower, from whence it was drawn; of so pure a substance, that in many yeers it will not have any dregs in it, but will continue in a perpetual cleerness, subtilty, and strength. After the extraction, the matter remaineth discoloured, and useless for any thing. I will present some examples to you how to extract the Tincture out of Metals and Flowers, *&c.*

How to draw out the Tincture of Gold.

If the Vertues of this never-sufficiently-praised Metal, were known, as well for the health of the Body, as the conveniency of mens living, it would be adored with a greater devotion then it is already. The Apes of wise Nature, cunning Inquirers in Experiments, perceiving a certain Glory and Brightness in Gold, and an attractive or magnetick Vertue, (if I may so say) which at first sight draws every mans eye to look upon its Majesty and Beauty, and tempts our hands to touch and handle it, and even our mindes to desire it, so that even Infants do rejoyce, and laugh at the sight of it, and reach their arms out after it, and catch it, and will by no means part from it; presently conjectured, that there was some extraordinary Vertue in it for the health of man. Astrologers, seeing it contend with the Sun in Beams, Brightness and Glory, and to have a Prærogative of Majesty among Metals, like the Sun among the Stars, do therefore set it down for a Cordial, and a Destroyer of Melancholy, and all the ill Companions of it. Refiners say, That the Elements are so proportionably mixt in the Compositon of it, so pure and compacted, that they account it a most exactly tempered body, and free from corruption: in which there is nothing deficient nor superfluous; so compact and close, that it will not onely endure the fire without consumption, but will become more bright and refined by it. It will also lie under Ground thousands of yeers without contracting any rust: neither will it foul the hands like other Metals, or hath any ill sent or taste in it. Wherefore, say they, being taken into our Bodies, it must needs reduce the Ele-

Elements and humors into a right temper, allay the exceſſive, and ſupply the defective, take away all putrefaction, refreſh the natural heat, purge the blood, and encreaſe it; and not onely cure all ſickneſſes, but make us healthy, long lived, and almoſt immortal. *Rainoldus*, *Raimundus*, and other Phyſitians of the beſt eſteem, do attribute to Gold, a power to corroborate and ſtrengthen the Heart, to dry up ſuperfluities and ill humors, to exhilarate and enliven the Spirits with its Splendor and Beauty, to ſtrengthen them with its Solidity, temper them with its Equality, and preſerve them from all diſeaſes, and expel Excrements by its Weight: by which it confirmeth Youth, reſtoreth Strength, retardeth old Age, corroborateth the principal Parts, openeth the Urinary Veſſels, and all other paſſages, being ſtopt: cureth the Falling-ſickneſs, Madneſs, and Leproſie, (for which cauſe, *Oſiander* the Divine, wore a Chain of Gold about his neck) and alſo Melancholy, and is moſt excellent againſt Poyſon and Infections of the Plague. We will now examine whether the old or new Phyſitians knew the way to prepare it aright, to perform theſe admirable Effects. *Nicander* doth mightily cry up for an Antidote againſt Poyſon, Fountain-water in which Gold hath been quenched; ſuppoſing, that it imparteth ſome of its Vertue to the Water in the extinction. *Dioſcorides*, *Paulus Ægineta*, and *Aëtius*, affirm the ſame. *Avicenna* ſaith, That the filings of it helpeth Melancholy, and is uſed alſo in Medicines for the ſhedding of the Hair, in liquid Medicines, or reduced into very fine Powder; it is uſed in Collyriums, or Medicines for the Eyes, for the pain and trembling of the Heart, and other paſſions of the Minde. *Pliny* uſeth it burnt in an earthen Pipkin, with a treble quantity of Salt; whereby it will communicate its Vertue, but remain entire and untouched it ſelf. He alſo makes a Decoction of it with Honey. *Marſilius Ficinus* ſaith, It is of a ſolid ſubſtance, and therefore muſt be attenuated, that it may penetrate the Body. But he is ignorant of the way of it, onely he adviſeth to give it in Cordial-waters, being beaten out into thin Leaves; for ſo the Water will ſuck out the Vertue of it: or elſe by extinguiſhing it in Wine. There are ſome of *Pliny*'s Scholars, who would have the parts of a Hen laid in melted Gold, until it conſume it ſelf; for the parts of a Hen are Poyſon to Gold. Wherefore *Ficinus* mixeth Leaf-Gold in Capon-broath. Thus far the Grecians, Latines, and Arabians, have diſcourſed concerning the Extraction of the Tincture of Gold; but they have erred far from the Truth: for what a vanity is it to imagine, that quenching it in Water, can extract the Vertue of it? or, that the heat of Man's Body, though it be liquified and be made potable, can draw any thing from it, when the force of the moſt vehement fire is ineffectual, and cannot work upon it? I have made trial of it in a moſt violent fire for the ſpace of three months, and at laſt I found it nothing abated in weight, but much meliorated in colour and goodneſs; ſo that the fire, which conſumeth other things, doth make this more perfect. How then can it be concocted by the heat of Man's Body, which is ſcarce able to concoct Bread? And how can it impart its Vertue by Extinction, when neither *Aqua Vitæ*, nor any ſtrong Waters can alter the colour or taſte of it? I will ſet down what I have ſeen. The later learned Men, and curious Inquirers into Nature, affirm, That the Magiſtery, Secret and Quinteſſence of Gold, conſiſteth in the Tincture: ſo that the Vertue, Power, Life and Efficacy of it, reſideth in the Colour. Wherefore it will be no ſmall Secret to know how to extract the Tincture; no ſmall labor and pains: for thoſe who pretend to ſpeak of it, do it ſo intricately and obſcurely, that they rather ſeem to obſcure it, or not to underſtand it, then to diſcover or teach it. Know therefore, that the Tincture cannot be extracted, but by perfectly diſſolving it in Strong Waters; and that it cannot be diſſolved, as the work requireth, in common *Aqua Fortis*, or Royal Waters; becauſe the corroſive Salts in them, are not perfectly and abſolutely diſſolved into Water. Wherefore you muſt learn by continual ſolution and immiſtion, ſo to diſtil them, that the whole ſubſtance of the Salt may be melted; which muſt be done by reiterating the Operation. I have informed you, what Salts are eaſie to be ſeparated, the which muſt onely be uſed in this Work. After perfect ſolution, caſt in that Menſtruum or Water, which I have often mentioned for the Extraction of Eſſences or Colors. I have with great joy beheld it attract to it ſelf the Golden, Yellow, or

or Red-colour, and a white duſt ſettle down to the bottom. We muſt then ſeparate the Salt from the Menſtruum: diſſolve it, and let the liquor evaporate away, and there will remain true potable Gold, the right Tincture, and that great Arcanum of Philoſophers, diſguiſed with ſo many Riddles; ſo thin, that it will eaſily penetrate the Body, and perform thoſe wonders, which Antiquity could only promiſe.

Tincture of Roſes.

Cut Red-Roſe-Leaves with a pair of Shears into ſmall pieces, lay them in *Aqua Vitæ*; and they will preſently dye it with a ſanguine color. After three hours, change thoſe Leaves, and put in freſh ones, until the water become very much coloured: then ſtrain it out, and let the Liquor evaporate quite away, and in the bottom will remain the Tincture of Roſes. The ſame may be done with Clove-Gilliflowers. We may alſo do it another more perfect way, without *Aqua Vitæ*. Fill a wide-mouthed Glaſs, with Red-Roſe-Leaves: ſet it into a Leaden-Limbeck, and fill it with other Roſes: then ſet on the Head, and kindle the fire; whereupon the vapours will ariſe, and fall into the Glaſs, of a ſanguine-colour. This is a new way of extracting Tinctures, which may be uſed in any coloured Flowers. So the

Tinctures of Marigolds, Violets, Bugloſs, and Succory-Flowers.

If you extract them the former way, the Tincture of Marygolds will be yellow; of Bugloſs, Violets, and Succory-Flowers, Red; becauſe the colours of thoſe Flowers, is but thin and ſuperficiary: ſo that it expireth with a little heat, and is red underneath.

Tincture of Orange-Flowers of an excellent ſent.

Cut the Orange-Flowers into ſmall pieces, macerate them in *Aqua Vitæ*; and when the Water is turned yellow, and Flowers have loſt their ſent, change them, and put in freſh, until the Water become very ſweet, and well-coloured, and ſomewhat thick: then ſtrain it, and let it evaporate: it will leave behinde it a Tincture, enriched with the ſent and vertues of the Flowers.

Tincture of Coral.

Beat the Coral to Powder, and with a vehement fire turn it into Salt; add an equal quantity of Salt-Peter to it: then extract the Salt with *Aqua Vitæ*, and it will bring out with it, the Tincture of a wondertul vertue.

CHAP. XVI.

How to extract Salts.

SAlts do retain the greateſt part of the Vertue of thoſe things, from whence they are extracted; and therefore are uſed to ſeaſon the ſick perſons meat: and otherways, becauſe they have a penetrative quality. It was a great Queſtion among the Ancients, Whether Salts retained the vertue of the things; or, whether they loſt ſome in the fire, and acquired others: but it is now manifeſted by a thouſand Experiments, that the vertues do not onely remain in them, but are made quicker and more efficacious.

Salt of Lemmons.

Diſtill the Lemmons with their Peels and Juice: reſerve the Water, and dry the reſt in the Sun, if the ſeaſon permit it; or in an Oven. Put them in a Pot cloſe luted, and calcine it in *igne reverberationis*. Then diſſolve the Powder in the Water, and boyl them in a perfect Lye: cleanſe it with a Feather, that the Dregs may ſettle to the bottom: purifie it, and let the Liquor evaporate: ſo the Salt will remain in the bottom; which is moſt excellent to break the Stone in the Bladder.

Salt of Pellitory of Spain.

Dry the Roots, and burn it in a close luted pot, for three dayes, until it be reduced into white Ashes: pour on its own Menstruum: distil it, and calcine it again; so the third time: then cleanse it with a Feather, boyl it in an earthen vernished Pipkin, with the white of an Egg to clarifie the Salt: at length, a white grained Salt will appear.

Salt of Cumine.

Put the Roots, Leaves, and Flowers in a close luted Vessel, and dry them, and put them into a Potters Furnace, till they be burned to Ashes. In the mean while, distil the Roots, Leaves and Flowers; or, if you please, make a decoction of them; and of that decoction, a sharp Lye: which, being strained very clean through a Linen-cloth three or four times, must be boyled to a Salt in a Glass-Vessel. If you desire it very fine and white, strow the Salt upon a Marble, and set it in a moist place with a pan underneath to receive it as it dissolveth: cleanse the filth still away; and do this three times, until it become of a Chrystal colour; so reserve. In this manner *Sal Alchali* is made.

Of Saxifrage.

It is made like the former: if you season your meat with it, it protecteth from all danger of poysoned bread or meat; conserveth from the contagion of pestilential and infectious Air. The same may be extracted out of other Alexipharmacal Bodies, which Princes may use at meals, instead of ordinary Salt; for they scarce differ in taste. A Salt may be made of Thapsia, very good to remove the Stone in the Bladder or Kidneys, and to dissolve the Tartar, or viscous Concrescency; to kill the Worms, and purge the Blood; to provoke sweat by being often taken, and is admirable in Venereal Diseases. The Salt of Pimpernel, being taken three days, and the third month, for a mans whole life-time, secureth him from the Dropsie, Pthisick, and Apoplexy. It also preserveth from Infection and pestiferous Air, and helpeth digestion in a weak Stomack. But it is to be observed, That these Salts must not be eaten every day, lest they become too familiar to the Stomack, and be taken for food. There may be a Salt also extracted out of the filings of Lignum Guaiacum, which is excellent in the French Pox, being taken as the former. By these you may learn to make other Salts.

CHAP. XVII.
Of Elixirs.

ELixirs are the Conservators of Bodies in the same condition wherein they finde them: for their Vertue is to preserve from corruption, not by meliorating their state, but by continuing it; and if by accident, they cure any Diseases, it is by reason of their tenuity. They have a double Vertue to preserve from sickness, and continue health, not onely in Men, but to preserve Plants also. They imitate the qualities of Balsam, and resort chiefly to the Heart, Brain, and principal Parts, where the Spirits reside. There are three kinds of Elixirs; of Metals, of Gems, and of Plants; as of Roots, Herbs, Flowers, Seeds, Woods, Gums, and such-like. An Elixir differeth from Essences, Tinctures, and the rest; because it is compounded of many things void of fatness: therefore it cannot be an Oyl, because it wanteth perspicuity and clearness; not an Essence, because it is a Compound; not a Tincture, but a mean between all, and of a consistence most like to Water: whence it had its name *ab eliquesco*, to be dissolved or liquified.

To make Elixir of Pimpernel.

Dig up the Roots in a convenient time, and macerate them in their Water, putting some weight on them to depress them under Water: when the Flowers are blown, gather them, and macerate them in the same manner, in a peculiar Vessel: the same must

must be done with the Seeds: Then put them in an Alimbeck, and draw out the Water and Oyl, until the Fœces remain dry: then separate the Oyl from the Water, and circulate it in a Pelican for two months: then take it out, and reserve it for your use.

An Elixir of many things.

Many Compositions of Elixir, are carried about, which are erroneous and false to my knowledge, and of so hard a work to extract the Oyl and Water, that you will more probably lose your time and cost, then gain any good by them: for they are made for pomp and magnificence, rather then for the benefit of man. Besides, I have found them often fail in the performance of what was promised from them, and cannot be made according to those descriptions: But here I will deliver one to you which will perform far more then is promised. Take the Flowers of Sage, Origanum, Mugwort, Savory, Elder, Sage-Leaves, white Mint, Rosemary, Basil, Marjoram, Penyroyal, Rose-buds, the Roots of Betony, Pellitory, Snake-weed, white Thistle, Aristolochy, Elder, Cretan Ditany, Currants, Pine-Apples, Dates, Citron-Pill, of each an ounce and a half; Ginger, Cloves, Nutmegs, Zedoary, Galangal, white and long Pepper, Juniper-berries, Spikenard, Mace, Cubebs, Parsley-seed, Cardomoms, Cinnamon, Stœchados, Germander, Granes, Rose of Jerusalem, Doronicum, Ammoniac, Opoponax, Spodium, Schœnanthus, Bdellium, Mummy, Sagapenum, Champhire, Mastick, Frankincense, Aloes, Powder of Ebony, Bole-Armenick, Treacle, Musk, Galls, Mithridate, Lignum Aloes and Saffron, of each three drachms; of clarified Sugar, thirteen pounds; of Honey two. I exclude Pearl, Rubies, Jacinths, Saphires, Emeraulds and Leaf-Gold, from the Composition; because, as I have proved before, they have no operation; especially, thus exhibited: and therefore are used in Medicines by none but ignorant Physitians. Reduce all these into Powder, and put them into a Pelican or blinde Alimbeck, with twelve pound of *Aqua Vitæ*, very well clarified, as though the whole work depended on it: let it circulate in Balneo a whole month: take off the yellow Oyl or Quintessence of all, with a Silver-Spoon, and add to it a drachm of Musk and Amber, and set it by for your use in a Glass-bottle close stopt. Distil the remainder, and it will afford a yellow cleer water: but you cannot extract the Oyl without a stink of burning. I have very exactly extracted Oyl of Gums, Roots and Seeds of the forementioned: and mixing them together, have effected strange things with them. Most of their operations are against Poysons, and Pestilential Contagions; especially, those that are apt to seize on the Spirits; for a drop of it, being anoynted on the Lips or Nostrils, reviveth the Soul, and keepeth it in perfect Senses at least six hours.

CHAP. XVIII.
Of a Clyssus, and how it is made.

THat there may nothing be omitted, I will now shew what a Clyssus is, and how it may be made. A Clyssus is the Extraction of the Spirits of every part of a Plant, united in one common entity. There are in a Plant, the Root, Leaf, Flower, Fruit and Seed, and in every one of these parts, there is a peculiar Nature. The Operation is thus: Dig the Roots when they are full of juice, the Leaves when they are fresh and green, the Flowers when they are blown, the Fruit and Seeds in their due time. Extract the Spirits or Essences out of all these by Distillation, Maceration or Calcination, or any other of the former wayes. But when they are all extracted severally, one in the form of Oyl, another of Salt or Liquor; then mix them all together, so that they may be conjoyned and united in one body, which is called a Clyssus. Some mix them in Distillation in Vessels made for the purpose in this manner: They put the Water, Salt and Oyl in three several Curbicles of equal height and bigness; and tying their three necks together, and put them into one common Head, which may be fit to receive them all, close them, lute them, and kindle the fire under. The heat will elevate the thinnest substance in all of them,

which will meet and mix in the Head, and run down by the Noſe, or Spout, into the Receiver: ſo ſet them by for uſe. This Congregation of Eſſences, doth penetrate and ſearch all the remote paſſages of the Body, and is very uſeful in Phyſick.

CHAP. XIX.

How to get Oyl out of Salts.

I Have declared many ways of extracting Oyl, now I will ſhew how to draw it out of Salts, that they may be more penetrative, and work more powerfully, which can be done no other way. They ſeem to have ſome kinde of fat in them, yet will not burn; ſo that it cannot be called a perfect Oyl.

How to extract Oyl of Tartar.

Burn the Tartar, and reduce it into a Salt, as I ſhewed before: then lay it on a Marble in a moyſt place, and in a few days it will turn to Oyl, and run down into a diſh, which you muſt ſet underneath to receive it. Thus you may eaſily make it into Salt: Beat the Tartar into Powder, and mix an equal quantity of Salt-Peter with it: when they are mixt in Iron-Mortar, ſet them in the fire, until they be quite burned: grind the remaining Fœces, and diſſolve them in a Lye, ſtrain it, and let the Lye evaporate away, and the Salt will ſettle to the bottom: then boyl ſome Eggs hard, take out the yelks, and fill up their place with Salt, and in a little time it will diſſolve into Oyl.

Oyl of Sal Sodæ.

Diſſolve the Salt in Water, and ſtrain it through a cloth, then dry it, lay it on a Marble, and ſet it in a moyſt place, and it will run down in an Oyl. So

The famous Oyl of Talk

is extracted onely by the vehement heat of fire: yet I knew not at firſt what it was uſeful for. But I perceive it is much accounted of by women in their Fucus. Beat it into fine Powder in an Iron-Morter, and put it into a very ſtrong thick Pot, faſten the cover on with wire, plaiſter it with Potters Clay, and ſet it in the Sun for three days: then thruſt it into a Potters Furnace where the flames are moſt violent. After three or four days, take it out, break open the Pot; and if you finde it not ſufficiently calcined, make it up, and ſet it in again. When it is burned perfectly white, lay it on a Marble, and place it in a moyſt room, or in a hole dug in the earth: and there let it ſtand for a good while, until it diſſolve into Oyl; then reſerve it in a Glaſs-bottle. So alſo is made

Red Oyl of Sulphur.

Grinde live Sulphur into a ſmall Powder, and mix it with an equal quantity of the former Oyl of Tartar: boyl it three hours in a Glaſs-bottle; and when it is diſſolved, ſtrain it through a Linnen-cloth into another Glaſs, and ſet it over a Gentle fire, till it thicken like clotted blood, and ſo dry. Then powder it, and lay it on a Marble in a moiſt Cellar; there it will diſſolve, and run down into the under-placed diſh. Set this Liquor, being firſt ſtrained thorow a cloth in a Glaſs-bottle over warm Aſhes, until the moyſture be conſumed, and there will remain a red Oyl of Sulphur.

Oyl of Myrrh.

Boyl ſome Eggs hard, cut them in the middle, take out the yelks, and fill their places with Myrrh, powdered and ſeirced: lay them in an earthen Pan upon long croſs-ſticks, that the Eggs may not imbibe the Oyl again, and ſhut them in a moiſt Cellar; ſo the Oyl will drop down into the Pan.

CHAP.

CHAP. XX.

Of Aqua Fortis.

NOw I will recite thoſe Diſtillations, which draw out neither Water nor Oyl, but a middle between both: for the terrene parts are forced up, turned into Water by the vehemency of the fire: from whence they do acquire ſo great a heat, that corrode and burn moſt violently. They are extracted onely in *igne reverberationis*, and with great care and labour.

How to draw Aqua Fortis, *or Oyl, out of Salt.*

It is a piece of Art diſcovered to very few. Take Pit-Salt, put into a Glaſs-Retort, treble luted over, and dried: ſet it in *igne reverberationis*, where the flames do ſtruggle moſt violently: the firſt time you will get but little moyſture. Break the Retort, and remove the Fœces into another, and pour the extracted Water into them, and diſtill them again: the ſecond time thou wilt get more. Do the ſame a third time, and ſo to the tenth, until the Salt be all turned into Liquor, which is a moſt precious Jewel and worth thy labor. Some quench hot Bricks in the liquified Salt, and then diſtil them with a moſt intenſe fire, as in Oyl of Bricks.

A Water for the Separation of Silver.

Take Salt-Peter and Alom in equal quantity, beat them in a Morter, and put them into a Glaſs-Retort luted over three double: when it is well dried, ſet it in the circulating fire, that is, which is reverberated on the top and below too. Stop it cloſe, and ſet a large Receiver under it: for if it be too narrow, the ſtrong Spirits will break out with a great bounce, crack the Veſſel, and fruſtrate your labour. Diſtil it ſix hours: if you calcine the Alome-fire, the VVater will be ſtronger.

A Water for Separation of Gold.

Mix with the equal parts of Salt-Peter and Alom, as much Vitriol, and diſtil it, as before: there will proceed a VVater ſo ſtrong, that it will even corrode the Nature of Gold. Wherefore, if this ſeem too violent, take nine pounds of the former Salts, being diſſolved in VVater, and two ounces of *Sal ammoniacum*: when they are melted, ſet them two days in *Fimo*, and with hot Aſhes you may diſtil a VVater that will corrode Gold. If you refund the VVater upon the Fœces, let them macerate and diſtil it again, the VVater will be much ſtronger.

How to purge the phlegm from theſe Waters,

without which they are of no force: caſt a little Silver into a little of this VVater; which, being overcharged with phlegm, will not corrode it. But ſet it to heat over the fire, and it will preſently do it: pour all this VVater into another Pot, and leave the Fœces behinde in the former: ſo the VVater will be clarified.

Oyl of Vitriol.

Diſſolve Vitriol in an earthen Pan with a wide mouth; let the phlegm evaporate, then encreaſe the fire and burn it, till it be all red, and the fourth part be conſumed. Put it into a Glaſs-Retort, luted all over thrice double, and well dried, and ſet in *igne reverberationis*, continually augmenting the fire, and continuing it for three days, until the Veſſel melt, and an Oyl drop out without any VVater. Every three pounds will yield one ounce of Oyl. Put it into a Glaſs-bottle, and ſet it in hot Embers that all the VVater, if any be in the Oyl, may evaporate; for ſo it will be of greater ſtrength. The ſign of a perfect extraction, is, if it make a piece of VVood, being caſt into it, ſmoak, as if it burned it.

Oyl of Sulphur.

This

This is the proper way to extract Oyl of Sulphur : Take a Glaſs with a large mouth in the form of a Bell, and hang it up by a wire : place a large Receiver under it, that it may catch the Oyl, as it droppeth out of the Bell. In the middle between theſe, hang an earthen Veſſel full of Sulphur : kindle the fire, and make the Sulphur burn; the ſmoak of which, aſcendeth up into the Bell, condenſeth it ſelf, and falls down in an oyly ſubſtance. When the Sulphur is conſumed, put in more, until you have the quantity of Oyl which you deſire. There is alſo another way to extract it in a greater quantity : Prepare a great Glaſs-Receiver, ſuch as I deſcribed in the Extraction of Oyl of Tartar, and *Aqua Fortis* : cut a hole thorow it with an Emerauld, and indent the edges of it, that the ſmoak may paſs out : ſet this upon an earthen Pan, in which you burn the Sulphur. Above this, ſet another Veſſel of a larger ſize, ſo that it may be about a handful diſtant from the firſt : cut the edges of the hole in deeper notches, that the vapor aſcending thorow the firſt, and circulating about the ſecond, may diſtil out of both ; ſo you may add a third and fourth. Pour this Oyl into another Glaſs, and let the phlegm evaporate over hot Embers; it will become of that ſtrength, that it will diſſolve Silver : and I may ſay, Gold alſo, if it be rightly made. The ſume of Sulphur is congealed in *Sal Ammoniacum* : for I have gathered it in the Mountains of Campania, and condenſed it into Salt, nothing at all differing from that which is brought out of the Eaſtern Countries. Thus *Sal Ammoniacus*, which hath ſo long lain unknown, is diſcovered in our own Country, and is nothing but Salt of Sulphur; and this Oyl is the Water of *Sal Ammoniac*, or Salt of Sulphur. I would fain know how Learned Men do approve this my Invention. I take the Earth, thorow which the ſmoak of Sulphur hath ariſen, and diſſolve it in warm Water, and purge it thorow a hanging Receptacle deſcribed before : then I make the Water evaporate ; and ſo finde a Salt nothing different, as I hope, from Ammoniacum.

CHAP. XXI.

Of the Separation of the Elements.

IN every Compound, there are four Elements ; but for the moſt part, one is predominant, the reſt are dull and unprofitable. Hence, when we ſpeak of ſeparating the Elements of a Compound, we mean the ſeparating that predominant one. In the Water-Lilly, the Element of Water is chief; Air, Earth and Fire are in it, but in a ſmall proportion. Hence there is but a ſmall quantity of heat and drineſs in it, becauſe VVater overwhelms them all. The ſame muſt be underſtood in other things alſo. But do not think, that we intend by the ſeparation of the Elements, to divide them abſolutely, the Air from the VVater, and the VVater from the Fire and Earth; but onely by a certain ſimilitude, as what is hotter then the reſt, we call Fire; the moiſter, VVater. Stones participate more of Earth; VVoods, of Fire; Herbs, of VVater. VVe account thoſe Airy, which fill the Veſſels and Receivers, and eaſily burſt them, and ſo flie out. VVhen the Elements are thus ſeparated, they may afterwards be purified and attenuated. The manner of extracting them, is various according to the diverſity of natural things ; for ſome muſt be calcined: ſome ſublimated, others diſtilled. I will ſet down ſome examples.

How to ſeparate the Elements of Metals.

Lay your Metal in *Aqua Fortis*, as I ſhewed before, till it be diſſolved : then draw out the *Aqua Fortis* by a Bath, and pour it on again, and ſo again, until it be turned into an Oyl of a light Red, or Ruby-colour. Pour two parts of *Aqua Fortis* unto the Oyl, and macerate them in a Glaſs in *Fimo* for a month : then diſtil them on Embers till the VVater be all drawn out, which you muſt take and ſtill again in Balneo, until it aſcend ; ſo will you have two Elements. By the Bath the Air

Air is elevated, the VVater and Earth remain in the bottom : the Fire continueth in the bottom of the former Veſſel : for it is of a fiery ſubſtance : this, Nature, and the Affuſion of Water, and the Diſtillation in Balneo will reduce into an Oyl again : in which you muſt correct the Fire, and it will be perfect. You may lay Metal in Embers, then by degrees encreaſe the fire : the VVater will firſt gently aſcend, next the Earth. In Silver, the firſt Oyl is blewiſh, and in perfect ſeparation, ſettleth to the bottom, and the VVater aſcendeth ; but in Balneo, the Elements of Fire and Earth : for the ſubſtance of it is cold and moiſt : in Balneo the Elements of Fire and Earth remain; firſt the Earth will come out, afterwards the Fire. So of Tin, the firſt Oyl is yellow ; in Balneo, the Air will remain in the bottom, the Fire, Earth and VVater will aſcend : which is proper onely to Tin ; for in no other Metal, the Air remaineth laſt ; but in Tin, the VVater is firſt elevated ; next the Fire; laſt of all, the Earth. Of Iron is made a dark ruddiſh Oyl ; Of Quick-ſilver, a white Oyl : the Fire ſettleth to the bottom : the Earth and Water are elevated : and ſo of the reſt.

How to ſeparate the Elements in Herbs.

In Herbs there is alwayes one Element which reigneth in chief. Take the Leaves of Sage, bruiſe them, macerate them in *Fimo*, and then diſtil them : the Fire will firſt aſcend, until the colours be changed; next the VVater; then a part of the Earth : the other part will remain in the bottom, not being volatile, but fixed. Set the VVater in the Sun ſix dayes, then put it in Balneo : the VVater will aſcend firſt, then the colour will alter : and the Fire aſcendeth next, till the taſte be changed : at length, a part of the Earth, the reſt being mix'd with the Air, tarrieth behinde in the Bottom. In VVater-Plants, the Air ariſeth firſt ; next the VVater and Fire.

How to finde out the Vertues of Plants.

There are no ſurer Searchers out of the Vertues of the Plants, then our Hands and Eyes; the Taſte is more fallible : for, if in Diſtillation, the hotteſt parts evaporate firſt, we may conclude, that it conſiſteth of hot and thin parts : and ſo of the reſt. You may eaſily know by the ſeparation of the Elements, whether a Plant have more of Fire, or VVater, or Earth, by weighing the Plant firſt : then afterward, when the VVater and Oyl are extracted, weighing the Feces, and by their proportion you may judge of the degrees of each Element in the Compoſition of it, and from thence of their Qualities. But the narrow limits of this Book will not give me leave to expatiate farther on this Subject. Wherefore I will leave the Diſcourſe of it to a particular Treatiſe, which I intend to ſet out at large on this matter.

How to extract Gum out of Plants.

There are ſome Plants out of which we may extract Gum : ſome Plants, I ſay, becauſe many have none in them, and nothing can give more then it hath. Fennel, and all other kinds of it, Opoponax, and ſuch-like Herbs are full of it. Nature is the beſt Director in extracting them : for when the Sun ſhines very hot, and the Stalks of theſe Plants are ſwelled with ſap, by reaſon of the continual encreaſe of their juice; they open themſelves in little clefts, like a Woman when her labour approacheth ; and thence doth the Plant bring forth, as it were in travel, that Noble Liquor, which partly by the heat of the Sun, partly by a natural Inclination grows clammy, and is condenſed into a hard Body. Hence we may learn

How to extract Gum out of Opoponax.

In the Summer Solſtice gather the Roots in the night-time, that the heat of the Sun may not exhauſt the moyſture ; ſlice it long wayes, and put it into a well-verniſhed earthen Pipkin : then ſet it upſide down in a deſcending Furnace with a Receiver under-

underneath, to catch the falling-Liquor: make a Fire about the upper part of the Veſſel, which will drive down a Noble Gum, which muſt be purged in other Veſſels, and may be meliorated by Diſtillation. The ſame may be effected on Sagapene, whoſe Roots muſt be gathered at the ſame time, and ſliced; and being put into a Veſſel with a gentle fire, will drop out a glutinous Liquor into the Receiver; which, being clarified, will harden like Gum, and is kept for Medicinal uſes.

How to extract Gum out of Fennel.

Gather the ſtalks of Fennel, when it is in its vigor, and the Flowers begin to blow, about the full of the Moon; for then they are more ſucculent: ſlice them into pieces of a hand-long, and put them into a Glaſs-Tub of a hand in wideneſs, and a handful and a half in length: fill it full, and ſet the bottom of it, being full of little holes, into a Tunnel fit to receive it, and the lower part of the Tunnel into a Receiver. Then make a gentle fire about the Tub at a handful diſtance, which may beat upon the ſtalkes on every ſide with its heat, like the Sun-beams. The Tub thus growing hot, will exclude ſome drops; which, flying from the violence of the heat, ſlide down thorow the holes of the bottom into the Tunnel, and from thence into the Receiver, where they will condenſe into Gum, participating of the Nature of Fennel, of no contemptible vertues.

THE

THE

ELEVENTH BOOK OF Natural Magick:

Of Perfuming.

THE PROEME.

After Diſtillation, we proceed to Unguents and ſweet ſmells: it is an Art next of kin to the other; for it provides odors of the ſame things, compounds and mingles Unguents, that they may ſend forth pleaſant ſents every way, very far. This Art is Noble, and much ſet by, by Kings and great Men. For it teacheth to make Waters, Oyls, Powders, Marchpanes, Fumes; and to make ſweet Skins that ſhall hold their ſent a long time; and may be bought for little money: not the common and ordinary way, but ſuch as are rare, and known to very few.

CHAP. I.

Of perfuming Waters.

I Have in the former Book ſhewed how ſweet Waters may be diſtilled out of Flowers and other things, as the place dedicated to Diſtillation did require: here now I will teach how to compound ſweet Waters and Flowers, that may caſt forth odoriferous ſents: as firſt,

To make a moſt ſweet perfumed Water.

Take three pound of Damaſk Roſes, as much of Muſk and Red Roſes, two of the Flowers of Orange, as many of Myrtle, half a pound of Garden-Claver, an ounce and a half of Cloves, three Nutmegs, ten Lillies: put all theſe in an Alimbeck, in the note of which you muſt faſten of Muſk three parts, of Amber one, of Civet half a one, tied up together in a clout: and put the Noſe into the Receiver, and tie them cloſe with a cloth dip'd in Bran and the white of an Egg mixed: ſet a gentle fire under it, until it be all diſtilled.

Another.

Take two pound of Roſe-water, of Lavender half one, of Cretan-Wine thirteen drachms; of the Flowers of Gilliflowers, Roſes, Roſemary, Jaſmine, the Leaves of Marjoram, wilde Betony, Savory, Fennel, and Baſil gentle, half a pound; an ounce of Lemmon-peel, a drachm of Cinnamon, Benjamin, Storax and Nutmegs: mix them, and put them in a Glaſs, and ſet them out in the Sun for four dayes; then diſtil them with a gentle fire: and unleſs you put Muſk in the Noſe of the Alimbeck, tie it up in a rag, hang it by a thread in the Water, whilſt it ſtandeth ſunning for a month. Set it in the Sun, to take away the ſcurvy favor of the diſtilling, if by chance it conceive any.

Aqua Nanſa.

Take four pound of Roſe-water, two of Orange-Flowers, one of Myrtle, three

ounces of ſweet Triſoil, one of Lavender: add to theſe, two ounces of Benjamin, one of Storax, the quantity of a Bean of Labdanum, as much Mace and Cloves, a drachm of Cinnamon, Sanders, and Lignum Aloes, an ounce of Spikenard: let theſe all be groſsly beaten, and boyled in a verniſhed earthen Pipkin over a gentle fire, for the ſpace of an hour; then let them cool. Strain them through a Linen-cloth, and ſet it up in a Glaſs cloſe ſtopt. But tye up the Cinnamon, Cloves, Lignum Aloes and Sanders in a thin Linen-cloth; and ſo put them into the pot, and boyl them, as I ſaid before, and afterwards take out the bundle: for after the boyling of the water, the remaining duſt may be formed into Pills, and made into Cakes, which may be uſed in perfuming, as I ſhall teach hereafter. This Water is made divers ways, but I have ſet down the beſt: yet in the boyling, it will turn coloured, and become red, ſo that Hankerchiefs or white Linen, if they be wetted in it, are ſtained, although they are made wonderfully ſweet: which maketh many forbear the uſe of it. Wherefore, if we would have

Aqua Nanſa clarified,

Take the former Water, and put it into a Glaſs-Retort, and ſet it in Balneo, over a gentle fire: the VVater will become clear, and almoſt of the ſame ſent: onely a little weaker: keep the Water, and lay aſide the reſt of the Feces for ſweet Cakes.

CHAP. II.

To make ſweet Water by Infuſion.

NOw I will teach how to make perfumed Liquors, and what Liquors they are, which will receive odors beſt; for VVater is unapt to keep ſent, Oyl is better, and VVine, (we may aſſign the reaſon out of *Theophraſtus*: for VVater is thin, void of taſte or ſent, and ſo fine, that it can gather no ſent) and thoſe Liquors which are thick, ſavory, and have a ſtrong ſent. VVine, although it be not ſweet of it ſelf, yet being placed nigh any odour, it will draw it, becauſe it is full of heat, which doth attract. VVater, being cold by Nature, can neither attract, nor receive, nor keep any ſent: for it is ſo fine, ſlender and thin, that the odour flieth out again, and vaniſheth away, as if there were no foundation whereon it could fix and ſettle, as there is in VVine and Oyl, who are more tenacious of ſent, becauſe they are of a denſer and callous Body. Oyl is the beſt preſerver and keeper of ſent, becauſe it is not changeable: wherefore Perfumers ſteep their perfumes in Oyl, that it may ſuck out their ſweetneſs. We uſe Wine to extract the ſent of Flowers, and eſpecially, *Aqua Vitæ*; for Wine, unleſs diſtilled, infecteth the Water too much with his own ſent.

Muſk Water.

This VVater ſetteth off all others, and maketh them richer; wherefore it is firſt to be made. Take the beſt *Aqua Vitæ*, and put into it ſome Grains of Muſk, Amber and Civet, and ſet them in the hot Sun for ſome dayes: but ſtop the Veſſel very cloſe, and lute it; for that will very much add to the frangrancy of it. A drop of this put into any other water, will preſently make it ſmell moſt pleaſantly of Muſk. You may do the ſame with Roſe-water and Fountain-water often diſtilled, that it may obtain a thinneſs and heat, which is very neceſſary for the extraction of Eſſences.

Water of Jaſmine, Muſk-Roſes, Gilliflowers, Violets and Lillies,

is extracted the ſame way: for theſe Flowers ſend forth but a thin odour, which dwelleth not in the ſubſtance of them, but onely lieth ſcattered on the ſuperficies; ſo that if they remain too long on the fire, or in their Menſtruum, their ſweetneſs degenerateth from its former pleaſantneſs, and is waſhed off by the mixture of the ſtinking ill-ſavoured part of their ſubſtance. VVherefore we muſt lay their Leaves onely

onely in the beſt *Aqua Vitæ*, that is, the Leaves of Lillies, Jaſmine, Muſk-Roſes, and the reſt; hanging them on a threed, that when the VVater hath ſucked out their odour, we may pluck them out, becauſe their odour lieth onely on their ſuperficies; ſo that if they ſhould remain long in the *Aqua Vitæ*, it would penetrate too deep into them, and draw out a ſent, which would not onely deſtroy their former ſweetneſs, but taint them with an ill ſavour, which accompanieth thoſe inward parts. After theſe Leaves are taken out, ſupply them with freſh, until you perceive their ſent is alſo extracted. But take out the Violets and the Gilliflowers ſooner then the reſt, leſt they colour the VVater. This VVater, being mixt with others, taketh away the ſcurvy ſent of the VVine.

A ſweet compounded Water.

Take a great Glaſs-Receiver, and fill the third part almoſt of it with *Aqua Vitæ*: put into it Lavender-Flowers, Jaſmine, Roſes, Orange and Lemmon-Flowers. Then add Roots of Iris, Cypreſs Sanders, Cinnamon, Storax, Labdanum, Cloves, Nutmegs, Calamus Aromaticus, with a little Muſk, Amber, and Civet. Fill the Glaſs, and ſtop it well. But after you have filled the Glaſs with the Flowers, they will wither and ſink down: wherefore fill it up with more. Set it in a very hot Sun or in Balneo, until their ſweetneſs be all extracted. Then ſtrain out the Water; and one drop of it in Roſe-water, or of Myrtle-Flowers, will perfume it all with a moſt fragrant ſmell.

CHAP. III.

How to make ſweet Oyls.

HOw to extract Oyl out of Spices and ſweet things, is declared before: now I will ſhew how to draw ſents out of other things with Oyl: or, as I ſaid before, to make Oyl the ground in which odours may be kept and preſerved a long time; which is done either by imbibing the Oyl with odors, or the Almonds out of which we afterwards expreſs the Oyl.

How to make Oyl of Ben,

which is the ſweeteſt Oyl of all, uſed by the Genois: take an ounce of Ben, a drachm of Amber, as much Muſk, half a drachm of Civet: put them in a Glaſs-bottle well ſtopt, and ſet it in the Sun for twenty days; then you may uſe it. But be ſure that it be cloſe ſtopt: for the Nature of odors being volatile and fugitive, it quickly decayeth, loſeth his fragrancy, and ſmelleth dully.

A way to make odoriferous Oyl of Flowers:

it is a common thing but very commodious for Perfumers, and may be uſed for other things: he that knoweth how to uſe it rightly and properly, will finde it an Oyl very profitable to him. Blanch your Almonds, and bruiſe them, and lay them between two rows of Flowers. When the Flowers have loſt their ſent, and fade, remove them, and add freſh ones. Do this ſo long as the Flowers are in ſeaſon: when they are paſt, ſqueeze out the Oyl with a preſs, and it will be moſt odoriferous. You may draw a ſent with this way, out of thoſe Flowers, from whom you cannot draw ſweet Water. Oyl of Jaſmine, Violets, Muſk-Roſes, Lillies, Crows-foot, Gilliflowers, Roſes, and Orange-Flowers, and of others, being made this way, ſmelleth moſt fragrantly. Oyl of Amber, Muſk, and Civet, may be thus made alſo: Cut the Almonds, being blanched from the top to the bottom, into ſeven or eight ſlices, and encloſe them in a Leaden Box with theſe perfumes for ſix days, until they have imbibed the ſent: then preſs them, and they will yield a moſt ſweet Oyl; and yet perhaps not make the Muſk much worſe.

CHAP. IV.

How to extract Water and Oyl out of ſweet Gums by Infuſion.

WE may extract ſweet VVaters by another Art that we ſpoke of before, out of Gums, by Infuſion and Expreſſion: as for example.

A ſweet Water of Storax, Benjamin, and Labdanum,

which affordeth a moſt ſweet ſavour, and is thus extracted. Infuſe Storax or Benjamin being bruiſed, in as much Roſe-water as will cover them two fingers over: ſet them in Balneo, or a warm place for a week: then diſtil them in Balneo, and you will have a very pleaſant Water from them, which you muſt expoſe to the hot Sun, that if there ſhould remain any ſtink of the ſmoak in it, it may be taken away. We may alſo put Gums into Glaſs-Veſſels, and make a ſlow fire under it: there will ſweat out a very little water, but of ſweet ſavour, and the Gum will ſettle to the bottom, which will be uſeful for other things.

To extract Oyl of Benjamin, Storax, and other things.

We may do this, by beating and mixing theſe Gums with Oyl of Almonds or of Ben, and macerating them in Balneo for a month: then draw out the Oyl either by a Retort or by Expreſſion, which is better; it will yield a moſt fragrant odour, that you can hardly perceive whether it were drawn out of the Gums themſelves by a Retort. Ben, called in Latine *Glans Unguentaria*, is uſed in precious Oyntments in ſtead of Oyl. *Pliny* calleth it Morobolane. So alſo *Martial*,

What not in Virgil *nor in* Homer's *found,*
Is of ſweet Oyl and Acorn the compound.

It is without any ſent, and therefore fitter to receive them; and when it doth receive them, to reſerve them, for it never groweth rank.

CHAP. V.

How to perfume Skins.

NOw we will diſcourſe of the perfuming of Skins, which is performed ſeveral ways, either by ſweet Waters, or rubbing them with Oyls, or laying them in Flowers, ſo that they may attract their odor. And firſt,

How to waſh Skins,

that they may loſe the ſent of the Beaſts and of Fleſh. The manner is this: Firſt waſh them in Greek-Wine, and let them lie wet for ſome hours: then dry them, and if the ſent continueth in them ſtill, waſh them again: that being taken away, waſh them in ſweet Waters. Take four parts of Roſe-water, three of Myrtle, of Orange-Flowers two, of ſweet Triſoli one, of Lavender half one: mix them, and put them into a wide mouthed earthen Veſſel, and ſteep the Skins in them for a day. Then take them out, and hang them up in the ſhade to dry: but when they are almoſt dry, ſtretch and ſmooth them with your hands, that they may not be wrinkled. Do this thrice over, till they favour of the ſweet Waters, and loſe their own ſtink. Next

How to perfume Skins with Flowers.

They muſt firſt be rub'd over with Oyl; for, as I have told you, that is the foundation of all ſents, both to attract them, and retain them in a greaſie body. It may be done with common Oyl, but better with Oyl of Ben, becauſe it is without any ſent of his own: beſt of all with the Oyl of Eggs, which I have taught before how to make. The manner is thus: Anoynt your Gloves or Skins with a Spunge on the inward ſide, and eſpecially, in the Seams: when that is done, you may thus make them attract the ſents of any Flowers. Violets and Gilliflowers blow nigh in the ſpring; gather them in the morning, and lay them on both ſides of your Skins for a day. When they grow dry ſooner or later, fling them away, and lay on new; ſtirring or moving them thrice or four times in a day, leſt they make the Skins damp, and grow muſty. When theſe Flowers are paſt, lay on Orange-flowers and Roſes in the ſame manner: and laſt of all, Jaſmine, which will continue until Winter: I mean, Garden-jaſmine, for it flouriſheth two or three months. Thus your Skins or Gloves will become very ſweet in a yeers ſpace. The odour will quickly fade and die but if you do the ſame the ſecond time, it will continue much longer, and preſerve their pleaſantneſs. It very much preſerveth their fragrancy, to keep them in a cloſe place, in either a Wooden or Leaden Box: but if you lay them among Linen, it will ſuck out their odour, and dull their ſent.

How to perfume Skins.

If you add Musk, Amber, and Civet to the aforeſaid Skins, they will ſmell much more ſweet and gratefully. Or take four parts of Weſtern Balſam, one of Muſk, as much Amber, and rub it on your Gloves with a Spunge, and they will ſmell very ſweet. I will add one more excellent Compoſition: Take eight parts of Iris, one of Sander, two of Benjamin, four of Roſe-Powder, one and a half of Lignum Aloes, half a one of Cinnamon, or rather leſs; ſoften them all with Roſe-water and Gum-Tragacanth, and grinde them on a Porphyretick Marble: then anoynt your Gloves with it in a Spunge, and take three Grains of Musk, two of Amber, one of Civet: mingle them, and rub them alſo on.

How to take the ſent out of Gloves.

If you repent your ſelf of perfuming them, or would make ſport with any one, boyl a little Roſe-water or *Aqua Vitæ*; and while they be hot, put the Gloves in, and let them remain there awhile. This will take away their ſent: and if you ſteep other Gloves in it, and dry them, they will imbibe it.

CHAP. VI.

How to make ſweet Powders.

NOw we come to making ſweet Powders, which are either Simple or Compound: they are uſed in ſtuffing ſweet Bags, in perfuming Skins and Compoſitions. Learn therefore

How to make Cyprian Powder.

Take Moſs of the Oak, which ſmelleth like Musk; gather it clean, in December, January, or February: waſh it five or ſix times in ſweet Water, that it may be very clean: then lay it in the Sun, and dry it. Afterwards, Steep it in Roſe-water for two dayes, and dry it in the Sun again. This you muſt iterate oftentimes; for the more you waſh it, the ſweeter it will ſmell. When it is dried, grinde it into Powder in a Braſs-Morter, and ſeirce it: then put it into the ceive, and cover it: make a fire, and ſet ſome ſweet waters to boyl over it; or caſt on ſome perfumed Cakes, and let the ſume ariſe up into the ceive. The more often you do this, the ſtronger and more laſting ſent will be imbibed by the Powder. When you perceive it to have attained a ſufficient odour, take one pound of the Powder, a little Muſk and Civet powdered, and a ſufficient quantity of Sanders and Roſes: beat them in a Braſs-Morter; firſt putting in the Musk, and then by degrees caſting in the Powder; ſo mingle them well. At laſt, put the Powders into a Glaſs cloſe ſtopt, that the ſent may not tranſpire and grow dull. There are ſeveral Compoſitions of this Powder, which would be too tedious to recount. It may be made, either white, or black, or brown. The white is made of Crude Parget waſhed in Roſe-water, or other ſweet Water; and adding Musk, Amber, Civet, and ſuch-like, it will ſmell at a good diſtance.

Chap.

CHAP. VII.

How to make ſweet Compounds.

THere may be made divers kindes of ſweet Compounds; of which are made Beads, which ſome uſe to reckon their Prayers by, and others to trim their clothes with: alſo waſh-Balls to cleanſe and ſweeten the hands. And firſt,

How to make ſweet Balls

with ſmall charge, which yet ſhall ſeem to be very coſtly and ſweet. Take one ounce of Cyprian Powder, and Benjamin of the beſt mixture, which is brought out of Turky; half an ounce of Cloves, a ſufficient quantity of Illyrian Iris. Firſt, melt ſome Gum Tragacantha in Roſe water: then with the former powder make it into a Maſs, and rowl it up in little Balls: bore them thorow, and fix every one on a ſeveral tent upon the Table: then take four Grains of Musk, diſſolve it in Roſe-water, and waſh the outſide of the Balls with it: then let them dry: afterwards wet them again, for three or four times; ſo will they caſt forth a moſt pleaſant ſent round about, which they will not quickly loſe. But if you would beſtow more coſt, and have a greater ſent, I will ſhew

How to make them another way.

Take one ounce of Storax, of Amber half one, a fourth part of Labdanum cleanſed, one drachm of Lignum aloes and Cinnamon, an eighth part of Musk. Beat the Gum, Storax and Amber in a Braſs Morter with an Iron Peſtle, being both hot: when theſe are well mixed, caſt in the other powders, and mix them all together: at laſt add the Musk; and before they grow cold, form what you pleaſe of them. I will add alſo

Another Compound,

very neceſſary in a time of Plague, which will not onely refreſh the Brains with its ſweet odour, but will preſerve it againſt Infection: Take three ounces of Labdanum, as much Storax, one of Benjamin, an ounce and a half of Cloves, an ounce of Sanders, three of Champhire, one of Lignum Aloes, Calamus Aromaticus, and juice of Valerian, a drachm of Amber: mix all theſe in the juice of Balm, Roſe-water, and Storax diſſolved. But to waſh the Face and Hands, I will ſet down a moſt Noble Compoſition.

Of waſhing Balls or Musk-Balls.

Take the fat of a Goat, and purifie it in this manner: Boyl a Lye with the Pills of Citron in a Braſs Kettle; let the fat remain in it for an hour: then ſtrain it thorow a Linen cloth into cold water, and it will be purified. Make the Lye of two parts of the Aſhes of the Ceruſs-Tree, one of Lime, and half a Porringer of Alom; mingle them, and put them in a wooden Bowl, with two holes in the bottom, ſtopt with Straw: then pour in water, that it may cover them three fingers over, and ſtrain it out thorow the holes: when the firſt is run out, add another quantity of water, and ſo the third time, whilſt the water doth receive any ſaltneſs. Keep theſe ſeveral runnings aſunder, and add ſome of the ſecond & third unto the firſt, while a new Egg will ſwim in it: for if it ſink and go to the bottom, it will be too weak; therefore add ſome of the firſt running. If it ſwim on the top, and lie upon the ſurface of the Water, put in ſome of the ſecond and third running, until it deſcend, ſo that ſcarce any part of it be ſeen above the Water. Heat twenty pound of this Water in a Braſs Kettle, and put into it two of the fat: then ſtrain it out into broad Platters, and expoſe it to the hot Sun, mixing it often every day. When it is grown hard, make Pomanders of it, and reſerve them. You may thus perfume them: Put two pound of the Pomanders into a Bowl, and with a VVooden Spoon, mix it with Roſe-water, till it be very ſoft: when it hath ſtood ſtill a while, and is grown hard, add more water, and ſet

ſet it in the Sun: do this for ten days. Then take half a drachm of Muſk, ſomewhat leſs Civet, and as much of Cinnamon well beaten: mix them, and if you add a little Roſe-powder, it will ſmell much ſweeter: then judge of it by your noſe. If the ſent be too weak, add more of the Perfumes; if too ſtrong, more of the Soap.

How to make Soap, and multiply it.

Since we are fallen upon the diſcourſe of Soap, we will not paſs it over this: Take Soap-Geta, and reduce it into a ſmall Powder: ſet it on the fire in a Braſs Kettle full of Lye of a moderate ſtrength; ſo that in three hundred pound of Lye, you may put fourſcore of Soap. When the Water beginneth to boyl up in bubbles, ſtir it with a wooden Ladle; and if the Lye do fail in the boyling, add new. When the Water is evaporated, take the Kettle from the fire, and caſt in ſix pound of ordinary Salt well beaten; and with an Iron Ladle empty it out, and let it cool all night. In the mean time, prepare a brine, ſo ſharp that it will bear an Egg. In the morning, cut the Soap into ſlices, and put it into a broad Veſſel, and pour the brine on it: there let it ſtand one quarter of a day, and it will become very hard. If you put ſome *Sal Alchali* into the brine, it will make it much harder.

CHAP. VIII.

How to make ſweet Perfumes.

IT remaineth, that we ſpeak of Perfumes; for they are very neceſſary for the ſenting of Skins, Clothes, and Powders, and to enrich Noble mens Chambers, with ſweet odors in Winter: they are made either of Waters or Powders.

How to make Perfumes of Waters.

Take four parts of Storax, three of Benjamin; of Labdanum, Lignum Aloes, and Cinnamon, one; an eighth part of Cloves, a little Musk and Amber. Beat them all groſsly, and put them in a Braſs Pot with an ounce and a half of Roſe-water. Set the Pot over the fire, or hot Aſhes, that it may be hot, but not boyl; it will caſt forth a pleaſant odor: when the Water is conſumed, put in more. You may alſo add what you have reſerved in the making *Aqua Nanſa*: for it will ſend out a very ſweet fume.

Another way.

Take three parts of Cloves, two of Benjamin, one of Lignum Aloes, as much Cinnamon, Orange-Pill and Sanders, an eighth part of Nutmeg. Beat them, and put them into a pot, and pour into them ſome Orange-flower-water, Lavender, and Myrtle-water, and ſo heat it.

Another way.

Expreſs and ſtrain the juice of Lemmon, into which put Storax, Camphire Lignum Aloes, and empty Musk-Cods: macerate them all in Balneo for a week in a Glaſs-Bottle cloſe ſtopt. When you would perfume your Chamber, caſt a drop of this Liquor into a Braſs Pot full of Roſe-water; and let it heat over warm Aſhes, it will ſmell moſt pleaſantly.

Excellent Pomanders for perfuming.

Take out of the Decoction for *Aqua Nanſa*, Lignum Aloes, Sanders, Cinnamon and Cloves; and of the remaining Powders make a maſs, which you may form into cakes, which being burnt on hot Aſhes, ſmell very ſweetly. I take out the Cinnamon and the Woods, becauſe in burning they caſt forth a ſtink of ſmoak.

Another way.

Take one pound and a half of the Coals of Willow, ground into duſt, and ſeirced: four ounces of Labdanum, three drachms of Storax, two of Benjamin, one of Lignum

Lignum Aloes: mix the Storax, Benjamin, and Labdanum in a Brass Morter with an Iron Pestle heated, and put to them the Coal and Lignum Aloes powdered. Add to these half an ounce of liquid Storax: then dissolve Gum Tragacantha in Rose-water, and drop it by degrees into the Morter. When the powders are mixed into the form of an Unguent, you may make it up into the shape of Birds, or any other things, and dry them in the shade. You may wash them over with a little Musk and Amber upon a Pencil; and when you burn them, you will receive a most sweet fume from them.

Another Perfume.

Anoynt the Pill of Citron or Lemmon with a little Civet; stick it with Cloves and Races of Cinnamon: boyl it in Rose-water, and it will fill your chamber with an odorifeous fume.

CHAP. IX.

How to adulterate Musk.

THese Perfumes are often counterfeited by Impostors; wherefore I will declare how you may discern and beware of these Cheats: for you must not trust whole Musk-Cods of it, there being cunning Impostors, who fill them with other things, and onely mix Musk enough to give its scent to them. Black Musk inclining to a dark red, is counterfeited with Goats blood a little rosted, or toasted bread; so that three or four parts of them beaten with one of Musk, will hardly be discovered. The Imposture may be discerned onely thus: The Bread is easie to be crumb'd, and the Goats blood looketh clear and bright within when it is broken. It is counterfeited by others in this manner: Beat Nutmegs, Mace, Cinnamon, Cloves, Spikenard, of each one handful, and seirce them carefully: then mix them with the warm blood of Pigeons, and dry them in the Sun. Afterward beat them again, and wet them with Musk-water and Rose-water: dry them, beat them, and moysten them very many times; at length, add a fourth part of pure Musk, and mix them well, and wet them again with Rose-water and Musk-water: divide the Mass into several parts, and rowl them in the hair of a Goat which groweth under his Tail. Others do it

Another way, and

mingle Storax, Labdanum, and Powder of Lignum Aloes: add to the Composition, Musk and Civet, and mingle all together with Rose-water. The Imposture is discovered by the easie dissolving of it in water; and it differeth in colour and scent. Others augment Musk by adding Roots of Angelica, which doth in some sort imitate the scent of Musk. So also they endeavour

To adulterate Civet

with the Gall of an Ox and Storax liquified and washed, or Cretan Honey. But if your Musk or Amber have lost their scent, thus you must do,

To make Musk recover its scent,

hang it in a Jakes and among stinks: for by striving against those ill savours, it exciteth its own vertue, reviveth, and recovereth its lost scent.

THE

THE

TWELFTH BOOK

OF

Natural Magick:

Of Artificial Fires.

THE PROEME.

BEfore I leave off to write of Fire, I shall treat of that dangerous Fire that works wonderful things, which the vulgar call Artificial Fire, which the Commanders of Armies and Generals, use lamentably in divers Artifices and monstrous Designs, to break open Walls and Cities, and totally to subvert them; and in Sea-fights, to the infinite ruine of mortal men; and whereby they oft-times frustrate the malicious enterprizes of their Enemies. The matter is very useful and wonderful, and there is nothing in the world that more frights and terrifies the mindes of men. God is coming to judge the world by Fire. I shall describe the mighty hot Fires of our Ancestors, which they used to besiege places with; and I shall add those that are of later Invention, that far exceed them: and lastly, I shall speak of those of our days. You have here the Compositions of terrible Gun-powder that makes a noise, and then of that which makes no noise: of Pipes that vomit forth deadly Fires, and of Fires that cannot be quenched, and that will rage under Water at the very bottom of it; Whereby the Seas rend asunder, as if they were undermined by the great violence of the flames striving against them, and are lifted up into the Air, that Ships are drawn by the monstrous Gulphs. Of Fire-Balls that flie with glittering Fire, and terrifie Troops of Horse-men, and overthrow them. So that we are come almost to eternal Fires.

CHAP. I.

How divers ways to procure Fire may be prepared.

VItruvius saith, That it fell out by accident, that sundry Trees, frequently moved with Windes and Tempests, the Bows of them rubbing one against another, and the parts smiting each other, and so being rarified, caused heat, and took fire, and flamed exceedingly. Wilde people that saw this, ran away. When the Fire was out, and they durst come neerer, and found it to be a great commodity for the Body of man, they preserved the Fire; and so they perceived that it afforded causes of civility, of conversing and talking together. *Pliny* saith, It was found out by Souldiers and Shepherds. In the Camp, those that keep watch, found this out for necessity; and so did Shepherds, because there is not always a Flint ready. *Theophrastus* teacheth what kindes of Wood are good for this purpose: and though the Auger and the handle are sometimes both made of one sort of Wood, yet it is so that one part acts and the other suffers; so that he thinks the one part should be of hard Wood, and the other of soft. Example:

Wood that by rubbing together will take Fire.

They are such as are very hot, as the Bay-Tree, the Buck-thorn, the Holm, the Piel-Tree: But *Nestor* adds the Mulberry-Tree; and men conjecture so, because they will

will presently blunt the Ax. Of all these they make the Auger, that by rubbing they may resist the more, and do the busin ss more firmly; but the handle to receive them, is to be made of soft Wood, as the Ivy, the wilde Vine, and the like, being dried, and all moisture taken from them. The Olive is not fit, because it is full of fat matter, and too much moysture. But those are worst of all to make Fires, that grow in shady places. *Pliny* from him. One Wood is rub'd against another, and by rubbing takes Fire; some dry fuel, as Mushroomes or Leaves, easily receiving the Fire from them. But there is nothing better then the Ivy, that may be rubbed with the Bay-Tree, or this with that. Also the wilde Vine is good, which is another kinde of wilde Vine, and runs upon Trees as the Ivy doth. But I do it more conveniently thus: Rub one Bay-Tree against another, and rub lustily, for it will presently smoak, adding a little Brimstone: put your fuel neerer, or dry matter made of dry Toad-stools, or Leaves that are very fine, found about the Roots of Colts-foot; for they will soon take fire, and retain it. I have done the same with Ivy-wood cleansed from the Bark, and dried; and by rubbing one Reed against another; or, which is better, drawing a cord swiftly upon it. The West-Indians binde two dry sticks together, and they put a stick between them, which they turn about with their hands moved from them, and so they kindle fire. But since the minde of Man seldom rests in the thing once invented, but seeks for new Inventions, by mans industry there is found out

A stone that will raise Fire with any moysture.

The way to make it is thus: Take quick Brimstone, Salt-Peter refined, of each a like weight; Camphire the double weight to quick Lime; and beat them all in a Morter, till they be so fine that they will flie into the Air: binde them all fast together, wrapt in a Linen cloth, and put them into an earthen pot; let it be well stopt: lute it well with clay and straw, and let it dry in the Sun: then put them into a Potters Oven; and when the earthen Vessel is perfectly baked, they will grow together, and be hard as a Stone: take them out, and lay them up in a dry place for use. I went to try this in haste, and my experience failed me. I know certainly, that some of my Friends have done it: but the pot must not have any vent, for it will all burn away. Yet I have seen water cast upon quick Lime, and by putting Brimstone to it, it took Fire, and fired Gun-powder. This I can maintain.

CHAP. II.

Of the Compositions for Fire, that our Ancestors used.

BEfore I come to our Compositions for Fire-works, I shall set down those that our fore-Fathers used in Sea-fights, and in taking or defending of Cities. *Thucidides* saith, That those that besieged Platæenses, when Engines would do no good, they fell to Fire-works: for casting about the Walls bundles of fluff, and throwing in Fire, Brimstone and Pitch, they burnt the wall: whence arose such a flame, that until that time no man ever saw the like. *Heron* teacheth, That in burning of Walls, after you have made a hole thorow, you must put wood of the Pine-Tree under, and anoynt them with dry pitch, and powdered Brimstone together, with Tar or Oyl, and set this on fire. And elsewhere he teacheth to burn with a pot: Take an earthen Pitcher, and binde it about with plates of Iron on the outside, and let it be full of small coal: let there be a hole about the bottom to put in the Bellows: for when the coals take fire, by sprinkling on of vinegar, piss, or any other sharp matter, the Walls are broken. *Vegetius* teacheth what combustible matter must be used: and he useth burning Oyl, Hards, Brimstone, Bitumen. Burning Arrows are shot in Cross-bows into the Enemies Ships; and these, being smeered over with Wax, Pitch and Rosin, they quickly fire the Decks, with so many things that afford fuell to the Fire. I shall add

The Fire-Darts the Ancients used.

Ammianus Marcellinus described Fire-Darts, a kinde of Weapon made after such a fashion:

fhion: It is an Arrow of Cane, joyned with many Irons between the Shaft and the Head, and they are made hollow after the fashion of a womans Distaff, where with Linen-threed is spun, in the midst of it, it hath many small holes, and in the very hollow of it, is put fire with some combustible matter, and so is it easily shot forth of a weak Bow: for a Bow that is strong, puts out the Fire; and there is no means to put it out, but by casting on Dust or Lees of Oyl. *Livy.* Some came with burning Torches, others carrying Tow, Pitch, and Fire-Darts; and the whole Army shined as if it were all in flames: but in the concave part of this Dart there was Glue and Fuel, for Fire not to be extinguished, of Colophonia, Brimstone, Salt-Peter, all mingled with Oyl of Bays. Others say, with Oyl of Peter, Ducks-grease, the Pith of the Reed of Ferula, Brimstone; and, as others think, with Oyl, Tallow, Colophonia, Camphire, Rosin, Tow. The old Warriors called this an incendiary composition. *Lucan* speaks of burning of Ships:

This plague to water is not consonant,
For burning Torches, Oyl and Brimstone joyn'd,
Are cast abroad, and fuel was not scant:
The Ships do burn with Pitch or Wax combin'd.

And elsewhere,

He bids them shoot their Shafts into the Sails,
Besmeer'd with Pitch, and so he soon prevails:
The Fire straight doth burn what's made of Flax,
And so their Decks were fir'd by melting Wax;
And tops of Masts were burnt, and Sea-mens packs.

But in compositions for Arrows and Darts, that they might burn the more vehemently, they put melted Vernish, Printers Oyl, Petroleum, Turpentine, made up with the sharpest Vinegar, pressed close, and dried at the Sun, and wrap'd over with Tow, and with sharp Irons to defend it, wrought together like to a bottom of yarn: all which at last, only passing over one hole, are smeered over with Colophonia and Brimstone, after the manner that follows. But by the subtilty of the Greeks, there was invented

A Fire, called the Greek Fire.

To overcome the Ship presently, they boyl'd Willow-coals, Salt, Spirit of VVine, Brimstone, Pitch, with the yarn of the soft VVoll of Ethiopia, and Camphire; which, it is wonderful to speak, will burn alone in the water, consuming all matter. *Callimachus* the Architect, flying from Heliopolis, taught the Romans that thing first, and many of their Emperors did use that against their Enemies afterwards. *Leo* the Emperor, burnt with this kinde of Fire those of the East, that sail'd against Constantinople with 1800 Carvels. The same Emperor, shortly after, burnt with the same Fire 4000 Ships of the Enemy, and 350 in like manner. *Promethens* found out, that Fire would keep a yeer in the Cane Ferula: wherefore *Martial* speaks of them thus:

Canes that the Masters love, but Boys do hate,
Are by Prometheus *gift held at great rate.*

CHAP. III.

Of the divers Compositions of Gun-powder.

WE should be ill spoken of, if, that treating of fiery Compositions, we should not first say something of that wonderful Gun-powder, that is the Author of so many wonderful things; for it is an ingredient in all mixtures, and all depends upon it: not that I have any minde to speak of it, because it is so common; but of such things that have some new or hidden secret in them. It is made of four parts of Salt-

Peter, Brimſtone and VVillow-coals, of each one part. But the Salt-Peter muſt be refined from common Salt, the fat and earthly parts: for that is the Foundation and Baſis of the reſt. All of theſe muſt be well powdered and finely ſeirced, and perfectly mingled together. Therefore if you would have

Gun-powder that ſhall make a great noiſe, and do much ſervice,

Put in more parts of Salt-Peter; namely, to one part of Brimſtone, and one of Willow-coal, put in ſix or eight parts of Salt-Peter, but excellent well refined and mingled. For four parts of Salt-Peter well refined and mingled, will do more then ten parts of that which is fæculent, and ill mingled. From the Salt-Peter comes the force, the noiſe of the flame; for Brimſtone it takes fire, and the ſooner for the coal. But if one would have

Gun-powder that will ſhoot a Bullet without noiſe,

he muſt make weak the Salt-Peter, but with ſome fat ſubſtance; which is done by the Glew and Butter of Gold, by mingling them according to a certain and due proportion; and ſo it will ſhoot a Ball with very little or no noiſe; for you ſhall ſcarce hear it: and though the force be not ſo ſtrong, yet it is but little leſs. I will not teach the way, leſt wicked men ſhould take occaſion to do miſchief by it.

CHAP. IV.

How Pipes may be made to caſt out Fire.

THe ſame *Heron* bids the Souldiers when they ſcale the VValls, that they ſhould ſet againſt the faces of their enemies that defend the Cities, ſuch hand-Guns that they can turn, and that will throw fire a great way: for ſo they ſhall ſo terrifie thoſe that defend the VValls, by theſe monſtrous Engines that caſt Fire-Balls at ſuch great diſtance, and with ſuch furious flames, that they will never endure to behold them, nor yet the Souldiers that mount up the VValls; but will quickly run away. Moreover, in fights at Sea, and amongſt Horſe-men, men of this later age make great uſe of them: for Horſes are terrified with Fire, as Elephants were; and will eaſily run away, and break the ranks. VVnen *Antipater* beſieged the Megarenſes, and the Macedonians did fiercely lie upon them, the Megarenſes firſt anoynted their Hogs with pitch, and ſet them on Fire, and ſo ſent them out amongſt their Enemies. The Hogs were mad at it, and ran furiouſly among the Troops of Elephants, and cried as they burned with the Fire; and, as ſo many Furies, they extreamly diſordered the Elephants. But I ſhall deſcribe

Rockets that caſt Fire a great way.

Make a ſtick of three foot long, round on the outſide, and with a Turners Inſtrument make it hollow within: let the hole in the middle be four fingers diameter, and the VVood a finger thick; but within let it be fenced with a thin Iron plate, and without with Iron hoops, at the mouth, in the middle, and on the end; and let the Spaces between be faſtned and joyned together with Iron-wires, leſt by the violence of the flames, ſtriving within, the Engine ſhould break in pieces, and hurt our Friends. Fill the hollow hole with this compoſition: Gun-powder three parts, Colophonia, Tutia, Brimſtone, half a part: but you muſt bruiſe your Brimſtone and Colophonia very well, and ſprinkle them with Linſeed Oyl, and work them in your hands. Then try if your mixture will burn gently or fiercely: fill the ſpace between the joynts in a Reed with powder; put Fire to it: if it burn vehemently, that it break the Cane, add to it Colophonia and Brimſtone; but if mildly, then put more Powder into your Rocket, preſſing it again with a ſharp ſtick: then ſtop the mouth of it, being full, with a Linen-clout, wax and pitch, and cover it, that the Powder fall not out: and making a hole in the clout, faſten a Cotton-match to the mixture, that when neceſſity is, it may take fire. You ſhall learn ſhortly after to make the Match. This is called a ſimple Rocket.

How

How to make a Rocket armed.

This by a continual ſending forth of Fire-balls and Leaden Bullets, and by the ſhooting off of Iron-guns, will ſtrike thorow the faces of thoſe that ſtand by. It is made of Turpentine-Roſin, liquid Pitch, Verniſh, Frankincenſe and Camphire, equal parts; quick Brimſtone a third part and half; two parts of Salt-Peter refined, three parts of *Aqua Fortis*, as much of Oyl of Peter and Gun-powder: pown them together, and make Fire-balls: put them into the hollow of the Pipe, that is broad enough to receive them. Put into the hollow part the firſt mixture, three fingers deep, and preſs it down: then put in the little Ball of Gun-powder onely, weighing one ounce, ready made: then put in again the firſt Powder: and do this by courſe one after another, till it be full; and ſtop the mouth, as I ſaid. Some do not thruſt down a Ball, but Hards wrap'd up in ſquare pieces of Iron; and that is ſo pliable, that the firſt mixture can kindle the Gun-powder. Some put in with the Tow, Glaſs groſly powdered. Others, Salt and powder of Lead: for if the Lumps ſtick to Armour or Garments, you cannot put them out with water or any thing elſe till they be conſumed. Some there are alſo that compaſs in the Rocket with Braſs or Iron-Guns, and at the open paſſage of the Rocket, they put in Gun-powder; when fire comes at it, with terrible and frequent noiſes, they caſt Leaden Bullets forth upon the ſtanders by. I ſaw a Rocket of extraordinary largeneſs; it was ten foot long, and as wide as a mans head might go in: it was full of Fire-balls, Stones, and other matters, and put into a Gun, and bound to the lower part of the Croſs-yard of a Ship, which was tranſported every way with cords, as the Souldiers would have it; and in Sea-fights was levelled againſt the Enemies Gallies, and deſtroyed them all almoſt. Yet I will not omit to relate how

A Braſs-Gun once fired, may diſcharge ten times.

It is a new Invention, that a great Braſs-Gun, or a hand-Gun, may diſcharge ten or more Bullets one after another without intermiſſion. Make a dark Powder, ſuch as I uſed in the precedent part, and fill it thus: Firſt, put in a certain meaſure of Gun-powder, that being put in, may diſcharge the Ball: then put in the Ball, but a ſmall one, that it may go in looſely, and that the powder put in upon it, may come to touch the Gun-powder: then pour in this dark powder two or three fingers depth: then put in your Gun-powder, and your Bullet: and thus in order, one after the other, until the Gun ſeems to be full to the very mouth. Laſtly, pour in ſome of your dark clammy powder: and when you have levelled your Gun to the place appointed, put Fire to the mouth of it; for it will caſt out the Bullets, and then Fire for ſo long time as a man may diſcharge a hand-Gun at divers ſhoots. And thus with one Braſs-Gun you may diſcharge many times.

CHAP. V.

How Fire-Balls are made that are ſhot off in Braſs-Guns.

NOw I will ſhew how to make ſome Pot-compoſitions of Fire-balls that are ſhot out of Braſs-Guns; for divers uſes: either to burn ſhips, or to give light to ſome men in the night, or at Solemnities to caſt up into the Air, that they may ſeem to ſtream along like falling Stars.

Fire-balls flying in the Air,

that are made at Feſtival times. Grind one pound of Gun-powder, one third part of Salt-Peter, two ounces of Brimſtone, and as much Colophonia: mingle all theſe; ſow them up in Coffins made of thick Cloth in faſhion of Balls, and put them into hollow half circles made in Wood, and ſtrike them with a wooden Hammer that they may be hard as ſtones; then binde them about with cords, and dip them in Tar three or four times, they that may be well fenced about, leſt being diſcharged by the violence of a Braſs-Gun, they ſhould break in pieces. Laſtly, pierce them thrice thorow with a ſharp ſtick in the centre, and fill them with Gun-powder, and dry them

to

to be ſent aloft. When you would uſe them, raiſe your Braſs-Guns, or more conveniently the but end of your Guns, and take the Ball in a pair of Iron Pinchers, and give Fire to the holes, that it may take: when your are certain that it is lighted, with your right hand caſt it into the hollow of the Gun; and with your left, give fire to the loweſt touch-hole of the Gun: when it is fired, it rebounds; and being carried up by force of the Fire, it ſeems to run up and down in the Air, as I often ſaw it at Rome, and prepared it. They are made alſo

Another way.

Take Sea-pitch three parts, Turpentine-Roſin two parts, as much Brimſtone, one part Goats ſuet: powder what muſt be powdered; and melt in a Braſs Veſſel what will melt: put them together, and ſtir them with a wooden ſtick. Then caſt in Hards of Hemp or Flax, ſo much as will drink up all the mixture: then take the Braſs Kettle from the fire, and with your hands make Balls as big as you will, that they may be ſhot forth of Braſs-guns; and before they grow hard, thruſt them through with wooden ſticks, making ſmall holes: then put in Gun-powder broken with Brimſtone, and rowl them about upon a Table ſtrewed with Gun-powder, and through the holes faſten cotton Matches rolled in the Powder, as I ſhall ſhew: let theſe dry and grow hard in the Sun. The way to diſcharge them from a Braſs Gun is this: Chuſe ſuch as are commonly called Petrils, that are fitteſt for this uſe. The weight of the Gun-powder to be put into the Veſſel, muſt be one fifth part of the Ball, or a little more or leſs: for if you put in much, they are either caſt down by the too great violence of the Fire, or elſe they are put out as they flie, and do not anſwer our expectation. The Powder being put into the Veſſel, lay neither Hards nor Hemp upon it; but fit the Ball upon the Powder, that as that fires, it may fire the Ball, and ſend it forth. Here is a more noble Compoſition

Another way.

Take five parts of Gun-powder, three of Salt-Peter refined, Brimſtone two, Colophonia one half part, beaten Glaſs, common Salt, of Oyl of Peter, and of Linſeed Oyl, and refined *Aqua Vitæ* as much: powder what muſt be powdered, and paſs it through a fine Cieve: then melt it in a new earthen pot with burning coals, without flame: let them not ſparkle; for ſo the Compoſition may take fire. Then caſt in the Powders, that they may incorporate well together: then make round Coffins of Linen cloth as I ſaid, and fill them with the Gun-powder alone, and binde them with cords about: then wrap your Tow in the Compoſition, and make a Ball of the bigneſs you would have it; and if you will ſhoot it out of a Braſs Gun, binde it the thicker with little cords: then pierce your Ball through in many places with wooden pricks, that they may come at the powder that lieth in the middle: then put cotton Match through, that when it flies in the Air ſo violently, they may preſerve the fire. In another earthen Pot, melt Pine-Tree-Gum, Gun-powder and Brimſtone, and dip in your Ball into that liquor, that it may be all over-caſt with it. When you take it out, lift up your cotton Matches with a ſtick, and ſtrew them with Gun-powder. This Ball will ſorely puniſh the Enemies with a great noiſe, cracking and breaking aſunder: the Fire cannot be put out: it will burn all kinde of Furniture, Garments and what elſe, till it be all conſumed; for it will burn Armour ſo mightily, that unleſs they be taken off, they will burn the man.

CHAP. VI.

Of Compoſitions with burning Waters.

PHiloſophers ſeeking the Reaſon of Waters that lie hid above and under the earth, and are always hot, they ſay, Bitumen is the cauſe thereof, which being once on fire, hath this property, that it will not only not be put out, but if you caſt on water it will burn the more. The Mountain Chimæra burns always in Phaſelis, both night and day. *Gnidius Cteſias* ſaith, The fire of it is kindled by water, and is put out with Earth

Earth or Hay. In the ſame Lycia, *Vulcan's* Mountains, touched with a burning Torch, will ſo burn, that the very ſtones and ſand in Rivers are conſumed by them, and will burn in the midſt of the waters; and that fire is maintained by water. The hollow Cave in Nymphæum foreſhews terrible things to the men Apollonia: as *Theopompus* writes; it encreaſeth by ſhowres, and it caſts forth Bitumen, that muſt be tempered with that Fountain that cannot be taſted, otherwiſe it is more weak then any Bitumen is. Now I ſhall ſearch out the kindes of Bitumen. The firſt kinde is liquid, called Naphtha, we call it Oyl of Peter, which remains in ſtones and Kitram. This hath great affinity with Fire, and the fire will take hold of it every way at a great diſtance. So ſome ſay, That *Medea* burnt a whore, who, when ſhe came to ſacrifice at the Altar, the fire laid hold on her Garland. Another kinde is, that men call Maltha; for in the City of Comagenes Samoſata, there is a Lake ſends forth burning mud: when any ſolid thing toucheth it, it will ſtick to it; and being touch'd, it will follow him that runs from it. So they defended the Walls, when *Lucullus* beſieged them, and the Soldier burned in his Armor. Waters do kindle it, and only Earth can quench it, as experience ſhews. Camphire is a kinde of it: as Bitumen, it draws fire to it and burns. Piſſaphaltum is harder then Bitumen: both Amber and Jet are of this ſort; but theſe burn more gently, and not ſo much in the waters. Moreover, in regard it burns in the Water, it is Brimſtone; for no farter thing is dug forth of the Earth. To maintain this fire, it ſelf is ſufficient: it neither burns in the waters, nor is it put out with water, nor doth it laſt long; but, joyn'd with Bitumen, the fire will laſt always, as we ſee in the Phlegrean Mountains at Puteoli: and as fire, if Oyl be caſt in, burns the more; ſo when Bitumen is kindled, water caſt on, makes the flame the greater. Wherefore I ſhall make uſe of thoſe fires that burn in and above the waters. But I ſhall bring ſome examples how is made

A Ball that will burn under Water.

Firſt prepare your Gun-Powder; for this muſt be one Ingredient in all Compoſitions, and gives force to the reſt to burn vehemently. If it be in great corns, pown it well, and feirce it fine: to ſeven parts of this, add two parts of Colophonia, three of Salt-Peter, one of Brimſtone: pown them all together, and mingle them; ſprinkling on of Naphtha, or of liquid pitch Kitram; moyſtning them ſo long, until the powder preſſed in your hand will ſtay together. When theſe are well mingled, make trial by them: if it burn too vehemently, add more Colophonia, Salt-Peter and Brimſtone; but if but weakly, more Gun-powder. This mixture muſt be wrapt in ſtraw or linen-rags, or put into coffins made of the ſame things; and binde it as cloſe as you can with ſtraw, or little cords round about: then dip it into ſcalding pitch, and ſo let it dry: then wrap it again with ſtraw, and ſmeer it over with pitch, to keep it ſafe from water, and that it may not break aſunder by the violence of the fire. When it is well dried, and a little hole made in it, put in Gun-powder, and put fire to it: and when it begins to burn, ſtay but very little, and caſt it into the water. It will by its weight fall to the bottom, and the flames will ſtrive with the water, and drive them far from it: ſo it will appear to burn above, and is obſcured with a black ſmoak, that you will think you ſee the ſulphureous waters at Puteoli burning there. Being then made lighter by many turnings and windings, it will ſeem to aſcend to the ſuperficies of the water; which is a moſt pleaſant ſight: for you will think that the water burns; and you ſhall ſee two contrary Elements fighting together, yet to unite friendly until the matter be ſpent. Others wrap in cloth nothing but Gun-powder a whole handful; and this they binde in with cords: then they dip it in melted ſcalding pitch, and bound very faſt, and wrapt in many linen rags; they make a ſmall hole through it, and they place this in the Centre of the Ball we even now ſpake of, that when it comes to the ſuperficies of the water, the fire taking hold on the Powder within, breaks the Ball in pieces; and with a mighty noiſe, wounds all thoſe that ſtand neer it. Some make it

Otherwiſe.

They make a Compoſition of Brimſtone, Colophonia, Salt-Peter, Verniſh; and to this they add a fourth part of Gun-powder; and they add Venice-Tur-

Turpentine-Rosin, Oyl of liquid Vernish, Petroleum, Linseed Oyl, and the best refined *Aqua Vitæ*: with these they wet and sprinkle the dry Powders. I have seen this take fire more vehemently, and to cast the flames farther. To do

The same,

Take Mastick one part, Frankincense two, Grains of Vernish, Brimstone, Camphire, Gun-powder, of each three parts; of Colophonia six, Salt-Peter refined nine: pown them all together, and sift them; onely pown the Camphire mingled with the Salt; for that onely will not be powdered: strew them all about upon an earthen dish with a large mouth, and sprinkle them with Naphtha, or Vernish, or Linseed Oyl, and mingle them with your hands. Take out part of the Powder, and put it into a hollow Cane, and try it, whether it will burn to your minde; and if it burn too weak, put in more Gun-powder; if too vehemently, more Colophonia: always trying if it be as it should be. For to these Compositions, we add the same things to blunt the vehement burning of the Salt-Peter and the Gun-powder. Then make Coffins of Canvas, like Balls, and fill them with your Composition, and stuff it in well, and binde them well with cords round about. Then melt Brimstone, and let there be in it one fourth part of Gun-powder: stir them together with a wooden stick, and lute the Ball over with that liquor, that it may be well fenced and crusted. Then with a wooden prick make a hole in it in the middle to the Centre, and fill that with powder; and so put in fire, and it will burn under water: it may also be shot forth of brass Engines. I will shew you how to make

Balls and Pots to be cast forth of Ships.

The Ancients write, That *Alexander the Great* found out this Composition of Fires, to burn Bridges, Gates, Ships, and the like: but it will work now more vehemently, by reason of the Gun-powder added. Take Gun-powder, Salt-Peter, Brimstone, Pitch, Pine-Tree-Gum, Vernish in Grains, Frankincense, of each alike; Camphire one half: beat all these, and mingle them. Then take Oyl of Peter, liquid Vernish, Rosinous Turpentine, equal parts; and with these, being liquid, mingle all together, and fill Pots with them, to be cast among Ships and enemies: or, if you make a Ball of these, binde it hard about the head of a hammer, whose sharp-tooth'd end must be a foot long, and the handle three foot. If at a Sea-fight, any one with a light Boat strike this into a Ship of the enemies with one blow, he shall raise a mighty fire, that neither water nor any other thing will put out.

CHAP. VII.

How Balls are made of Metals that will cast forth fire and Iron wedges.

I Shall shew you how to make brittle Balls of Metal, that being filled with Gun-powder, and all the places of vent stopt, with the violence of the flame will flie into many pieces, and strike through those they meet with, and on all sides they will pierce through those who are not onely unarmed but armed men; and these are to be used in besieging of Cities: for cast amongst multitudes, they will wound abundance. The danger is seen among Herds of Cattle. Make then

Balls that will cast pieces of Iron a great way off.

Let a Ball of Metal be made a hand-breadth diameter, half a finger thick: the Metal is made of Brass three parts, Tin one part, to make it so brittle, that by force of fire it may flie in small pieces. To make the Ball more easily, make it of two half circles, for the charge is the less, and let them joyn together like a box, or let them screw one within another: let it be equally thick, that it may break in all parts alike. Then with a Nail drove through the middle, let it be fastened the better together, a finger thick, that it may break in all parts before it do in the joynts. Then make a little Pipe as big as a finger, and as long as ones hand, that it may come to the Centre of the Ball, and so stick forth beyond the Superficies, like a Pyramis, the Basis outward, the Point inward: sodder it fast to the Ball. The

The nail, as I said, must come forth on both sides; and to this fasten wires, that runs through iron piles, that have a large hole through them, that every wire may have thirty of them; that when the ball is broken by force of the fire, the wires of iron may break also, and the piles of iron may be thrown about, a great way, with such force, that they may seem to be shot forth of Guns and Ordnance. Lastly, let the Ball be filled with the best Gunpowder onely, but the pipe with that mixture that burns more gently, that when fire is put to it, you may hold it so long in your hand, until that slow composition may come to the centre; and then throw it amongst the enemies, for it will break in a thousand pieces; and the iron wires and pieces of iron, and parts of the Ball will fly far, and strike so violently, that they will go into planks or a wall a hand depth: These are cast in by Souldiers, when Cities are besieged, for one may wound two hundred men: and then it is worse to wound then to kill them, as experience in wars shews. But when you will fill the pipes, hold one in your hand without a Ball, full of the composition, and try it how long it will burn, that you may learn to know the time to cast them, lest you kill your self and your friends. I shall teach you how with the same Balls

Troops of Horsemen may be put into confusion.

There are made some of these sorts of Balls, that are greater, about a foot in bigness, bound with the same wire, but fuller of iron piles, namely with a thousand of them. These are cast amongst Troops of Horsemen, or into Cities besieged, or into ships with slings, or iron guns, which they call Petrels; and divers ways: for if they be armed with iron pieces, when they break they are cast forth so with the violence of the fire, that they will strike through armed men and horses, and so fright the horses with a huge noise, that they cannot be ruled by bridle nor spurs, but will break their ranks. They have four holes made through them, and they are filled with this said mixture, that being fired they may be cast amongst Troops of Horsemen; and they will cast their flames so far with a noise and cracking, that the flames will seem like to thunder and lightning.

CHAP. VIII.

How in plain ground, and under waters, mines may be presently digged.

TO dig Mines to overthrow Cities and Forts, there is required great cost, time, and pains, and they can hardly be made but the enemy will discover it: I shall shew how to make them in that champion ground, where both armies are to meet, with little labour, and in short time.

To make Mines in plain grounds where the Armies are to meet.

If you would do this in sight of the enemy (for they know not what you do) I shall first teach how. A little before night, or in the twilight, where the meeting shall be, or passage, or standing, there may pits be made of three foot depth, and the one pit may be distant from the other about ten foot: There fit your Balls about a foot in bigness, that you may fill the whole plain with them; then dig trenches from one to the other, that through them cotton matches may pass well through earthen pipes, or hollow canes; but fire the Balls at three or four places: then bury them, and make the ground even, leaving a space to give fire to them all at once. Then at the time of war, when the enemy stands upon the ground, then remove at your pleasure, or counterfeit that you fly from them; and cast in fire at the open place, and the whole ground will presently burn with fire, and make a cruel and terrible slaughter amongst them; for you shall see their limbs fly into the air, and others fall dead pierced through, burnt with the horrible flames thereof, that scarce one man shall scape. You shall make your Match thus: In a new Test let the best *Aqua vitæ* boyl with gun-powder, till it grow thick, and be like pap; put your matches into it, and role them in the mixture: take the Test from the fire, and strew on as much gunpowder as they will receive, and set them to dry in the Sun: put this

this into a hollow cane, and fill it full of gunpowder: or take one part refined salt-peter, brimstone half as much, and let it boyl in a new earthen pot, with oyl of linseed: put in your Match, and wet them well all over with that liquor, take them away and dry them in the Sun. But if you will make

Mines under the Water,

use this rare invention: You shall make your Mines where the enemies Galleys or Ships come to ride; you shall upon a plain place fit many beams, or pieces of timber, fastned cross-wise, and thrust through, or like nets; according to the quantity in the divisions, you shall make fit circles of wood, and fasten them, and fill them with gunpowder; the beams must be made hollow, and be filled with match and powder, that you may set fire to the round circles: with great diligence and cunning, smeer over the circles and the beams with pitch, and cover them well with it, that the water may not enter, and the powder take wet (for so your labour will be lost) and you must leave a place to put fire in; then sink your engine with weights to the bottom of the water, and cover it with stones, mud and weeds, a little before the enemy come. Let a Scout keep watch, that when their Ships or Galleys ride over the place, that the snare is laid; for fire being put to it, the sea will part, and be cast up into the air, and drown'd the Ships, or will tear them in a thousand pieces; that there is nothing more wonderful to be seen or done. I have tried this in waters and ponds, and it performed more then I imagined it would.

CHAP. IX.

What things are good to extinguish the fire.

I Have spoken of kindling fires, but now I shall shew how to quench them; and by the way, what things obnoxious to the fire, will endure it and remain. But first I will relate what our Ancestours have left concerning this business. *Vitruvius* saith, That the Larch-tree-wood will not burn, or kindle by it self, but like a stone in the furnace, will make no coles, but burn very slowly. He saith the reason is, That there is in it very little air or fire, but much water and earth, and that it is very solid, and hath no pores that the fire can enter at. He relates how this is known. When *Cæsar* commanded the Citizens about the Alps, to bring him in provision, those that were secure in a Castle of wood, refused to obey his commands: *Cæsar* bade make bundles of wood, and to light torches, and lay these to the Castle: when the matter took fire, the flame flew exceeding high, and he supposed the Castle would have fallen down; but when all was burnt, the Castle was not touched. Whence *Pliny* writes, The Larch-tree will neither burn to coles, nor is otherwise consumed by fire, then stones are. But this is most false: For seeing it is rosiny and oyly, if presently takes fire and burns; and being one fired, is hard to put out. Wherefore I admire, that this error should spread so far, and that the Town Larignum, so called from the abundance of Larch-wood, compassed about with fire, should suffer no hurt. Moreover, I read that liquid Alom, as the Ancients report, will stand out against fire: For wood smeered with Alom, and Verdigrease, whether they be posts or beams, so they have a crust made about them, will not burn with fire. *Archelaus* the General, for *Mithridates* made trial of it in a wooden Tower against *Sylla*, which he attempted in vain to set on fire: which I find observed by *Quadrigarius*, in his Annals. But this liquid Alom is yet unknown to many learned men: our Alum wants this property. But many say, that vinegar prevails against fire. *Plutarch* saith, That nothing will sooner quench fire then vinegar: for of all things, it most puts out the flame, by its extreamity of cold. *Polienus* reports, *Athenules*, when he was besieged by his enemies, poured out of brazen vessels, melted lead upon the engines, that were set to scale the place, and by this were the engines dissolved; but the enemies poured vinegar upon it, and by that they quenched the lead, and all things else that fell from the walls: and so they found vinegar to be the fittest to quench fire, and an excellent experiment, if things be wet with it. *Pliny* prayseth

seth the white of an egge to quench it, saying, that the white of an egge is so strong, that if wood be wet with it, it will not burn, nor yet any garment. *Hieron*, to cover scaling engines, used the raw hides of beasts new killed, as having force to resist fire; and the joynts of wood they fenced with chalk, or with ashes tempered with blood, or clay molded with hair or straw, and with sea-weeds wet in vinegar; for so they were safe from fire. *Carchedonius* was the first that taught men to cover engins and rams, with green hides. I have heard by men of credit, that when houses were on fire, by a peculiar property, the menstruous clothes of a woman that had her courses the first time, cast over the planks, would presently put out the fire. Thick and muscilaginous juyces are good against fire, as of Marsh mallows. Therefore *Albertus* writ not very absurdly, that if a man anoint his hands with juyce of Marsh-mallows, the white of an egge and vinegar, with alom,

He may handle fire without hurt.

And it is a thing that hath much truth in it. But I think that quick-silver killed in vinegar, and the white of an egge, and smeered on, can preserve any thing from fire.

CHAP. X.

Of divers compositions for fire.

I Shall speak of divers compositions for fire to be used for divers uses. But men say *M. Gracchus* was Author of this invention.

To make a fiery composition, that the Sun may kindle.

It consists of these things: Oyl of Rosinous Turpentine, of Quick-silver (otherwise then I shewed in distilling) of Juniper, of Naphtha, Linseed, Colophonia, Camphire; let there be Pitch, Salt-peter, and Ducks-grease, double to them all; *Aqua vitæ* rectified from all flegm. Pound them all, and mingle them; put them up in a glazed vessel, and let them ferment two moneths in horse-dung, always renewing the dung, and mingling them together. After the set time, put it into a retort, and distil it: thicken the liquor either with Pigeons-dung, finely sifted, or with gunpowder, that it may be like pap: Wood that is smeered over with this mixture, and set in the summer Sun, will fire of it self. Pigeons-dung easily takes fire by the Sun-beams. *Galen* reports, That in Mysia, a part of Asia, a house was so set on fire. Pigeons-dung was cast forth, and touched a window that was neer; as it came to touch the wood that was newly smeered with rosin, when it was corrupted, and grew hot, and vapoured at Midsummer, by heat of the Sun, it fired the rosin, and the window; then other places smeered with Rosin, took fire, and by degrees part of the house began to take hold; and when once the covering of the house began to flame, it soon laid hold of the whole house, because it hath a mighty force to inflame all. Ducks-grease is very prevalent in fire-works, and Physicians praise it extremely, that it is most subtile, penetrating and hot, it makes other things penetrate; and as it is most subtile and hot, so it takes fire vehemently, and burns. I shall shew how to distil

A most scalding Oyl.

When I would prepare the most excellent compositions of burning oyl, I distilled common oyl in a retort, but with great labour; yet what was distilled was thin, combustible, and ready to fire; that once kindled, it was not to be put out; and it would draw the flame at a great distance, and hardly let it go. But oyl of Linseed is stronger than it; for if you distil it often, it will have such a wonderful force to take fire, that it can hardly be shut up in a vessel, but it will draw the fire to it: and the glass being opened, it is so thin, that it will fly into the Air; and if the light of a candle, or of fire touch it, the Air takes fire, and the oyl fired by it, will cast the flame afar off, so vehemently, that it is almost impossible to quench it. It must be distilled with great cunning, lest the vessel over-heat, it should take fire within. Moreover,

Fire that is quenched with oyl, is kindled with water.

It is thus made: I ſaid that Naphtha will burn in water, and that Camphire is a kind of it. Wherefore, if you mingle brimſtone with it, or other things, that will retain fire; if you caſt in oyl or mud, it will quench it; but it revives and flames more, if you caſt in water. *Livy* relates, That ſome old women in their plays, lighting Torches made of theſe things, paſſed over Tyber, that it ſeemed a miracle to the beholders. I ſaid it was the property of Bitumen to take fire from water, and to be quenched with oyl. *Dioſcorides* ſaith, That the Thracian ſtone is bred in a certain River of Scythia; the name of it is Pontus: it hath the Force of Jet, they ſay it is enflamed by water, and quenched with oyl, like as Bitumen. *Nicander* ſpeaks of this ſtone thus:

If that the Thracian ſtone be burnt in fire,
And wet with water, the flame will aſpire;
But oyl will quench it. Thracian ſhepherds bring
This ſtone from th' River Pontus, Poets ſing.

Torches that will not be put out by the winds.

They are made with brimſtone, for that is hardly put out, if once kindled. Wherefore Torches made with wax and brimſtone, may be carried ſafely through winds and tempeſts. Theſe are good for Armies to march by, or for other neceſſary things. Others uſe ſuch: They boil the wick of the Torches in Salt-peter and water; when it is dried, they wet them with brimſtone and *Aqua vitæ*: of this mixture then they make their Candles, with brimſtone, and then with half Camphire, and Turpentine, two parts Colophonia, three of Wax; of this they make four Candles, and put them together: in the middle that is empty, they caſt in quick-brimſtone, and they will forcibly reſiſt all things. Or thus: Boil wicks of Hemp or Cotton in water, with Salt-peter; take them out and dry them: then melt in a braſs pot equal parts of brimſtone, gunpowder, and wax; when they are melted, put in your wicks to drink up part of the mixture; take them out, and to what is left in the kettle, add Gunpowder, Brimſtone, and Turpentine, of each a like quantity, of which mixture make your Torches, and joyn them together. Alſo there is made

A cord that ſet on fire, ſhall neither ſmoke nor ſmell.

When Souldiers or Hunters go ſecretly by day or night, they uſe ſometimes to make a Match, that being lighted, will neither ſmell near hand, nor far off, nor make any ſmoke; for wild Beaſts, if the Match ſmell, will ſent it, and run to the tops of the Mountains. Take a new earthen pot, and put into it a new cord ſo handſomely, that the whole pot may be filled: ſo laid in rounds, that no more can go in; cover it, and lute it well three or four times, that it may have no vent; for the whole buſineſs depends on this. Then make a fire round about it, by degrees, that firſt it may grow hot, then very hot, and laſtly red hot; and if ſometimes the ſmoke come forth, ſtop the chinks with clay ſtill; then heaped up under the coles, let it grow cold of it ſelf; and opening the Pot, you ſhall finde the Cord black, like a cole. Light this Cord, and it will neither ſmoke nor ſmell.

CHAP. XI.

Fire-compoſitions for Feſtival days.

I Have ſhewed you Terrible and Monſtrous fire-works, it is fit to ſhew you ſome to uſe at Solemn Times: not ſo much for uſe, as to give you occaſion to find out higher matters. I ſhall ſhew then how to make one,

That when a man comes into his Chamber, the whole Air may take fire.

Take

Take a great quantity of the beſt refined *Aqua vitæ*, and put Camphire into it, cut ſmall, for it will ſoon diſſolve in it: when it is diſſolved, ſhut the Windows and Chamber-doors, that the vapour that exhales, may not get forth: when the veſſel is full with water, let it boil with coles, put under, without any flame, that all the water may reſolve into ſmoke, and fill the Chamber, and it will be ſo thin, that you can ſcarce perceive it. Let ſome man enter into the Chamber with a lighted Candle in his hand, and the Air by the Candle light, will take fire all about, and the whole Chamber will be in a flame, like an Oven, and will much terrifie one that goes in. If you diſſolve in the water a little Muſk, or Amber-greeſe, after the flame you ſhall ſmell a curious ſent. Alſo there is made

Exceeding burning water:

Thus: Take old ſtrong black Wine, put into it quick Lime, Tartar, Salt, and quick-Brimſtone; draw out the water of them with a glaſs retort. This will burn exceedingly, and never ceaſe till it be all conſumed. If you put it into a veſſel with a very large mouth, and put flame neer it, it will preſently take fire: if when it is on fire you caſt it againſt a wall, or by night out at the window, you ſhall ſee the Air full of ſparks, and kindled with fires. It will burn, held in your hands, and yet will not ſcald you. Diſtil it once again, and it will burn the leſs. But if you take equal parts of quick Lime, and Salt, and ſhall mingle them with common Oyl, and make little Balls, and caſt them into the belly of the retort at the neck, and then ſhall draw forth the Oyl by a vehement fire; and mingling this Oyl again with Salt and quick Lime, ſhall diſtill them again, and ſhall do the ſame four times, an Oyl will come forth that will burn wonderfully, that ſome deſervedly call it infernal Oyl. A Solemn Pleaſant fire, is made for the Theater. If Camphire be diſſolved in *Aqua vitæ*, and with that Fillets, Papers, or Parchments, be ſmeered; and being dried again, be lighted, and ſhall fall from a loft; as they fall lighted through the Air, you ſhall ſee Serpents with great delight. But if you deſire

To caſt flame a great way,

Do thus: Beat Colophonia, Frankincenſe, or Amber finely, and hold them in the palm of your hand, and put a lighted Candle between your fingers; and as you throw the Powder into the Air, let it paſs through the flame of the Candle; for the flame will fly up high. If you will have that

Many Candles ſhall be lighted preſently,

on Feſtival Days, as I hear they are wont to do amongſt the Turks: You ſhall boil Brimſtone and Orpiment with Oyl, and in them let thred boil; when it is dry, bind it to the wicks of Candles, and let them paſs through; for when one head is lighted, the flame will run to them all, and ſet them on fire. Some call it *Hermes* his Oyntment. Any man may

Eating in the dark, caſt ſparkles out of his mouth.

It is pleaſant for the Spectators; and it is thus: Let a man eat Sugar-candy, for as he breaks it with his teeth, ſparkles will ſeem to fly out of his mouth; as if one ſhould rub a fire-brand.

CHAP. XII.

Of ſome Experiments of Fires.

I Will ſet down ſome Experiments, that are without the ranks of the reſt. I held it better to conceal them: but they may give you occaſion to think on greater matters by them. If you will

That Bullets from Braſs Guns, may enter deeper,

you may eaſily try this againſt a wall, or plank ſet up. Let the Ball rather go into the

the hollow of it, ſtreight, then wide: but wet it in Oyl, before you put it in, and ſo caſt it in: this Bullet ſhot off by force of fire, will go in twice as far as otherwiſe. The reaſon is eaſie: for the Oyl takes away the occaſion of the Airs breathing forth; for all vents being ſtopt, the flames ſtriving within, caſt forth the Bullet with more violence, as we ſhall ſhew more at large. So alſo will the Bullets of Braſs Guns penetrate with more force: and if you lard the Bullets, they will penetrate through Arms of proof. I can alſo by a cunning Artifice

Shoot a man through with a Bullet, and no place ſhall be ſeen where it went in, or came forth.

The minde of man is ſo cunning, that it hath invented a way to ſhoot a man quite through with a Bullet, and yet no mark of the Bullet ſhall appear, though all the inward parts be bruiſed and beaten through. Conſider, that what things are heavy, are ſolid, and ſo ſubtile, that they will penetrate and leave no marks, where they entred or came out; and they will do the ſame, though they be united, as if they were diſjoynted; and every part will act by it ſelf alone, as it would do being united. I have ſaid thus, to take away all occaſions from ignorant and wicked people, to do miſchief. I ſaw

A Gun diſcharge often, and yet no more powder was put in.

Famous Souldiers uſe this, not onely for Braſs Cannon, but for ſmall hand-Guns. It is thus: wrap a paper three or four times about the rammer that is put into the hollow mouth of the Gun, and drawing out the Gun-ſtick, fill that hollow place with Powder and Bullet; here and there let the Bullets be ſtopt in, and glewed faſt, that no ſciſſure or vent may appear in the paper. Firſt, let it be put into the Gun, but looſly, that the Powder put in above, may come to the vent-hole beneath: then put your meaſure of Powder in atop, and ſtamp in your Bullet, putting Gunpowder to the touch-hole; and putting fire to it, the upper Ball ſhall be ſhot off with its Powder: preſently thruſt in a ſharp inſtrument at the vent-hole, and make a hole in the Carteridge, and feed it with Powder, and put fire to it again; and in ſhort time it will diſcharge twice. I can

Blind your eyes with the ſmoke.

This may much profit, when enemies come to ſtorm a City. But firſt we muſt conſider the wind, that it may be on the backs of our men, and may carry the ſmoke into the faces of our enemies. Let there be meaſures made like lanthorns, ſo wide that they may go in at the mouths of the Braſs Guns: fill them with Powder of Euphorbium, Pepper, quick Lime, Vine-aſhes, and Arſnick ſublimate; and put them into the hollow of it, after the Gunpowder: for by force of the fire, will theſe paper-frames break; and the ſmoke of the Powder, if it come at the eyes of the enemies, will ſo trouble them, that caſting away their weapons, they can hardly ſave their eyes.

CHAP. XIII.

How it may be, that a Candle ſhall burn continually.

BEfore we end this Book, I ſhall diſcover, whether it may be that a Candle once lighted, ſhould never be put out; which ſeems very contrary to the reaſon of the corruptible things of this world, and to be paſt belief. But let us ſee firſt whether the Antients ever attempted it, or did it. We read in the Roman Hiſtories, that there was at *Rome*, in the Temple of the goddeſs *Veſta*; and of *Minerva*, at Athens; and of *Apollo*, at Delphi, a perpetual fire kindled. But this ſeems to be falſe; for I remember that I have read in many Authors, that this perpetual fire was always kept ſo by the Veſtal Nuns, that it ſhould never go out: as we find it in *Plutarch*, in the Life of *Numa*; and then in the time of the Civil War, and of *Mithridates*, it went out. At Delphi it was watched by widows, who took care, by always pouring in of

of Oyl, that it ſhould never go forth: but this failed, when the Medes burnt that Temple. Of the ſame ſort was that fire, God appointed by *Moſes* in the Scriptures. The fire ſhall always burn upon mine Altar, which the Prieſt ſhall always keep lighted, putting under wood day by day. Wherefore, the fire was not perpetual in the Temples of the gods of the Gentiles. Yet I read that about the Town Ateſte neer Padua, there was found an earthen Pitcher, in which there was another little Pitcher, and in that there was found a little light ſtill burning, which by the hands of ſome ignorant fellows, pouring it rudely forth, was broken, and ſo the flame was put out. And in our time, about the year 600. in the Iſland Neſis, that ſtands in Naples, there was a Marble Sepulchre of ſome Roman found, and that being opened, a Vial was found within it, in which there was a Candle: when this was broken, and it came to the light, it went out: it was ſhut in before the coming of our Saviour. Some others I have heard of, by report of my friends, that were found and ſeen with their eyes. Whence I collect this may be done, and was done by our Anceſtors. Let us ſee if we can do the ſame. Some ſay that Oyl of Metals may laſt long, and almoſt perpetually. But this is falſe: for Oyl of Metals will not burn. Others ſay, Oyl of Juniper from the wood will laſt long, becauſe the coles of that wood may be kept a whole year alive under aſhes. But this is moſt falſe, becauſe I kept a cole under aſhes, and it would not laſt two, nor yet one day; and the Oyl of the wood burns moſt vehemently, and is ſooner waſted then common Oyl. Some boaſt they have drawn Oyl from the incombuſtible ſtone, thinking that flame cannot conſume that: for a wick made thereof, will never be burnt; and yet burns always, if you put Oyl always to it: But if that be true, that the wick is not conſumed by fire, yet that follows not, that Oyl extracted from it, ſhould burn always and never waſte: And no man yet was ever ſeen to draw Oyl from the ſtone Amiantus that would burn. Others think that Oyl drawn from common Salt, will laſt always; for if you caſt Salt into Oyl, it makes the Oyl in the Lamp laſt twice as long, and not be conſumed, which I affirm to be true; therefore if Oyl be diſtilled from it, it will burn always and never waſte. Yet this follows not that Oyl drawn from Salt will burn continually; and Oyl diſtilled from it will burn no more than a ſtone of *Aqua fortis*, that parts Gold and Silver, of which kind it is. But it is an ignorant thing to imagine, that an Oyl may be made that ſhall burn always, and never conſume. Wherefore ſome other thing muſt be thought on. Some ſay (and they do not think fooliſhly) that fire in a Vial doth not always burn; but in the Vial there is ſome compoſition laid up, that ſo ſoon as it comes to the Air, preſently takes fire, and ſeems to burn onely at that time, yet it never burned before. This may be true: for as I often have laboured in Chymical matters, a glaſs well ſtopt, and forgot by me after the things were burnt in it; and being ſo left for many moneths, I may ſay, many years: at laſt, being opened, hath been ſeen to flame, and burn, and ſmoke. What I had burnt I had forgot, but they might be the ſame things, that I heard of by my friend, that had the ſame chance: for when he had boil'd Litharge, Tartar, quick Lime, and Cinnaber in Vinegar, until it was all evaporated; and then covering and luting the Veſſel well, he ſet it into a vehement fire, and when it was enough, he ſet it by till it was cold: after ſome moneths, when he went to open it to ſee his work, a flame ſuddenly flew out of the Veſſel, and ſet fire on ſome things, when as he thought of no ſuch matter: and the ſame hath happened to many more. Moreover, when I boiled Linſeed Oyl for the Preſs, when the flames took within, I covered the pot with clothes to put it out: after ſome time I opened the Veſſel, the Oyl at the Air coming to it flamed again, and took fire. But experience is againſt this opinion: For who ſaw a Candle ſhut up cloſe in a glaſs Vial, and to keep its flaming quality, and to give light? For the Ancients thought that the ſouls of the dead did always reſt in the grave, as the aſhes do; and that they might not lye in the dark, they endeavored all they could to ſend out this light, that their ſouls might enjoy light continually. Therefore we muſt think on another experiment, and make trial of it. But this muſt be held for a rare and firm principle in Natures ſhop, that the cauſe of wonders is becauſe there can be no vacuum; and the frame of the work will ſooner break aſunder, and all things run to nothing, then there can be any ſuch thing: Wherefore if a flame

flame were shut up in a glass, and all vent-holes stopt close, if it could last one moment, it would last continually, and it were not possible for it to be put out. There are many wonders declared in this Book, and many more shall be set down, that have no other cause. But how the flame should be lighted within side, this is worth the while to know; It must be a liquor or some subtile substance, and that will evaporate but little; and if then it can be shut up in the glass, when the glass is shut it will last always: which may easily be performed by burning-glasses, fire, industry, and cunning. It cannot be extinguished, because the Air can come in nowhere to fill up the emptiness of the Vial: The Oyl is always turned into smoke, and this, being it cannot be dissolved into Air, it turns to Oyl, and kindleth again, and so it will always by course afford fuel for the light. You have heard the beginnings; now search, labour, and make trial.

THE

THE THIRTEENTH BOOK OF Natural Magick:

Of tempering Steel.

THE PROEME.

I Have taught you concering monstrous Fires; and before I part from them, I shall treat of Iron Mines; for Iron is wrought by Fire: not that I intend to handle the Art of it; but onely to set down some of the choicest Secrets that are no less necessary for the use of men, in those things I have spoken of already, besides the things I spake of in my Chymical works. Of Iron there are made the best and the worst Instruments for the life of man, saith Pliny. *For we use it for works of Husbandry and building of Houses; and we use it for Wars and Slaughters: not onely hard by; but to shoot with Arrows, and Darts, and Bullets, far off. For, that man might die the sooner, he hath made it swift, and hath put wings to Iron. I shall teach you the divers tempers of Iron, and how to make it soft and hard. that it shall not onely cut Iron and other the hardest substances, but shall engrave the hardest Porphyr and Marble Stones. In brief, the force of Iron conquers all things.*

CHAP. I.

That Iron by mixture may be made harder.

IT is apparent by most famous and well-known Experience, that Iron will grow more hard by being tempered, and be made soft also. And when I had sought a long time whether it would grow soft or hard by hot, cold, moist or dry things; I found that hot things would make it hard and soft, and so would cold and all the other qualities: wherefore something else must be thought on to hunt out the causes. I found that it will grow hard by its contraries, and soft by things that are friendly to it; and so I came to Sympathy and Antipathy. The Ancients thought it was done by some Superstitious Worship, and that there was a Chain of Iron by the River Euphrates, that was called Zeugma, wherewith *Alexander the Great* had there bound the Bridge; and that the links of it that were new made, were grown rusty, the other links not being so. *Pliny* and others think, That this proceeded from some different qualities; it may be some juices or Minerals might run underneath, that left some qualities, whereby Iron might be made hard or soft. He saith. But the chief difference is in the water that it is oft plunged into when it is red hot. The pre-eminence of Iron that is so profitable, hath made some places famous here and there; as Bilbilis and Turassio in Spain, Comum in Italy: yet are there no Iron Mynes there. But of all the kindes, the Seric Iron bears the Garland; in the next place, the Parthian: nor are there any other kindes of Iron tempered of pure Steel: for the rest are mingled. *Justine* the Historian reports, That in Gallicia of Spain, the chiefest matter for Iron is found; but the water there is more forcible then the Iron: for the tempering with that, makes the Iron more sharp; and there is no weapon approved amongst them, that

is not made of the River Bilbilis, or tempered with the water of Chalybes. And hence are thoſe people that live neer this River called Chalybes; and they are held to have the beſt Iron. Yet *Strabo* ſaith, That the Chalybes were people in Pontus neer the River Thermodon. *Virgil* ſpeaks,

And the naked Calybes Iron.

Then, as *Pliny* ſaith, It is commonly made ſoft with Oyl, and hardened by Water. It is a cuſtome to quench thin Bars of Iron in Oyl, that they may not grow brittle by being quenched in Water. Nothing hath put me forward more to ſeek higher matters, then this certain Experiment, That Iron may be made ſo weak and ſoft by Oyl, that it may be wreſted and broken with ones hands: and by Water it may be made ſo hard and ſtubborn, that it will cut Iron like Lead.

CHAP. II.

How Iron will wax ſoft.

I Shall firſt ſay how Iron may grow ſoft, and become tractable; ſo that one may make Steel like Iron, and Iron ſoft as Lead. That which is hard, grows ſoft by fat things, as I ſaid; and without fat matter, by the fire onely, as *Pliny* affirms. Iron made red hot in the fire, unleſs you beat it hard, it corrupts: as if he ſhould ſay, Steel grows ſoft of it ſelf, if it be oft made red hot, and left to cool of it ſelf in the fire: and ſo will Iron grow ſofter. I can do the ſame divers wayes.

That Iron may grow ſoft,

Anoynt Iron with Oyl, Wax, Aſafœtida; and lute it over with ſtraw and dung, and dry it: then let it for one night be made red hot in burning coals. When it grows cold of it ſelf, you ſhall finde it ſoft and tractable. Or, take Brimſtone three parts, four parts of Potters Earth powdered: mingle theſe with Oyl to make it ſoft. Then cover the Iron in this well, and dry it, and bury it in burning coals; and, as I ſaid, you may uſe Tallow and Butter the ſame way. Iron wire red hot, if it cool alone, it will be ſo ſoft and ductible, that you may uſe them like Flax. There are alſo ſoft juices of Herbs, and fat, as Mallows, Bean-Pods, and ſuch-like, that can ſoften Iron; but they muſt be hot when the Iron is quenched, and Juices, not diſtilled Waters: for Iron will grow hard in all cold waters, and in liquid Oyl.

CHAP. III.

The temper of Iron muſt be uſed upon ſoft Irons.

I Have ſaid how Iron may be made ſofter, now I will ſhew the tempering of it, how it may be made to cut ſharper. For the temper of it is divers for divers uſes. For Iron requires ſeveral tempers, if it be to cut Bread, or Wood, or Stone, or Iron, that is of divers liquors; and divers ways of firing it, and the time of quenching it in theſe Liquors: for on theſe doth the buſineſs depend. When the Iron is ſparkling red hot, that it can be no hotter, that it twinkles, they call it Silver; and then it muſt not be quenched, for it would be conſumed. But if it be of a yellow or red colour, they call it Gold or Roſe-colour: and then quenched in Liquors, it grows the harder: this colour requires them to quench it. But obſerve, That if all the Iron be tempered, the colour muſt be blew or Violet colour, as the edge of a Sword, Raſor or Lancet: for in theſe the temper will be loſt if they are made hot again. Then you muſt obſerve the ſecond colours; namely, when the Iron is quenched, and ſo plunged in, grows hard. The laſt is Aſh colour: and after this if it be quenched, it will be the leaſt of all made hard. For example:

The

The temper of a Knife to cut Bread.

I have ſeen many ingenious men that laboured for this temper, who, having Knives fit to cut all hard ſubſtances, yet they could ſcarce fall upon a temper to cut Bread for the Table. I fulfilled their deſire with ſuch a temper. Wherefore to cut Bread, let the Steel be ſoftly tempered thus: Heat gently Steel, that when it is broken ſeems to be made of very ſmall grains; and let it be excellent well purged from Iron: then ſtrike it with a Hammer to make a Knife of it: then work it with the File, and frame it like a Knife, and poliſh it with the Wheel: then put it into the Fire, till it appear Violet-colour. Rub it over with Sope, that it may have a better colour from the Fire: then take it from the Fire, and anoynt the edge of it with a Linen-cloth dipt in Oyl of Olives, until it grow cold; ſo you ſhall ſoften the hardneſs of the Steel by the gentleneſs of the Oyl, and a moderate heat. Not much differs from this,

The temper of Iron for Wood.

Something harder temper is fit to cut wood; but it muſt be gentle alſo: therefore let your Iron come to the ſame Violet-colour, and then plunge it into waters: take it out; and when it appears Aſh-colour, caſt it into cold water. Nor is there much difference in

The temper for Inſtruments to let blood.

It is quenched in Oyl, and grows hard; becauſe it is tender and ſubtile: for ſhould it be quenched in water, it would be wreſted and broken.

The temper of Iron for a Sythe.

After that the Iron is made into a Sythe, let it grow hot to the colour of Gold, and then quench it in Oyl, or ſmear it with Tallow, becauſe it is ſubtile Iron; and ſhould it be quenched in waters, it would either crumble or be wreſted.

CHAP. IV.

How for all mixtures, Iron may be tempered moſt hard.

NOw I will ſhew ſome ways whereby Iron may be made extream hard: for that Iron that muſt be uſed for an Inſtrument to hammer, and poliſh, and fit other Iron, muſt be much harder then that.

The temper of Iron for Files.

It muſt be made of the beſt Steel, and excellently tempered, that it may poliſh, and fit other Iron as it ſhould be: Take Ox hoofs, and put them into an Oven to dry, that they may be powdered fine: mingle well one part of this with as much common Salt, beaten Glaſs, and Chimney-ſoot, and beat them together, and lay them up for your uſe in a wooden Veſſel hanging in the ſmoak; for the Salt will melt with any moiſture of the place or Air. The powder being prepared, make your Iron like to a file: then cut it chequerwiſe, and croſswayes, with a ſharp edged tool: having made the Iron tender and ſoft, as I ſaid, then make an Iron cheſt fit to lay up your files in, and put them into it, ſtrewing on the powders by courſe, that they may be covered all over: then put on the cover, and lute well the chinks with clay and ſtraw, that the ſmoak of the powder may not breath out; and then lay a heap of burning coals all over it, that it may be red-hot about an hour: when you think the powder to be burnt and conſumed, take the cheſt out from the coals with Iron pinchers, and plunge the files into very cold water, and ſo they will become extream hard. This is the uſual temper for files; for we fear not if the files ſhould be wreſted by cold waters. But I ſhall teach you to temper them excellently

Another way.

Take the pith out of Goats horns, and dry it, and powder it: then lay your files in a little Cheſt ſtrewed over with this Powder, and do as you did before. Yet obſerve this, That two files ſupernumerary muſt be laid in, ſo that you may take them forth at pleaſure: and when you think the Cheſt, covered with burning coals,

hath taken in the force of the Powder, take out one of the ſupernumerary Files, and temper it, and break it; and if you finde it to be very finely grain'd within, and to be pure Steel, according to your deſire, take the Cheſt from the fire, and temper them all the ſame way: or elſe, if it be not to your minde, let them ſtay in longer; and reſting a little while, take out the other ſupernumerary File, and try it, till you have found it perfect. So we may

Temper Knives to be moſt hard.

Take a new Ox hoof, heat it, and ſtrike it with a Hammer on the ſide; for the pith will come forth: dry it in an Oven; and, as I ſaid, put it into a pot, alwayes putting in two ſupernumeraries, that may be taken forth, to try if they be come to be pure Steel; and doing the ſame as before, they will be moſt hard. I will ſhew

How an Habergeon or Coat of Arms is to be tempered.

Take ſoft Iron Armour of ſmall price, and put it into a pot, ſtrewing upon it the Powders aboveſaid; cover it, and lute it over, that it have no vent, and make a good Fire about it: then at the time fit, take the Pot with iron pinchers; and ſtriking the Pot with a Hammer, quench the whole Herneſs, red hot, in the foreſaid water: for ſo it becomes moſt hard, that it will eaſily reſiſt the ſtrokes of Poniards. The quantity of the Powder is, that if the Harneſs be ten or twelve pounds weight, lay on two pounds and a half of Powder, that the Powder may ſtick all over: wet the Armour in water, and rowl it in the Powder, and lay it in the pot by courſes. But, becauſe it is moſt hard, leſt the rings of a Coat of Male ſhould be broken, and flie in pieces, there muſt be ſtrength added to the hardneſs. Workmen call it a Return. Taking it out of the Water, ſhake it up and down in Vinegar, that it may be poliſhed, and the colour be made perſpicuous: then make red hot a plate of Iron, and lay part of the Coat of Male, or all of it upon the ſame: when it ſhews an Aſh-colour, workmen call it Berotinum: caſt it again into the water, and that hardneſs abated; and will it yield to the ſtroke more eaſily: ſo of a baſe Coat of Male, you ſhall have one that will reſiſt all blows. By the mixture of Sharp things, iron is made hard and brittle; but unleſs ſtrength be added, it will flie in pieces with every blow: therefore it is needful to learn perfectly how to add ſtrength to it.

CHAP. V.

Liquors that will temper Iron to be exceeding hard.

I Said that by Antipathy Iron is hardened, and ſoftened by Sympathy: it delights in fat things, and the pores are opened by it, and it grows ſoft: but on the contrary, aſtringent things, and cold, that ſhut up the pores, by a contrary quality, make it extreme hard; they ſeem therefore to do it: yet we muſt not omit ſuch things as do it by their property. If you would have

A Saw tempered to ſaw Iron,

Make your Saw of the beſt Steel, and arm it well that it be not wreſted by extinguiſhing it. Then make a wooden Pipe as long as the Iron of the Saw, that may contain a liquor made of Water, Alom, and Piſs; Plunge in the red hot Iron, and take it out, and obſerve the colours: when it comes to be violet, put all into the liquor, till it grow cold. Yet I will not conceal, that it may be done by a Braſs wire bent like a bow, and with Powder of Emril and Oyl: for you ſhall cut Iron like Wood. Alſo, there are tempered

Fiſh-hooks to become extream hard.

The Hook ſerves for a part to catch Fiſh; for it muſt be ſmall and ſtrong: if it be great, the Fiſh will ſee it, and will not ſwallow it; if it be too ſmall, it will break with great weight and motion; if it be ſoft, it will be made ſtraight, and the Fiſh will get off.

off. Wherefore, that they may be ſtrong, ſmall, and not to be bended in the mouth; you ſhall thus temper them: Of Mowers Sythes make wire, or of the beſt Steel, and make Hooks thereof, ſmall and fine: heat them not red-hot in the Fire; for that will devour them: but lay them on a plate of red hot Iron. When they grow red, caſt them into the water: when they are cold, take them out and dry them. Then make the plate of Iron hot again, and lay on the Hooks the ſecond time; and when an Aſh colour, or that they commonly call Berotinus, appears, plunge them into the water again, that they may be ſtrong: for elſe they would be brittle. So you may make

Culters extream hard.

Albertus, from whom others have it, ſaith, That Iron is made more ſtrong, if it be tempered with juice of Radiſh, and Water of Earth-worms, three or four times. But I, when I had often tempered it with juice of Radiſh, and Horſe-Radiſh, and Worms, I found it alwayes ſofter, till it became like Lead: and it was falſe, as the reſt of his Receits are. But thus ſhall you make Steel extream hard, that with that onely, and no other mixture, you may make Culters very hard: Divide the Steel into very ſmall pieces like Dice, and let them touch one the other, binding Iron wires over them, faſtning all with an Iron wire: put them into the Fire till they grow red hot, and ſparkle, at leaſt fifteen times, and wrap them in theſe powders that are made of black Borax one part, Oyſter-ſhells, Cuttle-bones, of each two parts: then ſtrike them with a Hammer, that they may all unite together, and make Culters, or Knives, or what you will: for they will be extream hard. For this is the moſt excellent ſort of Steel, that onely tempered with waters, is made moſt hard. There is another, but not ſo good; and unleſs it be well tempered, it alwayes grows worſe. It is this:

To temper a Graver to cut Marble.

Make your Graver of the beſt Steel, let it be red hot in the Fire, till it be red or Roſe coloured; dip it into water, then take it away, and obſerve the ſecond colour. When it is yellow as Gold, caſt it into the water. So almoſt is

A Tool made to cut Iron.

When the ſame red-Roſe colour appears, plunge it into the water, or ſome ſharp liquor that we ſhall ſhew; and you muſt obſerve the ſecond yellow colour, or wheat colour, and then caſt it into the water. Theſe are the beſt

Tempers for Swords.

Swords muſt be tough, leſt whilſt we ſhould make a thruſt, they ſhould break; alſo, they muſt have a ſharp edge, that when we cut, they may cut off what we cut. The way is thus: Temper the body of it with Oyl and Butter, to make it tough; and temper the edge with ſharp things, that they may be ſtrong to cut: and this is done, either with wooden Pipes, or woollen Cloths, wet with Liquor: uſe it wittily and cunningly.

CHAP. VI.

Of the temper of a Tool ſhall cut a Porphyr Marble Stone.

OUr Anceſtors knew well to temper their Tools, wherewith they could eaſily cut a Porphyr Stone, as infinite Works teſtifie that were left to us: but the way was ſhewed by none, and is wholly concealed; which is a mighty diſgrace to our times, when we neglect ſuch rare and uſeful Inventions, and make no account of them. That we might be freed from this diſhonour, with great care, and pains, and coſt, I made trial of all things came to my hand, or I could think of, by divers wayes and experiments, that I might attain unto it: at laſt, by Gods great bleſſing, I found a far greater paſſage for to come to theſe things, and what exceeds this. And I will not be grieved to relate what I found out by chance, whilſt I made trial of theſe things.

things. The buſineſs conſiſted in theſe difficulties. If the temper of the Graver was too ſtrong and ſtubborn, with the vehement blow of the Hammer it flew in pieces: but if it was ſoft, it bowed, and would not touch the ſtone: wherefore it was to be moſt ſtrong and tough, that it might neither yield to the ſtroke, nor flie aſunder. Moreover, the juice or water the Iron muſt be tempered in, muſt be cleer and pure: for if it be troubled, the colours coming from heat could not be diſcerned: and ſo the time to plunge the Tools in would not be known, on which the whole Art depends. So then, cleer and purified juices will ſhew the time of the temper. The colours muſt be chiefly regarded: for they ſhew the time to plunge it in and take it out; and becauſe that the Iron muſt be made moſt hard and tough, therefore the colour muſt be a middle colour between ſilver and gold: and when this colour is come, plunge the whole edge of the Tool into the liquor, and after a little time, take it out; and when it appears a Violet-colour, dip it into the liquor again, leſt the heat, yet remaining in the Tool, may again ſpoil the temper: yet this we muſt chiefly regard, that the liquors into which the Iron is plunged, be extream cold; for if they be hot, they will work the leſs: and you muſt never dip an Iron into water, that other Iron hath been dipt in before; for when it is grown hot, it will do nothing: but dip it into ſome other that is freſh and cold; and let this in the mean time, ſwim in ſome glazed Veſſel of cold water, that it may ſoon grow cold, and you ſhall have it moſt cold for your work. Yet theſe are

The hardeſt tempers of Iron.

If you quench red-hot Iron in diſtilled Vinegar, it will grow hard. The ſame will happen, if you do it into diſtilled Urine, by reaſon of the Salt it contains in it. If you temper it with dew, that in the month of *May* is found on Vetches Leaves, it will grow moſt hard. For what is collected above them, is ſalt; as I taught elſewhere out of *Theophraſtus*. Vinegar, in which Salt Ammoniac is diſſolved, will make a moſt ſtrong temper: but if you temper Iron with Salt of Urine and Salt-Peter diſſolved in water, it will be very hard; or if you powder Salt-Peter and Salt Ammoniac, and ſhut them up in a Glaſs Veſſel with a long neck, in dung, or moiſt places, till they reſolve into water, and quench the red-hot Iron in the water, you ſhall do better. Alſo, Iron dipped into a liquor of quick Lime, and the Salt of Soda purified with a Spunge, will become extream hard. All theſe are excellent things, and will do the work: yet I ſhall ſhew you ſome that are far better.

To temper Iron to cut Porphyr Marble.

Take the fugitive ſervant, once received, and then exalted again, and ſhut it in a glazed Veſſel, till it conſume in Fire or water; ſo the Iron Tool will grow hard, that you may eaſily have your deſire: but if it be too hard, that it be too brittle, add more liquor, or elſe more Metal: yet take care of this alone, whilſt you have found the meaſure of your work: for the Iron will grow ſtrong and tough. The ſame alſo will be happily performed by the foul moyſture of the Serpent Python, and by the waſting thereof: for the ſalt gives force, and the fat toughneſs. And theſe are the beſt and choiceſt that I have tried in this kinde.

CHAP. VII.

How to grave a Porphyr Marble without an Iron tool.

SOme have attempted to do this without any Graver, but with ſtrong and forcible water; and this Argument moved them to it: When they ſaw Vinegar and ſharp juices to ſwell into bubbles, being caſt upon Marble, and to corrode it, they ſuppoſed that if they ſhould draw very ſtrong ſharp liquor from ſharp and corroding things, they might do the ſame work without labour. At laſt, thus they did it: Take a little Mercury ſublimate, and a little Salt Ammoniac, diſtil theſe as I ſhewed in Glaſs Stills: then take a little Verdigreaſe, Tin calcined, and of the fire-ſtone, powder all theſe with *Sal Gemmæ*, and common Salt, and Salt Ammoniac, and diſtil them, and pour the

the diſtilled liquor again upon the Feces, and diſtil it again, and do it again the third time: then keep the liquor in a Veſſel well ſtopt. When you go about your work, ſmear the Porphyr Marble with Goats ſuet, onely touch not thoſe parts you mean to have engraved: you muſt make a ledge about it, that when you pour on your water, it may not run off here and there; and the liquor poured on will eat moſt ſtrongly: when it ceaſeth to eat, caſt it away, and pour on freſh; and do this ſo often, till you have graved it ſo much as you pleaſe, and you have done.

CHAP. VIII.

How Iron may be made hot in the fire to be made tractable for works.

MAny ſeek moſt diligently, how by a ſecret Art Iron may be ſo tempered, that it may neither break, nor be ſhot through with Guns. But theſe men do not take care of what they have before them, and ſeek for what they have not; for would they conſider whilſt the Iron heats, the thing they ſeek for ſo eargerly, is before their eyes. I ſay therefore, That the reaſon why Swords break and flie in pieces, and breſts of Iron are ſhot through with Guns, is, becauſe there are flaws in the Iron, and it cleaves in divers places, and the parts are ill united; and becauſe theſe clefts are ſcarce viſible: this is the cauſe that when they are bended or ſtricken they break: for if you mark well, whenever Knives or Swords break in pieces, you ſhall alwayes finde theſe craks and flames, and the ſolid parts are not broken; and being bended, reſiſt. But when I ſought for the cauſe of theſe flaws, I found at laſt, that in Smiths Shops, where Iron is made hot, they heap up coals over the Iron, and the refuſe of coals; ſaying, The Iron will not heat ſo eaſily, if ſome rubbiſh of the coals and duſt be not heaped over it: and with this trumpery-duſt, there are always mingled ſmall ſtones, chalk, and other things gathered together in pieces; which, when they meet in the fire, they cauſe many knots outwardly, or cavities inwardly, and crack, that the parts cannot well faſten together. Whence, though the buſineſs be trivial and of ſmall regard, yet this is the cauſe of ſo great inconveniences that follow. Wherefore, to avoid this impediment, I thought on this courſe to be taken: I caſt my coals into a wooden bowl full of water: for they will ſwim on the top, (but the filth and bricks will fall to the bottom) thoſe that ſwim, I take out and dry them; and thoſe I uſe for my works. What a bleſſing of God this profitable Invention is! for thus men make Swords, Knives, Bucklers, Coats of Male, and all ſorts of Armour ſo perfect, that it were long and tedious to relate: for I have ſeen Iron breſts, that ſcarce weighed above twelve pound, to be Musket-proof. And if we ſhould add the temper to them, they would come to far greater effects.

CHAP. IX.

How Damask Knives may be made.

NOw whilſt I ſet down theſe Operations very pleaſant, namely, how Damask Knives may be made to recover their marks that are worn out, and how the ſame marks may be made upon other Knives. If then we would

Renew the waved marks of Damask Knives that are worn out,

poliſh a Poniard, Sword or Knife, very well with Powder of Emril and Oyl, and then cleanſe it with Chalk, that no part may be dark, but that it may gliſter all over: then wet it all with juice of Lemmons mingled with Tanners water, that is made with Vitriol: for when it is dry, the marks will all be ſeen in their places, and wave as they did before. And if you will

Make marks with Damask Knives,

And that ſo acurately, that you can ſcarce know them from Damask Knives: Poliſh a Knife very well, as I ſaid, and ſcowre it with Chalk: then ſtir with your hands, Chalk

Chalk mingled with water ; and touching it with your fingers , rub the edge of the Sword that was poliſhed , and you ſhall make marks as you pleaſe : when you have done,dry them at the fire or Sun:then you muſt have a water ready wherein Vitriol is diſſolved, and ſmeer that upon it : for when the Chalk is gone, it will dye it with a black colour. After a little ſtay, wet it in water, and waſh it off : where the Chalk was, there will be no ſtain ; and you will be glad to ſee the ſucceſs. You may with Chalk make the waving Lines running up and down. If any one deſires

To draw forth Damask Steel for work,

You may do it thus : for without Art it is not to be done. Too much heat makes it crumble,and cold is ſtubborn:but by Art,of broken Swords Knives may be made very handſomely ; and Wheels and Tables, that Silver and Gold wire are drawn through, and made even by,to be uſed for weaving : Put it gently to the fire,that it may grow hot to a Golden colour ; but put under the fire for aſhes, Gip calcined, and wet with water : for without Gip, when you hammer it, it will ſwell into bubbles, and will flie and come to be droſs and refuſe.

CHAP. X.

How poliſhed Iron may be preſerved from ruſt.

IT is ſo profitable to preſerve Iron from ruſt, that many have laboured how to do it with eaſe. *Pliny* ſaith, That Iron is preſerved from ruſt, by Ceruſs,Gip,and liquid Pitch. But he ſhews not how Ceruſs may be made : Yet thoſe that know how to make Oyl of Ceruſs without Vinegar, Iron being ſmeered therewith , is eaſily preſerved from ruſt. Some anoynt the Iron with Deers ſuet, and ſo keep it free from ruſt; but I uſe the fat ſubſtance in the Hoofs of Oxen.

THE

THE

FOURTEENTH BOOK

OF

Natural Magick:

I ſhall ſhew ſome choice things in the Art of Cookery.

THE PROEME.

THE Cooks Art hath ſome choice Secrets, that may make Banquets more dainty and full of admiration : Theſe I purpoſe to reveal , not that ſo I might invite Gluttons and Parasites to Luxury, but that with ſmall coſt and expence, I might ſet forth the curioſities of Art, and may give occaſion to others thereby to invent greater matters by theſe. The Art conſiſts about eating and drinking. I ſhall firſt ſpeak of Meats, then of Drinks ; and by the way I ſhall not omit ſome merry paſs-times , that I may recreate the Gueſts, not onely with Banquets, but alſo with Mirth and Delights.

CHAP. I.

How Fleſh may be made tender.

I Shall begin with Fleſh, and ſhew how it may be made tender, that Gluttons much deſire. I ſhall do it divers ways; Some that proceed from the kind of their death ; others from the ſecret properties of things : and they will grow ſo tender, that they will almoſt reſolve into broth. Then how whileſt the creatures are yet alive , they may be made tender. For example:

How to make Sheeps fleſh tender.

The Fleſh of creatures killed by their enemies, eſpecially ſuch as they hate and fear , will be very tender. *Zoroaſter* in his *Geoponicks* ſaith , that Sheep killed by Wolves, and bitten, their fleſh will be more tender , and ſo the ſweeter. *Plutarch* in *Sympoſiacis* gives the cauſe of it. Sheeps Fleſh,he ſaith,bitten by a Wolf becomes the ſweeter, becauſe the Wolfe by biting, makes the Fleſh more flaggy and tender. For the breath of the Wolfe is ſo hot , that the hardeſt bones will conſume in his ſtomach, and melt; and for this cauſe, thoſe things will the ſooner corrupt, that the Wolfe bites. And both Hunters and Cooks can teſtifie , that creatures killed divers ways , are diverſly affected. Some of theſe are killed at one blow, that with one ſtroke they lye for dead: yet others are hardly killed at many blows. And which is more wonderful, ſome by a wound given with the Iron weapon, have imprinted ſuch a quality upon the creature , that it preſently corrupted, and would not keep ſweet one day ; and others have killed them as ſuddenly , yet no ſuch quality remain'd in the fleſh that was killed , and it would laſt ſome time. Moreover, that a certain vertue , when creatures are ſlain or dye , comes forth to their skins, and hair, and nails, *Homer* was not ignorant of , who writing of skins and thongs ; A thong ſaith he of an ox ſlain by force, for the skins of thoſe creatures are rougher and ſtronger, when they dy not by old age or of diſeaſes, but are ſlain. On the contrary, ſuch as dye by the bitings of Beaſts , their hoofs will grow black, and their hairs fall off, and their skins will wither and flag. Thus far *Plutarch*. But I think theſe things

are falſe; for how ſhould Sheeps fleſh grow tender by the Wolfes breath, I underſtand it not: For other creatures that are killed by their enemies, and fleſh of a contrary nature doth alſo grow tender, where there are no hot vapours. But I think that the abſence of blood, makes the fleſh tender, for theſe reaſons. Quails and Pheaſants killed by Hawks, are very tender, but their hearts are found full of blood, and hard within them. Deer and Bores, killed by Dogs, are more tender; but harder if by Guns: and about, the heart the parts are ſo hard, that they can ſcarce be boiled. Fear of death drives the blood to the heart; the other parts are bloodleſs, as ſhall appear by the following experiments. As

How Geeſe, Ducks, Pheaſants, Quails, and other Birds become moſt tender.

This is eaſily done, if we hunt them and fly Hawks, and other birds of prey, at them; for whilſt they fight, they ſtrive to be gone, and they are ſometime held in the Falcons Tallents, and are wounded with divers ſtrokes; and this makes them ſo tender that it is wonderful: Wherefore, when we would eat crammed Birds, we ſhould purpoſely fly a Hawk at them, and being killed by them, ſhould grow more tender to be deſired. So

That Ox-fleſh may grow tender,

eſpecially of old Oxen; for they are dry and hard, and will not eaſily boil. The Butchers ſet hounds at them, and let them prey upon them, and they will for ſome hours defend themſelves with their horns: at laſt, being overcome by multitudes of Dogs, they fall with their ears torn, and bit in their skin; theſe brought into the ſhambles, and cut out, are more tender than ordinary. Some of them fighting openly with Bears, and ſometimes kill'd by them, if any of the body be left, it will be ſo tender that it will melt in a mans mouth. We may do the ſame, if we keep creatures ſometime in fear of death, and the longer you keep them ſo, the tender they will be. For

To make Hens tender,

we fright them off from high Towers; ſo we do Turkies, Peacocks: and when they cannot fly away by the weight of their bodies, for fear of death, with great pains and ſhaking of their wings, they fall down, that they may take no hurt by falling. Thoſe that are ſo killed with fear of death, grow very tender. So old Pigeons that by chance had fallen into deep pits, when they had long laboured, ſtruggling with their fluttering wings above the waters to ſave themſelves from drowning, with ſtrugling and fear of death they grew very tender; and by this accident we have learned, that when we would have them very tender, we purpoſely drive them in. *Horace* in Serm. ſaith almoſt the ſame.

How a Cock may grow tender,

if you muſt ſuddenly ſet him before your friends, and cannot help it. If that a gueſt do come by chance at night, and if the cock be tough, not fit to eat, drown'd him alive in Muſcadel out right, and he will ſoon come to be tender meat. We uſe to hang up Turkies alive by the bills, at the ſadle-bow when we ride; and theſe being thus rack't and toſſed with great pains, at the journeys end you ſhall find them dead, and very tender.

CHAP. II.

How fleſh may grow tender by ſecret propriety.

SOme things there are, that by ſecret propriety make fleſh tender. I ſhall record two prodigious miracles of Nature. One, that hung on a fig-tree,

Cocks fleſh grows tender,

and ſo ſhort, that it is wonderful: Another, that wild Cocks bound to a fig-tree, will grow

grow tame, and ſtand immoveable. *Plutarch* in his *Sympoſiacks*, gives the reaſon, why the Sacrifices of Cooks hung to a Fig-tree did preſently grow tender and ſhort; when the Cook of Ariſtian, amongſt other meats, offered to *Hercules* a tender dunghil-Cock, newly ſlain, that was extream ſhort: *Ariſtio* gives the reaſon of this tenderneſs to be the Fig-tree; and he maintained, that theſe killed, though they be hard, will grow tender, if they be hanged up on a Fig-tree. It is certain, as we may judge by ſight, that the Fig-tree ſends forth a vehement and ſtrong vapour. This alſo confirms that which is commonly ſpoken of Bulls, that the fierceſt of them bound to a Fig-tree, will grow tame preſently, and will endure to be touched with your hand, and to bear the yoke; and they puff out all their anger, and lay aſide their courage that thus fails them: for ſo forcible is the acrimony of the vapour of that Tree, that though the Bull rage never ſo much, yet this will tame him. For the Fig-tree is more full of Milky juice, then other Trees are; ſo that the Wood, Boughs, Figs, are almoſt all full of it: wherefore, when it is burnt, the ſmoke it ſends forth, doth bite and tear one very much; and a lixivium made of them burnt, is very detergent, and cleanſing: alſo Cheeſe is curdled with Fig-tree milk, that comes forth of the Tree, if you cut the green bark. Some would have the heat to be the cauſe, that the Milk curds, by the juice of the Fig-tree caſt in, which melts the watry ſubſtance of the humour; wherefore the Fig-tree ſends forth a hot and ſharp vapour, and that is digeſting, and dries and concocts the fleſh of Birds, ſo that they grow tender. So

Ox fleſh may be made tender,

If you put the ſtalks of wilde Fig-trees into the pot, wherein Ox fleſh is boil'd, they will be boil'd much the ſooner, by reaſon of the wood. *Pliny.* I gave you the reaſon of it before from Antipathy. The Egyptians alluding to this, when they would deſcribe a man that was puniſhed to the height, they painted a Bull tied to a wilde Fig-tree: For when he rores, if he be bound to a wilde Fig-tree, he will preſently grow tame. If we will have

Pulſe grow tender,

becauſe I ſee that there is great antipathy between Pulſe and Choke fitch, that deſtroys and ſtrangles them. Some call this Lions Herbe: for as a Lion doth with great rage and furiouſly kill Cattle and Sheep, ſo doth choke fitch all Pulſe: wherefore this Herbe put to Pulſe, when they boil, will make them boil the ſooner. But

To make meats boil the ſooner,

All kinds of Docks, though they be dry and juiceleſs, will do it, that all fleſh will grow tender, and become fit to eat. Wherefore the Antients always fed on it, that it might digeſt the meat in their ſtomacks, and looſe their bellies. Alſo the root of wilde Nettles boil'd with fleſh, will make them tender. *Pliny.*

CHAP. III.

How Fleſh may be made tender otherwiſe.

THere be other ways to make fleſh tender: Firſt, if fleſh killed be hung in the open Air, for they will grow tender, as beginning to corrupt, but they muſt not ſtay there ſo long till they corrupt indeed. Wherefore you muſt know their quality, which will keep longeſt, and which not. For example

Peacocks, Partridge, Pheaſants to be made tender.

Iſaac ſaith, That a Peacock killed will be kept two days, and three in winter, that the hard fleſh of it may grow ſoft. *Haliabas* hangs them up three days, hanging ſtones to their feet. *Savanrola* hangs them up ten days without weights. *Simeon Sethi* ſaith, That Partridge newly killed are not to be eat, but after a day or two, that they may loſe their hardneſs. Pheaſants in Summer hung up two days, and three days in winter, after they are killed, will be fit meat. *Arnolens.* And to avoid tediouſneſs, the ſame muſt be done with other fleſh. The like

That Birds may grow tender.

If you hang thoſe in Moon-light, that were killed in the night, they will grow more tender by boiling: For the Moon hath great vertue to make fleſh tender, for it is but a kind of corruption. Therefore wood, cut by Moon-light, will ſooner grow rotten, and fruit ſooner grow ripe. *Daphnis* the Phyſitian in *Athenæus.*

CHAP. IV.

How Shell-creatures may grow more tender.

BEfore I end to ſpeak of ways to make fleſh more tender; It will not be amiſs to make Crabs tender, and by another way then I ſhew'd before. How we may make

Crab-fiſh tender ſhel'd.

At Rome they do ſo, and it becomes pleaſant and excellent meat for Noble mens Tables. I ſpeak of thoſe Crabs bred in freſh waters: For at Venice I have eaten them that bred naturally tender in ſalt-waters; they call them commonly Mollecass but they are not ſo ſweet, as they are made at Rome; and they ask a Julius apiece. The way is, in the Moneths of *June*, *July*, *Auguſt*, and *September*, the Crabs uſe to caſt their ſhels, and put off their old coat; at that time fiſher-men ſearch about the banks of Rivers, where they find their holes and caves half ſtopt, and by that they know the time is come to caſt their ſhells; for the more their ſhells grow tender, the more they ſhut up their holes. They grow tender firſt about the feet, and by degrees it aſcends over their whole bodies. When they have taken them, they bring them home, and put them every one in ſeveral earthen pots; and they put in water, that it may cover half their bodies, and ſo they let them remain eight or ten days, changing the water every day, and their ſhells will grow more tender every day. When it is all ſoft, that it is tranſparent as Cryſtal, they fry them with butter and milk, and bring them to the Table. So

Squils grow tender.

We muſt do as we did to Crabs, for they caſt their ſhells as Crabs do: and Nature did this for ſome end; for when their ſhells are grown too thick and weighty, they can ſcarce crawl; wherefore by the excrements that go into it, that are conſumed to make a new ſhell within, the former that was made is broken, and falls off.

CHAP. V.

That living Creatures may be made more fat and well taſted.

I Shall endeavour to ſhew how living Creatures may be made more fat and well taſted, that we may ſet more favory meats before our gueſts. The Antients were not negligent in this matter: Wherefore you ſhall find many ways, not onely amongſt Cocks, but ſuch as write concerning Husbandry. Liccoriſh Gluttons found out the ways to fat Cattle, that they might feed on them more plentifully and daintily. Hence they called them cram'd, becauſe they were full fed, and had groſs bellies. Thoſe were called Bird-pens, where they fatted all ſorts of Birds. *M. Lelius Strabo*, was the firſt that appointed this; and he appointed Crammers to take care of them, and ordered how much every crammed bird ſhould eat. They will fat better in winter than in ſummer, becauſe Birds at that time of the year are beſt, being not ſo much waſted with yong; and Cocks will fat better then Hens, and ſuch as never trod, nor made eggs. In ſummer, when it is at an end, and the ſowre Grapes hang yet upon the Vines, they are at the beſt. I ſhall therefore teach.

How Hens and other Birds muſt be crammed.

Chooſe

Chooſe a place that is hot and obſcure; ſhut them all up apart, and ſo cloſe in their pens, that they cannot come together, nor turn; and make two holes, one for their heads to put forth, and the other for their tails, that they may both eat their meat and ſhite it out again when it is digeſted. Lay ſoft hay under them; for if they lye hard, they will never fat. Pull off all the feathers from their heads, thighs, and from under their wings; there, that it may breed no lice; here, that the dung corrupt it not. For meat, give them gobbets of Barley-Meal, made up with water; at the firſt for ſome time, more ſparingly, then after give them as much as they can digeſt; and you muſt give them no new meat, till you feel their crops that all the old is digeſted. When the Bird is full, let him go a while, not to wander abroad; but if there be any thing that urgeth him, he may pick it off with his bill. Let him not be ſet to fatting before five, or after twenty Moneths old. Yong Pigeons or Chickens, will fat better with their dams, if you pull off a few of their feathers, and bruiſe their legs, that they may ſtay in their places; and if you give meat plentifully to their dams, that they may feed themſelves, and their yong ones ſufficiently. Turtles are beſt fatted in ſummer: give them nothing but meat, eſpecially Miller-ſeed, for they much delight to eat that; but Geeſe in winter: They muſt be put up to fat four Moneths, you need give them nothing elſe but Barley-Meal, and Wheat-meal three times a day; ſo that you give them water enough to drink, and no liberty to walk about; thus they will fat in two Moneths. But tender Pullets will not be made fat in forty days. Ducks will grow fat with all nutriment, if it be abundance; eſpecially with Wheat, Millet-ſeed, Barley, and with Water-ſquils, Locuſts, and Creatures found in Lakes. *Columella.* Pheaſants, Partridges, Heath-cocks, and Turky-hens, will fat being ſhut up; and the firſt day they eat meat, the next ſet them water or good ſtrong wine to drink: Let their meat be raw Barley-Meal, made up with water, giving them it by degrees; or elſe broken and ground Beans and Barley ſod with water, and whole Miller-ſeed, Linſeed boil'd and dry, mingled with Barley-meal: to theſe you may add Oyl, and make gobbets of them, and give them to eat to the full, and they will grow fat at longeſt in ſixty days. Now I ſhall ſhew how

Four-footed Beaſts are fatted.

The Sow will ſooneſt fat, for in ſixty days ſhe will be fat. Firſt kept hungry three days, as all the reſt muſt be. She grows fat with Barley, Miller, Acorns, Figs, Pears, Cucumbers; reſt, and not wandring. But Sows will grow fatter by wallowing in the mire. Figs and Chick-peaſon, will fat them ſooneſt; and they deſire change of meats. *Varro.* The Sow is fed with Beans, Barley, and other Grain; for theſe will not onely fat them, but give them a good reliſh. The Olive, wilde Olive, Tares, Corn in ſtraw, Graſs: and they are all the better ſprinkled with brine; but the more effectual will they be, if ſhe faſt three days before. *Ariſtotle.* Beanhusks, and Coleworts are pleaſant meat for them; Salt put to them, will make them have a ſtomack, which in ſummer put into their troughs will ſeaſon their meat, and make them eat it up; and by that ſeaſoning of it, they will drink and eat the more. *Columella.* Oxen will grow fat with Corn and Graſs, Tares, ground Beans, and Beanſtalks: Alſo with Barley, whole or broken, and parted from the hulls: alſo by ſweet things, as preſſed Figs, Wine, Elm-boughs, and with a Lotion of hot water. *Ariſtotle.* We feed them at home with Wine of Surrentum, or elſe we put Calfs to two Cows, and thus being fed with abundance of Milk, they can ſcarce go for fat. Alſo in their cratches we ſtrew Salt ſtones, that they may lick them, and ſo drink, and they will grow exceeding fat and tender.

CHAP. VI.

How the fleſh of Animals is made ſweeter.

NOw ſhall I ſhew with ſome Meats, and Arts, How not onely the parts of Animals, but their whole bodies are made fat, tender, and more delicate. And firſt,

How

How to fat the Livers of Geese.

Our wise Ancestours, saith *Pliny*, who knew the goodness of a Goose liver, taught how by cramming to make it grow great; also taken forth, it is augmented by sweet Milk. And it is not without cause demanded, who was the first man that found out so profitable a thing: Whether it were *Scipio Metellus*, that was Consul, or *Mar. Sejus*, that in the same age was a Gentleman of Rome. *Palladius* taught the way how; when Geese have been fatting thirty days, if you desire to have their livers tender, you shall bruise old Figs, and steep them in water, and make gobbets of them, and feed the Geese with them twenty days together. But *Quintilius* way is, when they grow fat, you shall break dry wilde Radish in small pieces, and tempering them with water, give them this to drink for twenty days. Some, that the liver may be made great, and the Geese fat, feed them thus. They shut up the Goose, and cast to him Wheat steeped in water, or Barley the same way. Wheat makes him fat quickly, but Barley makes the flesh white. Let her be fed with the said grain, but severally with them both, for twenty days, giving to her twice a day a moyst Medicament made thereof; so that seven of those meats, may be given her for the first five days, and by degrees the days following, increase the number of these meats, until twenty five days be past, that the days in the whole may be thirty: and when they are over, heat Mallows, and in the decoction thereof, being yet hot, give her leaven moystned therewith; do so for four days, and in the same days give her water and honey; changing it thrice every day, not using the same again: and do this the days following, till sixty days: mingle dry Figs, bruised all this time with the said leaven, and after sixty days you may eat the Goose, and its liver, that will be white and tender. Which being taken forth, must be put into a large vessel, wherein there is hot water, that must be changed again and again. But the Bodies and Livers of the females are best, but let them be Geese not of one year, but from two years old to four. *Horace* in Serm. speaks of this,

Fat Figs do make the Goose white, Liver great.

And *Juvenal, Satyr* 5.

A Goose's Liver fed before him stood,
As big as a Goose, and to eat as good.

And *Martial*,

The Liver's greater then the Goose, that's true,
But now you wonder where this Liver grew.

Athenæus writes, That this was of great account at Rome. When you kill the Goose, take out the Liver quickly and cast it into cold water, that it may be solid; then fry it in Goose-grease, in a frying pan, and season it with spices. It is a dish for a Prince, and highly commended by many. So is

A Sows Liver fatted.

Pliny. There is art used for Sows Livers, as well as for Geese. It was the invention of *Marcus Apicius*, when they are fat with dry Figs, give them sweet wine to drink, and kill them presently. *Apicius.* Add to the Liver of a Sow fatted with Figs, Wine-pickle, Pepper, Time, Lovage, Suet, and a little Wine and Oyl. *Ætius.* If, saith he, any man feed that creature with dry Figs, the Sows Liver is preferred before all meat. I said out of *Aristotle*, that Figs and Chick peason will fat a Sow best. *Galen.* As whilst Sows are living, their Livers are fed for delight with dry Figs; so for Geese, I see their meats are moystned with milk, that their Livers may be not onely most pleasant meat, but may be fed exceedingly, and be most delicate. If you will

That

That Cattle may be more excellent to eat.

Cattle that use to feed on Masterwort, and to be first cleansed, will grow very fat, and their flesh will be exceeding sweet. *Pliny.* Whence it is that this Benjamin is not for many years to be found in Cyrene, because the Farmers, that hire the grounds, finding more gain by it, devour them by their Cattel. Moreover in India, and chiefly in the Country of the Prasii, it rains liquid honey; which falling down on the grass, and the tops of Reeds in the Lakes, is admirable food for Sheep and Oxen; and the Shepherds drive them thither, where most of this sweet dew falls from the Air, and there they are feasted with it, as with pleasant bankets: and they recompence their Shepherds with a pleasant reward; for they milk very sweet milk from them, and they have no need, as the Grecians do, to temper honey with it. *Ælian.* But

How Pullets are made most white, tender, and delicate,

Such as I use to set before my friends: The way is, I shut them up five days in chambers or cellars, and I give them a dish full of chippins of bread, wet with milk, and sometimes with honey: fed thus, they will grow as fat as great Sappers in Fig time, and so tender, that they will melt in your mouth, and they taste better by far then Pheasants, Heath-cocks, or Thrushes. And it seems the Antients knew this: For saith *Pliny*, when a crammed Hen was forbid to eat at supper, by the Laws of the Antients, they found out this evasion, to feed Hens with meats wet in milk; and so they were far more delicate to set on the Table. And *Columella.* They that will make Birds not onely fat, but tender, they sprinkle the foresaid Meal with water and honey new made; and so they fat them. Some to three parts of water, put one of good wine, and wet Wheat-bread, and fat the Bird; which beginning to be fatted the first day of the Moneth, will be very fat on the twentieth day.

CHAP. VII.

How the Flesh of Animals may be made bitter, and not to be eaten.

AGain, if we will that Flesh shall be rejected for the bitterness, and ill taste of it, we must do contrary to what hath been said: Or if we will not take the pains, we must wait the times that these creatures feed on such meats, as will do it, whereby sometimes they become venemous also. As if we would have

Deers flesh become venemous,

Simeon Sethi saith, That Deers flesh, that is catcht in summer, is poyson; because then they feed on Adders and Serpents; these are venemous creatures, and by eating of them they grow thirsty: and this they know naturally; for if they drink before they have digested them, they are killed by them: wherefore they will abstain from water, though they burn with thirst. Wherefore Stags-flesh, eaten at that time, is venemous, and very dangerous. Sometimes also

Partridge are naught,

Namely, when they eat Garlick. The Chyrrhai will eat no Partridge, by reason of their food; for when they have eaten Garlick they stink, and their flesh is stinking meat, that the Fowler will not eat them. So also

Quails, and Stares, are rejected,

at that time of the year, that black Hellebour is the meat they like onely. Wherefore, when Quails feed on Hellebour, they put those that feed on them into so great danger of their lives, that they swell and suffer convulsions, and are subject to vertigo's: Wherefore Millet-seed must be boil'd with them. Also

Birds are not to be eaten,

when

when the Gooſe-berries are ripe; for their Feathers will grow black thereby, and men that eat them, fall into ſcowrings. *Dioſcorides.*

The Eggs of the Barbel, or Spawn, not to be eaten

in *May*, becauſe they are dangerous; but the Eggs are not dangerous of themſelves, nor do they breed ſuch miſchiefs. For they do not do it always; for often you may eat them without danger: but they are onely then hurtful, when they feed on Willow-flowers, that fall into the waters. So are

Snails to be rejected,

when they ſtick faſt to briars and ſhrubs, for they trouble the belly and the ſtomack, and cauſe vomiting. *Dioſcorides.* And not onely theſe Animals themſelves cauſe this miſchief, but their excrements, as milk, honey, and the like. For

Milk muſt not be eaten,

when Goats and Sheep feed on green food, becauſe it will looſen the belly the more: but Goats-milk doth not try the belly ſo much, becauſe theſe Cattle feed on binding meats, as on the Oak, Maſtick, Olive-boughs, and Turpentine-tree. But in ſuch places where Cattle eat Scammony, black Hellebore, Perwincle, or Mercury, all their milk ſubverts the belly and ſtomack; ſuch as is reported to be in the mountains of Juſtinum: for Goats that eat black Hellebore, that is given them when the yong leaves come firſt out, their milk drank will make one vomit, and cauſeth loathing and nauſeating of the ſtomack. *Dioſcorides.* Alſo there is found

Honey that is venemous,

That which is made in Sardinia, for there the Bees feed on Wormwood. At Heraclia in Pontus, ſome times of the year, by a property of the flowers there, Honey is made, that they which eat it grow mad, and ſweat exceedingly. *Dioſcorides.* There are

Eggs laid that ſtink.

When there are no fruits nor herbs to be ſeen, then Hens feed on dung, and ſo do other Birds that lay Eggs. But then thoſe taſte beſt that feed on fat things, and eat Wheat, Millet, and Panick: but ſuch as eat Wormwood, their Eggs are bitter.

CHAP. VIII.

How Animals may be boiled, roſted, and baked, all at once.

I Have thus far ſpoken to pleaſe the palate. Now I ſhall repreſent ſome merry conceits to delight the gueſts, Namely,

How a Hog may be roſted, and boiled, all at once.

Athenæus in his ninth Book of *Dipnoſophiſtæ* (*Dalachampius* tranſlates it more elegantly) ſaying; There was a Hog brought to us, that was half of it well roſted, and half of it was ſoft boil'd in water; and the Cook had uſed great induſtry to provide it, that it ſhould not be ſeen in what part he was ſtuck: for he was killed with a ſmall wound under his ſhoulder, and the blood was ſo let out; all his inteſtines were well waſhed with wine; and hanging him by the heels, he again poured wine on him, and roſted him with much Pepper. He filled half the Hog with much Barley-flower, kneaded together with Wine and Barley; and he put him into an Oven, ſetting a braſs platter under him: and he took care to roſt him ſo leaſurely, that he ſhould neither burn, nor be taken up raw; for when his skin ſeemed ſomewhat dry, he conjectured the reſt was roſted. He took away the Barley-meal, and ſet him on the Table. So

A Capon may be boil'd, and roſted.

Put a Capon well pulled, and his guts taken out, into a ſilver diſh, and fill the one half

half of him with broth, and put him into an Oven; for the upper part will be roſted by the heat of the Oven, and the under part will be boiled. Nor will it be leſs pleaſant to behold.

A Lamprey fried, boil'd, and roſted all at once.

Before you boil your Lamprey, take out his bones, to make it more graceful, for his fleſh is full of bones; which you ſhall do with two little ſticks held in both hands; and faſtning the Lamprey in the middle, you ſhall cut his back-bone in the middle: then his head and end of his tail, about which the bones are heaped, by reaſon of the bones pulled out; being cut off, and his entrails taken forth, put him on a ſpit, and wrap about three or four times with fillets, all the parts that are to be roſted and fried, ſtrewing upon the one Pepper; and the fillets muſt be made wet in Parſley, Saffron, Mint, Fennel, and ſweet wine; or with water and ſalt, or broth, for the roſted parts; for the fried parts with Oyl: and ſo let him be turned, always moyſtning the fillets with ſtrewing on the decoction of Origanum: When part of it is roſted, take it from the fire, and it will be gallant meat; ſet it before your gueſts.

CHAP. IX.

Of divers ways to dreſs Pullets.

I Shall here ſet down divers ways to dreſs Chickens, that will be very pleaſant for the gueſts. So that

A boiled Peacock may ſeem to be alive.

Kill a Peacock, either by thruſting a quill into his brain from above, or elſe cut his throat, as you do for yong kids, that the blood may come forth: then cut his skin gently from his throat unto his tail; and being cut, pull it off with his feathers from his whole body to his head: cut off that with the skin, and legs, and keep it: Roſt the Peacock on a ſpit: his body being ſtuffed with ſpices and ſweet herbs, ſticking firſt on his breſt cloves, and wrapping his neck in a white linnen cloth, wet it always with water, that it may never dry: when the Peacock is roſted, and taken from the ſpit, put him into his own skin again; and that he may ſeem to ſtand upon his feet, you ſhall thruſt ſmall iron wires, made on purpoſe, through his legs, and ſet faſt on a board, that they may not be diſcerned, and through his body to his head and tail. Some put Camphire in his mouth; and when he is ſet on the table, they caſt in fire. *Platina* ſhews that the ſame may be done with Pheaſants, Geeſe, Capons, and other Birds; and we obſerve theſe things amongſt our Gueſts. But it will be a more rare ſight, to ſee

A Gooſe roſted alive.

A little before our times, a Gooſe was wont to be brought to the Table of the King of Arragon, that was roſted alive, as I have heard by old men of credit. And when I went to try it, my company were ſo haſty, that we eat him up before he was quite roſted. He was alive, and the upper part of him, on the outſide, was excellent well roſted. The rule to do it is thus: Take a Duck, or a Gooſe, or ſome ſuch lufty creature, but the Gooſe is beſt for this purpoſe; pull all the feathers from his body, leaving his head and his neck: Then make a fire round about him, not too narrow, leſt the ſmoke choke him, or the fire ſhould roſt him too ſoon; not too wide, leſt he eſcape unroſted. Within-ſide ſet every where little pots full of water, and put Salt and Meum to them. Let the gooſe be ſmeered all over with Suet, and well larded, that he may be the better meat, and roſt the better: put fire about, but make not too much haſt: when he begins to roſt, he will walk about, and cannot get forth, for the fire ſtops him: when he is weary, he quencheth his thirſt by drinking the water, by cooling his heart, and the reſt of his internal parts. The force of the Medicament looſneth and cleanſeth his belly, ſo that he grows empty; and when he is very hot, it roſts his inward parts. Continually moyſten his head and heart with a ſpunge. But when you ſee him run mad up and down, and to ſtumble (his heart then wants moyſture) wherefore take him away, and ſet him on the Table to your Gueſts, who will cry as you pull off his parts; and you ſhall almoſt eat him up before he is dead. If you would ſet on the Table

A yong Pigeon, with his bones pulled out,

You ſhall take out his bones thus: Put a yong Pigeon, his entrails taken forth and well waſh'd, for to lye a night and a day in ſtrong Vinegar: then waſh him well, and fill him with Spices and Herbs, and roſt him or boil him, as you pleaſe; either way you ſhall find him without bones. Of old, they brought to the Table

The Trojan Hog.

The Antient Gluttons invented, how a whole Ox or Camel ſhould be ſet on the Table, and divers other creatures. Hence the people had a Tale concerning the Trojan Hog; ſo called, becauſe he covered in his belly, many kinds of living creatures, as the Trojan Horſe concealed many armed men. *Macrobius* reports, 3. *Lib. Satur.* That *Cincius* in his Oration, where he perſwades to put in practiſe *Fannius* his Law concerning Moderation of Expence, did Object to the men of his age, that they brought the Trojan Hog to their Tables. Collers of Brawn, and the Trojan Hog, were forbidden by the Law of regulating expence. The Hog was killed, as *Dalachampas* tranſlates it, with a ſmall wound under his ſhoulder: When much blood was run forth, all his entrails were taken out, and cut off where they began; and after that he was often and well waſhed with wine, and hang'd up by the heels, and again waſh'd with wine, he is roſted with Muſk, Pepper: then the foreſaid dainties, namely, Thruſhes, Udders, Gnat-ſnappers, and many Eggs poured unto them, Oyſters, Scallops, were thruſt into his belly at his mouth: he is waſhed with plenty of excellent liquor, and half the Hog is filled with Polenta, that is, with Barley, and Barley-Meal, Wine, and Oyl, kneaded together, and ſo is he put into the Oven, with a braſs pan ſet under: and care muſt be had to roſt him ſo leaſurely, that he neither burn, nor continue raw: for when the skin ſeems crup, it is a ſign all is roſted, and the Polenta is taken away. Then a ſilver platter is brought in, onely gilded, but not very thick, big enough to contain the roſted Hog, that muſt lye on his back in it, and his belly ſticking forth, that is ſtuft with diverſity of goods; and ſo is he ſet on the Table. *Athenæus Lib. 9. Dipnoſophiſt.* But

That an Egge may grow bigger than a mans head.

If you would have an Egge ſo big, there is an Art, how it may cover other Eggs in it, and not be known from a natural Egge. You ſhall part fifty or more yelks of Eggs, and whites, one from the other: mingle the yelks gently, and put them into a bladder, and bind it as round as you can; put it into a pot full of water: and when you ſee it bubble, or when they are grown hard; take them out, and add the whites to them; ſo ſtirring the yelk, that they may ſtand in the middle, and boil them again; ſo ſhall you have an Egge made without a ſhell, which you ſhall frame thus. Powder the white Egge-ſhells, clean waſhed, that they may fly into fine duſt; ſteep this in ſtrong or diſtilled Vinegar, till they grow ſoft; for if an Egge ly long in Vinegar, the ſhell will diſſolve, and grow render, that it may eaſily be thruſt through the ſmall mouth of a glaſs: when it is thruſt in, with fair water it will come to its former hardneſs, that you will wonder at it: when the ſhells diſſolved are like to an unguent, with a Pencil make a ſhell about your Egge that is boiled, and let it harden in clear water: ſo ſhall you have a true natural Egge.

CHAP. X.

How Meats may be prepared in places where there is nothing to roſt them with.

SOmetimes it falls out that Men are in places where there want many things fit to provide ſupper; but where convenience wants, wit may do it: if you want a frying pan, you ſhall know

How to fry fiſh on a paper.

Make a frying pan with plain paper, put in oyl and fiſhes: then ſet this on burning coles, without flame, and it will be done the ſooner and better. But if you will

Roſt a Chicken without a fire; That

That Chickins may roſt whilſt we are in our Voyage: Put a piece of ſteel into the fire, put this into a Chicken that is pulled and his guts taken forth, and cover him well with clothes, that the heat breathe not out; and if he do ſmell ill, yet the meat is good. If you want Servants to turn the ſpit, and you would have

A Bird to roſt himſelf,

do thus: For the Bird will turn himſelf. *Albertus* writes, That a Bird called a Ren, that is the ſmalleſt of all Birds, if you put him on a ſpit, made of Hazel-wood, and put fire under, he will turn as if he turned himſelf. Which comes from the property of the wood, not from the Bird: and that is ſaid the Philoſopher ſaid; for if you put fire under a Hazel-rod, it will twiſt, and ſeem to turn it ſelf; and what fleſh you put on it, if it be not too weighty, will turn about with it. So

Eggs are roſted without fire.

Eggs laid in quick Lime, and ſprinkled with water, are roſted; for the Lime will grow as hot as fire. The Babylonians have their invention, when they are in the Wilderneſs, and cannot have an opportunity to boil Eggs; they put raw Eggs into a ſling, and turn them about till they be roſted. But if you

Want Salt

for your meats, the ſeed of Sumach ſtrewed in with Benjamin, will ſeaſon any thing. *Pliny.* If you want Salt, and would

Keep fleſh without Salt,

Cover what fleſh you will with honey, when they are freſh: but hang up the veſſel you put it into, longer in winter, a leſs time in ſummer. If you would have

That Salt-fleſh ſhould be made freſh.

Firſt, boil your Salted fleſh in milk, and then in water, and it will be freſh. *Apicius* You ſhall learn thus

To waſh ſpots from linnen clothes,

If you want Sope, for red wine will to ſtain them, that you can hardly waſh them out without it: But when it doth fall down and ſtain them, caſt Salt upon them, and it will take out the ſpots. If there want

Groundlings, how to make them.

Suidas ſaith, That when *Nicomedes*, King of Bithynia, longed for ſome of theſe Fiſh, and living far from the Sea, could get none; *Apicius* the glutton, made the Pictures of theſe Fiſh, and ſet them on the Table, ſo like, as if they had been the ſame. They were prepared thus: He cut the female Rape-root into long thin pieces, like to theſe Fiſh, which he boil'd in Oyl, and ſtrewed with Salt and Pepper, and ſo he freed him from his longing. As *Æthenæus* ſaith, in *Cuphron. Comic.* If there want fire, I have ſhewed already how to make divers ſorts of Artificial fires.

CHAP. XI.

Of divers Confections of Wines.

NOw I come to drink, for I have ſpoken of meat ſufficiently. And I will teach you to make many ſorts of wines, and that they may be pleaſant and odoriferous; for I have ſaid already what ways it may be made without pains. If you will

That your Wine ſhall ſmell of Muſk,

Take a glaſs Vial, and waſh it, and fill it with *Aqua vitæ*, and put into it a little muſk: ſtop the mouth cloſe, that it vent not; ſet it in the ſummer-Sun two weeks, always ſtirring the water. The uſe is, if you put a drop of this into a gallon of wine, all the wine will ſmell of Muſk; and ſo for Cinnamon or other Spices. So you may make

Hippocras Wine,

Take the ſweeteſt wine, we call it commonly *Mangiaguerra*, and into four Vials full of that, pour in two pounds of beaten Sugar, four ounces of Cinnamon, Pepper, and grains of Paradiſe, one ounce and half: let them infuſe one day; then ſtrain them: adde in the end in a knot a little Muſk, and it will be excellent Wine; or to powdred Sugar we put a little *Aqua vitæ*, wherein Cinnamon, Pepper, Grains of Paradiſe, and muſk have been infuſed, as I ſaid, and it is preſently provided, for it draws forth the quinteſſence. I ſhall ſhew how

Wine may freeze in Glaſſes.

Becauſe the chief thing deſired at Feaſts, is that Wine cold as ice may be drunk, eſpecially in ſummer; I will teach you how Wine ſhall preſently, not onely grow cold, but freeze, that you cannot drink it but by ſucking, and drawing in of your breath. Put Wine into a Vial, and put a little water to it, that it may turn to ice the ſooner; then caſt ſnow into a wooden veſſel, and ſtrew into it Salt-peter, powdred, or the cleanſing of Salt-peter, called vulgarly Salazzo. Turn the Vial in the ſnow, and it will congeal by degrees. Some keep ſnow all the ſummer. Let water boil in braſs kettles, then pour it into great bowls, and ſet them in the froſty cold Air, it will freeze, and grow harder than ſnow, and laſt longer.

CHAP. XII.

To make men drunk, and to make them loath Wine.

NOw we are come to ſpeak of Wine; before we paſs from it, I will ſhew you how to make your gueſts drunk; for drunkenneſs at Feaſts, increaſeth mirth: and then how to keep them ſafe from drunkenneſs, when they are often provoked ro drink healths, and to ſtrive who ſhall drink moſt. You may with theſe fruits

Make men drunk.

The fruits of the Arbute, and the Lote-tree, being eaten, will make men as though they were drunk: alſo Dates eat in too great a quantity, cauſe drunkenneſs, and the pain of the head; Sow-bread with Wine, makes a man drunk. Amber-greeſe, or Muſk, put in Wine, exaſperate drunkenneſs: The filth of a Dogs ear mingled with Wine, makes one drunk, as *Albertus* ſaith. But *Rhaſes*, out of whom he took it, ſaith, That Wine, wherein the ſeeds of Ricinus are infuſed, if any one drink it, it will inebriate them. Camels froth, drunk with water by a drunken man, will make him mad, as poſſeſſed with a Devil. Let theſe ſuffice, for I ſaid more in my deſcription of Plants. But on the contrary, theſe things will

Take away drunkenneſs.

Becauſe Hemlock, with Wine, is the cauſe of death by its venome, it hath been invented and found true, that Hemlock is the cauſe of life to others. *Pliny* ſeems to intimate as much. Alſo, venoms are prepared to drink, ſome taking Hemlock before, that they may drink, and die. If a man hath drunk too much Wine, that doth him hurt, he ſhall diſcuſs it thus: *Cato* bids, that at the beginning and middle of Supper, a man ſhould eat four or five tops of raw Coleworts, and it will take off his drunkenneſs, and remove the hurt comes by Wine, and will make a man as though he had neither eat nor drank. The Egyptians, before all meat, did eat boil'd Coleworts, and ſo provided themſelves for drink. Many to keep themſelves ſober, take Colewort-ſeeds firſt. The *Tibaritæ*, ſaith *Simæus*, before they drank, fenced themſelves by feeding on Coleworts. *Alexis.*

Yeſterday thou drank'ſt too much,
And now thy head doth ake: but ſuch
Diſtemper faſting cures; then
Eat boil'd Coleworts, drink agen.

And

And *Amphis.*

There is no means can half ſo well
As ſudden trouble drink diſpel.
For that will wonderfully cure:
Eat elſe Radiſh, that's as ſure.

They were wont in a veſſel of Amethyſt, to make another remedy for drunkenneſs, that they might drink Wine without danger. *Athenæus.* If you would otherwiſe hinder the vapours of the Wine, drink it well tempered with water; for they are ſooneſt drunk, that drink ſtrongeſt Wines. *Africanus* ſaith, If thou have drunk too much, eat before meat three or four bitter Almonds: they are drying, and will drink up the moyſture, and drive away drunkenneſs. *Plutarch* relates, That there was a Phyſitian with *Druſus*, who when he had firſt eaten five or ſix bitter Almonds, he always conquered at the duel of drunkenneſs. The powder of Pumex-ſtone will do as much, if the drinker take that firſt. *Theophraſtus* ſaith it is dangerous, unleſs he drink abundantly. So *Endemus* drank two and twenty Cups, at laſt he went into a Bath, and did not vomit; and ſupped, ſo as if he had drank nothing: for by its drying quality, it conſumes all the moyſture; and being caſt into a veſſel of new Wine that works, the heat of the Wine is ſtrait allayed. There are other things prepared by the Antients, to extinguiſh drunkenneſs, as to eat Lettice at the end of Supper, for they are very cold: we eat it now firſt, to procure appetite: whence *Martial* writes,

Why do we firſt our Lettice eat?
Our Fathers made it their laſt meat.

Dioſcorides ſeems to call it Acrepula, becauſe it hinders drunkenneſs. Leeks diſcuſs drunkenneſs: and he that takes Saffron before, ſhall feel no drunkenneſs. There are alſo Herbs and Flowers, that if you make Garlands of them, they will hinder drunkenneſs; as Violets, Roſes, and Ivy-berries. The aſhes of the Bill of a Swallow, powdred with Myrrhe, and ſtrewed into the Wine you drink, will keep you ſecure from being drunk. *Horus* the King of Aſſyria found out this invention. *Pliny.* I have ſaid how drunkenneſs may be diſpoſed: now I ſhall ſhew how men ſhall abſtain,

That love Wine, to refrain it,

There are many who when they have drank much Wine, that is the worſt thing in the world for them, fall ſick, and die of it. Now if you would refrain, and abhor Wine and ſtrong drink, becauſe the Fountain Clitorius is too far off; let three or four live eels, put into the Wine, ſtay there till they die. Let one drink of this Wine, who is given to drunkenneſs, and he will loath Wine, and always hate it, and will never drink it again: or if he do, he will drink but little, and with much ſobriety. Another way: waſh a Tortois with Wine a good while, and give one of that wine to drink privately, half a cupfull every morning for three days, and you ſhall ſee a wonderful vertue. *Myrepſus.* VVhen one complained before the King of the Indians, that he had Sons born to him, but when once they began to drink a little wine, they all died; *Jarchus* anſwered him thus: It is better for them that they died, for had they lived, they would have all run mad, becauſe they were begot of ſeed that was too cold. Therefore your children muſt abſtain from wine, ſo that they may not ſo much as deſire it. VVherefore if you have any more Sons born, obſerve this rule: ſee where an Owl lays her eggs; and boil her eggs rere, and give them your childe to eat; for if the childe eat them before he drinks wine, he will always hate it, and live ſober, becauſe his natural heat is made more temperate. *Philoſtratus*, in the life of *Apollonius*. *Democritus* ſaith, the deſire of wine is aboliſhed, with the watry juice that runs from Vines pruned, if you give it a drunkard to drink, who knows not of it.

CHAP.

CHAP. XIII.

How to drive Paraſites and Flatterers from great mens Tables.

IT is an eaſie matter to drive away from our Tables, and great mens Tables, all ſmell-feaſts, and cogging foiſting fellows, and this will make our gueſts very cheerfull and glad, to ſee ſuch Cormorants and Paraſites driven away, and derided by all men. When therefore he ſits down at Table,

That his hands may grow black when he wipes of the Napkin,

Beat Vitriol and Galls in a Mortar, put them in a narrow cloſe ſieve, that the powder may come forth very fine; with this wipe the Napkin, and ſhake it; that what ſticks not, may fall off: then rub it with your hands, till you find that it ſticks very faſt; then wiping and ſhaking off what ſtays not within, when the Paraſite hath new waſhed his hands and face, caſt to him the Towel to wipe himſelf; and when it is wet, it will make his hands and face as black as a cole, that will very hardly be waſh'd out with many waſhings. Being now waſh'd and wiped,

That he may not ſwallow the meat he chews.

And we ſhall make him feel the more pain, if he be any thing dainty. I find in writing, that if you ſtick under the Table a needle, that hath often ſowed the winding-ſheet of the dead; and do this privately before ſupper, the gueſts cannot eat, that they will rather loath the meat, than eat it. But experience proves this to be falſe and ſuperſtitious. *Florentinus* ſaith, That Baſel is an enemy to women, and that ſo much, that if it be put under the diſh, and the woman knows not of it, ſhe will never put her hand to the diſh, before it be taken away: but this is a moſt fearful lye. For a woman and Baſel agree ſo well, that they not onely ſow and plant them with great diligence in their Gardens, hanging in the Air; but they frequently feed on them in meats and ſallets. I have done it oft-times: I infuſed in a glaſs of wine one drachm of the root of an herb we call *Belladonna*, Fair Lady, not bruiſing it too much; and after twelve hours, or a little more, pour out this wine into another cup, and give him that muſt eat with you, in the morning a cup of it to drink: then detain him with you three hours; then call him to your Table, for the morſel he takes in his mouth, he can by no means ſwallow down, but he muſt hurt his chaps, and be in great pain, ſo that he can hardly drink. If you would have him eat or drink, let him gargle a good quantity of milk or vinegar in his mouth, and he will be as if he had ſuffered nothing at all. If we will

Drive Paraſites from great mens Tables,

we can eaſily do it thus: If we ſtrew ſome of the dry roots of Wake-robbin on the daintieſt meats, like Cinnamon or Pepper, in powder; when he takes a bit of it, it will ſo burn his chaps, and bite his mouth and tongue, and ſo fetch off the skin of his tongue, that he will ſo mump, and draw his chaps in and out, and gape, and make ſuch ſport, that will make people laugh: and the pain will not abate, until he hath anointed his chaps with butter and milk. Moreover, if you cut the leaves of Cuckowpint ſmall, and mingle them with ſallets; thoſe that eat of them, will have their mouths and tongues to drivel ſo much, with thick ſpittle, that they cannot eat till they have waſh'd it off. And it will be as good ſport, if you like not your gueſt.

That all things the ſmell-feaſt eats, may taſte bitter,

If you rub the edge of the Knife, and the Napkin he wipes his mouth with, with the juice of Colequintida, or fleſh of it, and lay it before him: For when he cuts bread with the Knife, or any things elſe, and ſhall touch his lips with the Napkin, it will give him ſuch a filthy and abominable taſte, that whatever he toucheth, taſteth, or licks, will have a moſt horrible ſmack with it; and the oftner he wipes his mouth, that he may wipe away this bitter taſte, the more will his mouth, palate, and jaws, be tormented, that he will be forced to forſake the Table. We can alſo delude him ſo, *That*

That when he drinks, the cup ſhall ſtick to his mouth, that he can hardly pull it off.

Beſmeer the cups mouth with the milk of Figs, and Gum-traganth diſſolved in it; for when they are dry, they will be clear: but when he drinks, the cup will ſtick ſo faſt to his lips, that when he hath done drinking, he can hardly pull it off. We ſhall do thus,

That fleſh may look bloody and full of worms, and ſo be rejected

by ſmell-feaſts. Boil Hares blood, and dry it, and powder it; and caſt the powder upon the meats that are boil'd, which will melt by the heat and moyſture of the meat, that they will ſeem all bloody, and he will loath and refuſe them. Any man may eat them without any riſing of his ſtomack. If you cut Harp-ſtrings ſmall, and ſtrew them on hot fleſh, the heat will twiſt them, and they will move like worms.

THE

THE

FIFTEENTH BOOK

OF

Natural Magick:

Shews to catch living Creatures with your hands, and to deſtroy them.

The Proeme.

WE ſhall ſpeak of Fawkning, that moſt men, and eſpecially great men, delight in. If you will catch living creatures, they are taken by force, or by craft. They are taken by craft, and killed. But how that may be done, ſhall be taught in Philoſophy, that ſhews the Nature and manners of living Creatures: For it is eaſie, when you know their Natures and their Manners, cunning may find ways to allure and take them. Firſt, I ſhall teach how to allure and take them, by meat, whiſtle, light, ſmell, love, and other frauds; or elſe to make them drunk, and take them, or to kill them with venome. I ſhall ſet down examples.

Chap. I.

With what meats divers ſorts of Animals are allured.

THere is nothing that more allures and draws on Animals, then meat and pleaſure, and love. Wherefore from theſe ſhall I begin. They follow meat for neceſſity; unleſs they would dye for hunger, they muſt ſearch for that: But divers Creatures feed on divers meats, and ſome of them feed on particular diet; and you may gueſs at the reſt thereby by your own reaſon.

The bait for a Sturgeon, or Whale-fiſh.

Sturgeons or Whales are allured with the Lungs of a Bull roſted, hung upon a line with a hook, caſt into the ſea; the Sturgeon preſently ſmels it, and being greedy of it, preſently ſwallows it down, and is caught with the hook: Oxen draw him to the ſhore. *Ælian.*

A bait for a Sargus.

The Sargus loves Goats exceedingly, as we ſhall ſhew, and hunts after the ſmell of them Wherefore the Fiſher-man wets his paſte in Goats blood, and caſts it into that part of the ſea where they haunt; and they are drawn thither by the ſent of it, as by a charm, and are catched with the hook. Moreover, if men faſten to the hook the bait that is made of a Mouſe fiſh ſalted, and move this gently in the ſea, the Sargi will come to it exceedingly, and gather about the hook for the love of it, and are eaſily caught by their greedineſs after the meat.

A bait for Thymalus.

Ticinus a River in Italy produceth a fiſh called Thymalus, that is not taken with the dainty baits that other fiſh are, but onely with the Gnat, an enemy to man; and ſhe delights in no other bait.

The bait for an Aulopius.

Coracini, blackfiſh, whoſe heads ſhine like Gold, allure the Aulopii; when they obſerve ſome ſuch dainty food, and they come to it rejoycing.

A

A Bait for Summer-whitings.

The Bait is made of the Purple fiſh; for this is bound faſt to the line, and this makes them ſwim to the Bait, becauſe they love it; and when any one of them by greedineſs lays hold of the Bait, the reſt will run after, and catch hold of the hooks, that for number you ſhall hardly draw them to you, ſo many will be hanged together by ſeveral hooks.

Bait for an Eel.

Eels lie in their holes; and the mouthes of their holes being ſmeered in the ponds with ſome odoriferous things, they are called forth as other Fiſh are. *Ariſtotle.* Yet *Pliny* ſaith falſe, that they are not allured, but driven away by the ſent of dead Eels. *Opianus* wittily ſaith, they are allured with garbage. Would you know

A Bait for Mullets.

Becauſe the Julides are a Bait almoſt for all Fiſh, or your groundlings or little Sea-ſquils; therefore they are a part of all Baits. Or, take of the Liver of the Tuny Fiſh, four drachms; Sea-ſquils, eight drachms; Seſamum-ſeed, four drachms; Beans ground, eight drachms; of raw Dog-fiſh, two drachms: pown all theſe, and make them up with new Wine diſtilled into balls, for good Baits. This is

A Bait for all Fiſh.

Tarentinus teacheth us this for all Fiſh: Take of the ſtrong Whale, eight drachms; yellow Butterflies, Anniſeed, Cheeſe of Goats Milk, of each four drachms; of Opoponax, two drachms; Hogs blood, four; as much Galbanum: pown them all, and pour on ſowre Wine: make cakes, and dry them in the Sun.

Chap. II.

How living Creatures are drawn on with the baits of love.

THere are two Tyrants that rule over brute Beaſts, meat, and pleaſure or love; not ſmell, nor ſound, nor fumes; nor do other things allure their minds beſides love: that we may ſay of wilde Beaſts as well as of man, Wanton love can do any thing with mortal Creatures. If we will

Take Cuttles with the bait of love;

To take Cuttles there needs neither wheels nor nets; but you may catch them thus, with baits of love, to trail the Female Cuttle; and the Male ſeeing it never ſo far off, ſwims preſently after, and faſteneth cloſe about her; and whilſt they thus embrace, the Fiſhers cunningly take them up.

To catch a Pollard or Cupito.

Ælian ſaith, that in the Grecian Gulph, the ſharp-ſighted Cupito is; but I have ſeen them taken in the Adriatick Sea by the fury of love. The Fiſher bindes the Female either to a long fiſh-pole, or to a long rope; but ſhe muſt be fair and fat: for the Male cares not for one that is lean: ſo is he drawn to the ſhore: or, he follows the net; and you muſt obſerve how to lay hold of him: for when the Female is drawn, the Males ſwim after her, being furiouſly in love: the Fiſherman caſts in his net, and takes them.

To catch a Scarus or Gilthead.

The Scarus of all Fiſh is the moſt laſcivious; his unſatiable deſire of the Female, is the cauſe that he is taken; cunning Fiſhermen that know this, lay ſnares for him thus: They catch the Female, and tie the top of her mouth to a rope, and they draw her alive through the Sea in ſuch places as they haunt: the Males are mad with luſt when they ſee her, and ſtrive to come at her, and uſe all ſuch means as lovers do: but when they come neer the net, the Fiſher draws in the Female, and the Males ſwimming in after her, are catcht. *Opianus.*

To catch Elephants.

There is a Pit made to catch Elephants, and four Females are put in to allure the Males; the Males come, and enter into the Pit: but thoſe that lie in wait, pull away the Bridge, and ſo they have the Elephants faſt. *Ælian.*

To catch a Nightingale.

The Female Nightingale is ſhut in a Cage, the Fowler counterfeits their note; the Males come when they hear it; and ſeeing the Female, the Male flies about till he fall into the net.

CHAP. III.

Alſo other Animals are called together by things they like.

ALſo, ſome Animals by Sympathy, are drawn by the love of ſome things, or of ſome other Creatures, which he that lays ſnares obſerving, uſeth ſuch meats for them, that whilſt they follow what they love, they may fall into the ſnares. If you would know how

To catch a Sargus;

It is a mad way to catch them. The Sargi love Goats unmeaſurably; and they are ſo mad after them, that when ſo much as the ſhadow of a Goat, that feeds neer the ſhore, ſhall appear neer unto them, they preſently leap for joy, and ſwim to it in haſte; and they imitate the Goats, though they are not fit to leap: and thus they delight to come unto them. They are therefore catch'd by thoſe things they ſo much deſire. Whereupon, the Fiſher putting on a Goats skin with the horns, lies in wait for them, having the Sun behinde his back, and paſte made wet with the decoction of Goats fleſh: this he caſts into the Sea where the Sargi uſe to come; and they, as if they were charmed, run to it, and are much delighted with the ſight of the Goats skin, and feed on the paſte. Thus the Fiſherman catcheth abundance of them. *Ælian.* *Opian* doth elegantly deſcribe it thus:

The Sargi doth run mad for love of Goats.

And a little after,

The cunning Fiſher hid in a Goats skin,
Makes two Goats horns unto his temples faſt;
His bait mix'd with Goats blood, he doth within
The Sea let looſe. The Sargus comes in haſte:
For of the bait he deerly loves the ſmell,
And the Goats skin doth tole him on as well.

How to catch Partridge.

Partridge love Deer exceedingly, and are coſened by their skin. Thus: If a man put on a Deer's skin, and the horns upon his head, and come cloſely to them; they ſuppoſing it is a Deer indeed, will entertain him, and draw neer to him; and will not flie away; and embrace him as much as one would do a Friend, come from a long journey: but by this great friendlineſs, they get nothing but nets and ſnares.

Catching of Buſtards.

Buſtards of all Birds are thought to be moſt in love with Horſes; and it appears, becauſe they cannot endure other living creatures, but when they ſee a Horſe, they will preſently flie to him, with great joy, and come neer to him. If a man put on a horſe skin, he may catch as many as he pleaſe; for they will come neer for love of the horſe. So almoſt are *The*

The Polypi or Pourcontrels taken.

The Polypi take delight in the Olive-tree, and they are oft-times found faſtned with their claws about the body of it: ſometimes alſo, they are found clapping about the Fig-tree that grows neer the Sea, and eating the Figs, ſaith *Clearchus.* Wherefore Fiſhers let down an Olive-bough into the Sea, where the Polypi uſe to be. In ſhort ſpace, without any labour, they draw up as many Polypi as they will. *Opian* handſomely deſcribes it thus:

The Polypus doth love the Olive-tree,
And by the ſpeckled leaves ('tis wonder) he
Is catch'd.——

Again,

He is enraged for the Olive-bough,
The wary Fiſher doth by this know how
To catch this Fiſh: for he doth binde about
A piece of Lead, an Olive-branch throughout:
The Fiſh lays hold, and will not let it go;
He loves it, and it proves his overthrow.

CHAP. IV.

What noiſes will allure Birds.

NOt onely love, but noiſes and Muſick will draw them: and each creature delights in ſome ſpecial noiſe. Firſt,

The Dolphin loves the Harp.

And with this Muſick is he moſt delighted, as alſo with the ſound of the Organs. Hence *Herodotus* firſt, and others from him, report, that *Arion* was carried to Tenarus on a Dolphins back: for when the men of Corinth caſt him into the Sea, he begged that he might have his Harp with him, and might ſing one ſong as he was thrown in. But a Dolphin took him, and brought him to Tenarus. *Opian.*

A Wolf is charmed by a Minſtrel or Flute.

A Minſtrel at Pythiocara, when he ſang and played very pleaſantly, he made the Wolves tame. *Ælian.*

Horſes delight in the Muſick of the Flute.

The Horſes of Lybia are ſo taken with the noiſe of the Flute, that they will grow tractable for mans uſe thereby, and not be obſtinate. Shepherds make a Shepherds Pipe of Rhododaphne; and by piping on this, they will ſo delight Horſes, that they will run after them: and when the Shepherds play on, the Horſes will ſtand ſtill, and weep for joy. *Euripides* ſaith, that Shepherds provoke Mares to take Horſe, by playing on a Pipe; and the Horſes are ſo provoked to back the Mares.

Stags and Bores are taken with a Pipe.

It is a common ſaying among the Tyrrheni, that Bores and Stags are taken moſt with them by Muſick: which ſo comes to paſs. Nets being pitch'd, and all things made ready for to enſnare them, a man that can play well on the Flute, goes through dales and hills, and woods, and plays as he goes, neer their haunts: they liſten exceedingly after it, and are eaſily taken by it: for they are ſo raviſhed, that they forget where they are. And thus by delight they fall into the ſnare, and are taken. *Ælian.*

The Paſtinaca is taken by dancing and Muſick.

When the Fiſherman ſees the Paſtinaca, or Ray, ſwimming, he leaps ridiculouſly in his

his Boat, and begins to play on the Pipe: the Paſtinaca is much taken with it, and ſo comes to the top of the water, and another lays hold of him with his Engine.

Grampels by Muſick are enticed on land.

Fiſhermen catch Grampels by Muſick: ſome lie hid, others begin to play with the Pipe: when the Grampels hear the Muſick, they preſently come forth of their holes, as if they had been charmed; and they are ſo raviſhed, that they will come out of the waters. Theſe go back and play on the Pipe, the others run and catch them on dry Land.

CHAP. V.

Fiſhes are allured by light in the night.

AMongſt the many Arts to deceive Animals, Light is one: for at night, when ſome Fiſh reſt, Fiſhermen carrying Light in their Boats, draw theſe Fiſh to them, and ſo ſtrike them with a three-forked Spear, or catch them alive. Which *Opian* knew.

Either at noon, or when the Sun doth ſet,
Are Fiſhes caught, or elſe in the dark night,
By burning torches taken in the Net;
For whilſt they take ſuch pleaſure in the Light,
The Fiſherman doth ſtrike them with his dart,
Or elſe doth catch them then by ſome ſuch Art.

Many men have been much troubled how to make a Fire or Light under Water, that Fiſhes ſeeing it afar off, might ſwim to it. I have done it thus: I made a Pillar of Braſs or Lead, three or four foot diameter: it was ſharp or pyramidal below, that it might ſink the better into the deep; and it was bound about with iron hoops, that being ſunk by its weight, it might be drawn under the water: I ſet on the top a Pipe that was fifteen or twenty foot long, and one foot broad. The middle of this Pillar had many open windows, five or ſix, and theſe were Glaſs-windows, well poliſhed and fitted to them, and the joynts were well glued with Pitch, that no water could come in. I ſunk the Pillar by its weight in a place fit for it; but the mouth of the Pipe ſtood at leaſt two foot above water: then I let down a lighted Candle into the belly of the Pillar by the Pipe, with a cord; and it was ſo provided, that what motion ſoever it had, it ſhould always ſtand upright. The Light paſſed through the windows into the waters, and by reflection made a Light that might be ſeen under water very far: to this Light, abundance of Fiſh came, and I catched them with Nets.

CHAP. VI.

That by Looking-Glaſſes many Creatures are brought together.

IF Females be wanting, Looking-Glaſſes may ſerve to make reflexion of themſelves; ſo theſe Creatures, deluded by their own pictures, are drawn thither. Alſo Liquors may ſerve inſtead of Glaſſes.

The Cuttle is taken with a Glaſs.

Glaſſes put into wood are let down by a cord by the Fiſhermen into the waters; and as they flote, they are drawn by degrees: the Cuttle ſeeing himſelf in it, caſts himſelf at his own image; and laying faſt hold of the wood with his claws, whilſt he looks upon his own picture as enamored by it, he is circumvented by the Net, and taken.

A Jackdaw is taken with a Looking-Glaſs.

Jack-

Jackdaws love themſelves: the Fowler following to take them, invents ſuch wayes; for where he ſees they flock, there he ſets a Baſon full of Oyl; the curious Bird coming thither, ſits on the brim of the Veſſel, looking down to ſee her own Picture; and becauſe ſhe thinks that ſhe ſees another Jackdaw, ſhe haſtens to flee down, and ſo falls into the Oyl, and the thick Oyl ſticks to her, and ſo ſhe is catched without ſnares or nets.

How Quails are taken with a Looking-Glaſs.

Clearchus ſaith, that Quails ſpend their ſeed not only when they ſee the Females, but when they hear their cry alſo. The cauſe is the impreſſion in their mindes, which you ſhall know when they couple, if you ſet a Looking-Glaſs againſt them, and before that a Gin: for running fooliſhly to their picture in the Glaſs, they ſee they are catcht. *Athenæus* and *Euſtathius*.

CHAP. VII.

How Animals are congregated by ſweet ſmells.

THere are many odours, or other hidden qualities, that gather Animals together, from the particular Nature of things, or of living Creatures. I ſhall ſpeak of the ſmelling odours and other aliments that they much deſire. As,

The Unicorn is allured by ſent.

Tretres writes, that the Unicorn ſo hunts after young Virgins, that he will grow tame with them; and ſometimes he will fall aſleep by them, and be taken and bound. The Hunters clothe ſome young luſty Fellow in Maids clothes; and ſtrewing ſweet odours on him, they ſet him right againſt the place where the Unicorn is, that the winde may carry away the ſmell to the wilde Beaſt: the Hunters lie hid in the mean time. The Beaſt, enticed with the ſweet ſmell, comes to the young man: he wraps the Beaſt's Head in long and large ſleeves: the Hunters come running, and cut off his Horn.

To make Wheezles come together.

The Gall of a Stellio beaten with water, will make Wheezles come together, ſaith *Pliny*. Alſo, the wiſe Plinianiſts write, that with the Gall of a Chamælion caſt into water, Wheezles will be called together.

To make Mice come together.

If you pour thick lees of Oyl into a Diſh, and ſet it right in the houſe, they will ſtick to it. *Palladius*. But *Anatolius* ſaith, if you pour Oyl-Lees into a Brazen Baſon, and ſet it in the middle of the houſe, all the Mice at night will meet together.

To make Fleas come together.

The fat of a Hedge-hog boyl'd in water, and taken off as it ſwims on the top; if you anoynt a ſtaff with it, and ſet it in the houſe, or under your bed, all the Fleas will come to it. *Rhaſis*.

To bring Frogs together.

The Gall of a Goat ſet into the earth in ſome Veſſel, is ſaid to bring all the Frogs together, if they can finde any delight therein.

CHAP.

CHAP. VIII.

How Creatures, made drunk, may be catch'd with the hand.

I Have ſaid what draws them, now I ſhall ſay what will make them drunk. There are many ſimples that will do it, that you may take them with your hands, whilſt they ſleep: and becauſe there are divers Animals that are made drunk with divers things, I ſhall ſpeak of them in order. And firſt,

How Dogs are made drunk.

Athenæus ſaith, that Dogs and Crows are made drunk with an Herb called Æuutra: but *Theophraſtus*, from whom he had it, ſaith, that the Root Æuothera, given with Wine, will make them more tame and gentle. Whence Æuutra comes, by corruption of the word. *Theophraſtus* his Æuothera is Rhododaphni, as I ſaid. So

Aſſes are made drunk.

And when they ſleep, they are not onely taken; but, if you pull off their skins, they will ſcarce feel you, nor awake; which comes by Hemlock: for when they have eaten that, they fall ſo faſt aſleep, that they ſeem ſtupid and ſenſleſs. So

Horſes are made ſtupid

by Henbane ſeed, if you give it them with Barley; and they will be ſo faſt aſleep, that they will be half dead, half a day. A certain Cheat, who wanted money on his way, caſt this ſeed to ſome of his company; and when they lay almoſt dead aſleep, and they were all much troubled for them, for a reward he promiſed to help them; which received, he put Vinegar to their Noſtrils, and ſo revived them. Whereupon they went on their journey. So

Libards are made drunk.

Opian teacheth the way, and how they are taken when they are drunk. In Africa, ſo ſoon as they come to a Fountain where the Libards uſe to drink every morning, there the Hunters in the night bring many veſſels of Wine: and not far from thence, they ſit covered in blankets. The Libards, very thirſty, come to the Fountain, and ſo ſoon as they have drunk Wine, that they delight in, firſt they leap, then they fall faſt aſleep on the ground; and ſo they are eaſily taken. If you deſire to know how

Apes are taken, being drunk;

Athenæus writes, that Apes will drink Wine alſo; and being drunk, are catch'd. And *Pliny* ſaith, that four-footed Beaſts, with Toes, will not encreaſe, if they uſe to drink Wine. So

Sows run mad,

eating Henbane-ſeed. *Ælian* ſaith, that Boars eating this Herb, fall ſick of a lingring diſeaſe, and are troubled: it is of the Nature of Wine that diſquiets the minde and head. So

Elephants are made drunk.

Athenæus reports out of *Ariſtotle*'s Book *de Ebrietate*, that Elephants will be drunk with Wine. *Ælian* writes, that they give the Elephant that muſt go to war, Wine of the Grapes, and made Wine of Rice, to make them bold. Now I will ſhew how Birds laid aſleep, may be catch'd with your hands. If then you would know how

Birds may be catch'd with hands;

Pliny writes, A certain Garlick grows in the Fields, they call it Alum, which being boyled, and caſt to them, is a remedy againſt the villany of Birds that eat up the Corn that it cannot grow again: the Birds that eat it are preſently ſtupid, and are catch'd with ones hand, if they have ſtaid a little, as if they were aſleep. But if you will

Hunt Partridge that are drunk,

Boetius teacheth you thus: You ſhall eaſily hunt ſuch Partridge, if you caſt unto them meal wet in wine: for every Bird is ſoon taken with it. If you make it with water and wine mingled, and put that which is ſtronger into the veſſels, ſo ſoon as they have but ſipt a little, they grow drowſie and ſtupid. He ſheweth,

How to take Ducks with your hand.

If any one obſerve the place where Ducks uſe to drink; and putting away the water, place black wine in the place: when they have drunk, they fall down, and may be eaſily taken. Alſo, wine-lees is beſt.

Ducks and other Birds being drunk are ſoon taken

With ſome meats, as are the Bur Dock ſeed, ſtrewed here and there in places where Birds frequent: they are ſo light-headed when they have eaten them, that you may take them with your hands. Another bait. Tormentil boyl'd in good wine, and boyl Wheat or Barley in the ſame, caſt to Birds, is good to catch them: for they will eat pieces of Tormentil with the ſeeds, and be drunk that they cannot flie; and ſo are they catc'd with your hands. This is beſt when the weather is cold, and the Snow deep. Or elſe ſtrew Barley-corns in places where many Birds come, then make a compoſition like a pultis of Barley-meal, Ox-gall, and Henbane-ſeed; ſet this on a plank for them: when they have taſted it, the Birds will be ſo ſtupid, that they cannot flie, but are catch'd with ones hand. Or mingle Barley, and muſhrooms, that are ſo called from flies, with the ſeeds of Henbane, and make the pap of it, and lay on a board, as before.

To catch Rooks with your hands.

Powder *Nux vomica*, and mingle it with fleſh. So alſo you may make Fiſh drunk. *Opian* teacheth ſome ways. If you will

Make Fiſh drunk,

Sow-bread will do it: for I ſaid, that Sow-bread will make men more drunk. His words are:

Of Sow-bread-Root, they make a paſte that's white
And fat, with which the rocks and holes they ſmeer:
The water's poyſon'd by it, and the might
And force thereof doth ſpread both far and neer.
The Fiſhes fall, the Fiſhes are made blinde,
And tremble at it: for the ſtinking ſmell
This Root thus ordered, always leaves behinde,
Doth make them drunk, as Fiſhers know full well.

CHAP. IX.

The peculiar poyſons of Animals are declared.

DO not think I mean, that one poyſon can kill all living Creatures, but every one hath his ſeveral poyſon: for what is venome to one, may ſerve to preſerve another; which comes not by reaſon of the quality, but of the diſtinct nature. Would we mention

The venoms that kill Dogs.

Die

Dioſcorides ſaith, that white Chamæleon made up with Barley-Flour, will kill Dogs, Sows, and Mice, being wet with water or Oyl. *Theophraſtus* ſaith, Dogs and Sows kneaded with water and Oyl: but with Coleworts Sows. Nux vomica, which from the effect is called Dogs Nut, if it be filed, and the thin filings thereof be given with Butter or ſome fat thing to a Dog to ſwallow, it will kill him in three hours ſpace; he will be aſtoniſhed, and fall ſuddenly, and dies without any noiſe: but it muſt be freſh, that Nature ſeems to have produced this Nut alone to kill Dogs. They will not eat the Fruit of the Aſh, becauſe it makes pain in their back-bone and hips: yet Sows are fatted by it So there is one Plant, called Dogs bane. *Chryſippus* ſaith, that Dogs are killed with it, if the ſhoots of it are given to them with water. Dogs cole, or wilde cole, if it be given with Fleſh; ſo the fumes of Lead. *Ariſtotle* in his wonders, concerning the Country of the Scythians and Medes, ſaith, that there is Barley that men feed on; but Dogs and Sows will not endure the Excrements of thoſe that eat it, as being poyſon to them. I ſay nothing of Aconitum, called by *Dioſcorides*, Dogs bane. I ſhall ſay the ſame

Of Wolfs bane.

Wolfs bane kills Wolfs and many other wild Beaſts; and it's ſo called from the effect. Mountebanks make venome thus: Take black Hellebore, two ounces; Yew-leaves, one ounce; Beech-rinde, Glaſs, quick Lime, yellow Arſenick, of each one ounce and half: of ſweet Almonds three ounces; Honey what may ſuffice. Make pellets, as big as a ſmall Nut. Others take Wolfs bane, yellow Arſenick, and Yew-leaves, of each alike, and mingle them. There are other Herbs that kill Wolfs: but I paſs them, to avoid tediouſneſs. *Ælian* ſaith, By Nilus grows an Herb called Wolfs bane; if a Wolf tread on it, he dies of convulſions. Wherefore the Egyptians forbid any ſuch Herb to be imported into their Country, becauſe they adore this Creature. There are alſo

Herbs that kill Mice.

That Aconitum, which is called Myoctonon, kills Mice a great way off. *Dioſcorides* and *Nicandor*. Staves-acre hath almoſt the ſame forces, whoſe Root or Seed in powder, mingled with Meal, and fried with Butter, kills Mice if they eat it. They are driven away with the Root of Daffodils; and if their holes be ſtopt with it, they die. The wilde Cucumber, and Colocquintida, kill Mice. If Mice eat Tithymal, cut into ſmall ſlices, and mingled with Flour and Metheglin, they will be blinde. So Chamæleon, Myacanthus, Realgar, namely, of live Brimſtone, quick Lime and Orpiment will do the ſame. But amongſt

Wolfs banes,

is reckoned Libards bane, by whoſe Root, powdered, and given with fleſh, they are killed. Fleſh is ſtrewed with Aconite, and Panthers are killed if they taſte thereof. Their jaws and throat are preſently in pain: therefore it is called Pardalianches. They are killed alſo by Dogs bane, which alſo they call Pardalianches.

Lions bane

is called Leontophonon: it is a little Creature that breeds nowhere but where the Lion is. Being taken, it is burnt: and with the Aſhes thereof, fleſh is ſtrewed; and, being caſt in the high-ways where they meet, Lions are killed: ſo Pardalianches kills Lions as well as Panthers.

Ox bane.

The juice of black Chamæleon kills Heifers by a Quinſey: wherefore ſome call it Ulophonon. Oxen fear black Hellebore, yet they will eat the white.

Goats bane.

There is an Herb, that from killing Beaſts, but eſpecially, Goats, is called Ægolethros. The Flowers of it, in a watry Spring-time, are venome when they wither; ſo that this miſchief is not found every yeer.

Harts bane.

Some venemous Fiſh are found in Armenia; with the powder of them, they ſcatter Figs ſtrewed with it, in the places where wilde Beaſts come: Beaſts no ſooner taſte of them, but they die. And by this Art are Harts and Bores killed. *Ælian.*

Horſe banes,

are Aconite, Hellebore, and red Arſenick.

Wheezles bane, are

Sal Ammoniac, and Corn moyſtened with ſome Liquor: ſcatter this about ſuch places as Wheezles haunt: when they eat it, they die, or flie away.

Sheeps bane.

Nardum kills Sheep. *Dioſcorides*. Cattel and Goats, if they drink the water where Rhododendron is ſteeped, will die. *Pliny* and *Ononymus*, an Author nameleſs. Fleabane kills Goats and Sheep: ſo doth Savin.

Pigeons bane.

Serapio writes, that Pigeons are killed when they eat Corn or Beans ſteept in water, wherein white Hellebore hath been infuſed.

Hens bane.

Hens die by eating the Seeds of Broom, called Spartum.

Bats bane.

Zoroeſtes in *Geopon.* ſaith they die by the fume of Ivy.

Vultures.

Some Animals are killed by things that ſmell very ſweet to us: Vultures by Unguents, and black Beetles by Roſes. The ſame happens if a man do but anoynt them, or give them meat that is ſmeered with ſweet Oyntment. *Ariſtotle lib. Mirabil.*

Scorpions bane.

Aconite called Theliphonum, from killing Scorpions. Scorpions are ſtupified by touching it, and they wax pale, ſhewing that they are conquered. The Eagle is killed with Comfrey: the Ibis with the Gall of the Hiæna: the Stare with Garlick-ſeed: the Charadrius with Brimſtone: the Urchin with Pondweed: the Faulcon, the Sea-gull, the Turtle, the black-Bird, the Vulture, the night-Bird, called Scopes, periſh with Pomegranate Kernels. The Titling by the Flower of Willows: the Crow with Rocket-ſeed: the Beetle with ſweet Oyntment: the Rook with the reliques of fleſh the Wolf hath fed on: the Lark by Muſtard-ſeed: the Crane by the Vine-juice.

CHAP. X.

Of the venomes for Fiſhes.

THe Sea and Rivers uſe to be infected with ſome Herbs, and other ſimples whereby the Fiſhes that ſwim in thoſe waters, are made drunk and die. But, becauſe they are ſeveral for ſeveral Fiſh, I ſhall ſet down both the Particulars and the Generals, that the Fiſherman taught by theſe, may invent others himſelf.

Fiſhes are killed,

ſaith *Pliny*, by the Root the Fiſhers of Campania uſe, called, round Birth-wort; called

called alſo the veneme of the Earth. This Root they bruiſe, and mingle it with Lime, and caſt itin to the Sea: the Fiſhes come to it with great delight, and are preſently killed, and float on the waters. *Dioſcorides* ſaith, that broad leaved Tithymal, bruiſed and ſtrewed in the waters, kills Fiſh. We uſe now to bruiſe the Roots of it, and with a weight let them down to the bottom of the waters, that will be infected by them, and kill the Fiſh preſently. But in the Sea, we ſhall ſooner kill them thus: Mingle Oriental Galls, two drachms; Cheeſe, one ounce; Bean-meal, three ounces, with *Aqua Vitæ*; make pellets of theſe as big as Chick-peaſon. Caſt them into the Sea, in the morning before Sun riſe: after three hours, come to the place again, and you ſhall finde all thoſe that taſted of it either drunk or dead, and to appear either on the top or bottom of the Sea; which you ſhall take up with a pole and a hook faſtened to it, or Fiſh-ſpeer. The *Aqua Vitæ* is added, becauſe it ſoon flies to the head. The Oriental Galls are poyſon that aſtoniſheth them: the Bean-meal is not of great concernment. This bait invites them; and the Cheeſe ſmells ſo, that they ſent it at a diſtance.

CHAP. XI.

Of other Experiments for hunting.

NOw I will add ſome Experiments that ſeem to be requiſite, that you may uſe for neceſſity when you pleaſe.

To change a Dogs colour.

Since white Dogs are ſeldom fit for hunting, becauſe they are ſeen afar off; a way is found to change his colour, that will be done if you boyl quick Lime with Litharge, and paint the Dog with it, it will make him black.

That a Dog may not go from you.

Democrites ſaith, a Dog will never run from you, if you ſmeer him with Butter from head to tail, and give him Butter to lick. Alſo, a Dog will follow you if you have the ſecondine of a Bitch cloſe in a bag with you, and let him ſmell to it. If you would not have

Your Dog to bark;

If you have a Bitches ſecond Membrane, or a Hares hairs, or Dung, or Vervain, about you. In Nilus there is a black ſtone found, that a Dog will not bark if he ſee it: you muſt alſo carry a Dogs Tongue under your great toe within your ſhooe, or the dry heart of a dog about you. *Sextus.* Or, the hair of a Hare, or the Dung. *Pliny.* Or cut off the tail of a yong Wheezel, and put it under your feet: or give the Dog a Frog to eat in a piece of meat. All theſe things are to keep Dogs from barking. *Nigidius* ſaith, that Dogs will all day flie from him who pulls off a tick from a Sow, and carrieth it a while about him. *Opian.*

If of Hyænas skin a piece you take,
And wear it, all the dogs will you forſake;
As frighted they will flie, and nevermore
Bark at you, though they barked much before.

That a Dog may not run.

If you anoynt him with Oyl under the ſhoulders, he cannot run.

To make a Hawke couragious.

You ſhall animate your Hawk againſt the prey, that he may aſſail and flee at great Birds. When you hawk, wet the Hawks meat with Wine. If it be a Buzzard, add a little Vinegar to it when you would have him flie: give him three bits of fleſh wet

...in wine: or, pour Wine in at his mouth, with a yong Pidgeon: ſo let him flie.

To make Partridge more bold to fight.

Give them Maidenhair with their meat. *Pliny.*

That dung-hill Cocks may fight the better.

Give them Garlick to eat ſoon before they fight: whence, in the old Comedy, a Cock ready and earneſt to fight is wittily called ἐυσκόροδος, fed with Garlick.

That a Bird may not flie high.

Take out the Feathers of his tail, that make him flie upwards; ſo he will whirl about, and flie downward. If you will have

That a Bird ſhall not flie,

cut the upper and lower nerves of his Wings, and it will not hurt him; yet he cannot flie out of your Bird-cages, or places you keep them in.

THE

SIXTEENTH BOOK

OF

Natural Magick:

Wherein are handled ſecret and undiſcovered Notes.

THE PROEME.

I Make two ſorts of ſecret marks, which they vulgarly call Syfers; one of viſible marks, and is worthy of a treatiſe by it ſelf: another of ſecret marks, whereof I have attempted to ſay ſomething in this preſent Volume, and what are the conſequents thereof, for the uſe of great Men, and Princes, that take care for things abſent, and write to ſome man that knows the invention. I ſhall ſet down plainly ſome examples: but theſe things and the conſequences of them muſt be faithfully concealed, leſt by growing common amongſt ordinary people, they be diſreſpected. This is that I ſhall publiſh.

CHAP. I.

How a writing dip'd in divers Liquors may be read.

THere are many, and almoſt infinite ways to write things of neceſſity, that the Characters ſhall not be ſeen, unleſs you dip them into waters, or put them neer the fire, or rub them with duſt, or ſmear them over. I ſhall begin with them that are read by dipping them into waters. Therefore

If you deſire that letters not ſeen may be read, and ſuch as are ſeen may be hid,

Let Vitriol ſoak in boyling water: when it is diſſolved, ſtrain it ſo long till the water grow clear; with that liquor write upon paper: when they are dry, they are not ſeen. Moreover, grinde burnt ſtraw with Vinegar; and what you will write in the ſpaces between the former lines, deſcribe at large. Then boyl ſowre Galls in white Wine, wet a ſpunge in the liquor: and when you have need, wipe it upon the paper gently, and wet the letters ſo long until the native black colour diſappear, but the former colour, that was not ſeen, may be made apparent. Now I will ſhew in what liquors paper muſt be ſoaked to make letters to be ſeen. As I ſaid, Diſſolve Vitriol in water: then powder Galls finely, and ſoak them in water; let them ſtay there twenty four hours: filtre them through a linen cloth, or ſomething elſe, that may make the water clear, and make letters upon the paper that you deſire to have concealed; ſend it to your Friend abſent: when you would have them appear, dip them in the firſt liquor, and the letters will preſently be ſeen.

That dipping a linen rag in water, the letters may appear.

Diſſolve Alom in water, and with it make letters upon white linen, ſheets, napkins, and the like; for when they are dry, they will preſently vaniſh. When you will have them viſible, ſoak them in water, and the linen will ſeem to be darkned: but only where the Alom hath written, it will not: for the letters will grow ſo clear, that you may read them: for where Alom, Vitriol, and all aſtringents are diſſolved, thoſe parts will admit water laſt. So

White letters are made with waters.

Li-

Litharge is firſt powdered and caſt into an earthen pot that hath water and vinegar mix'd, boyl it, and ſtrain it, and keep it: then write letters with Citron Lemons juice: theſe are added to them when they begin to dry. If you dip them in the liquor kept, they will appear clearly and very white. If womens breſts or hands be wet in it, and you ſprinkle the ſaid water upon them, they will grow white as Milk. Uſe it. If at any time you want theſe, if you pleaſe,

A ſtone dipped in vinegar will ſhew the letters.

Make letters with Goats fat upon a ſtone; when they are dry, they will not be ſeen. If the ſtone be dipt into vinegar they preſently come forth, and ſeem above the ſtone. But if you would have letters writ with water only, appear black, that you may the better be provided, and more ſpeedily for a voyage; beat Galls and Vitriol finely, and ſtrew this powder on your paper: rub it with a cloth, and poliſh it well, that ſo it may ſtick faſt to the paper, and be like it. Powder Juniper-gum, which Scriveners call Verniſh, and add it to the reſt: when you would uſe it, write with water or ſpittle, and they will be black letters. There are many ſuch Arts, too tedious to relate.

CHAP. II.

How letters are made viſible in the fire.

I Shall ſhew the ways how letters are not made viſible but by fire; or not, unleſs light interpoſe, or may be read when they are burnt. But

To make letters viſible by fire.

So we may bring forth letters written between the verſes, and in the cloſe ſetting together, or larger diſtances of ſyllables. Let the Epiſtle contain ſome void ſpace, that the letters may not be ſeen; and if this be intercepted, it will hardly be read. If you write with the juice of Citrons, Oranges, Onyons, or almoſt any ſharp things, if you make it hot at the fire, their acrimony is preſently diſcovered: for they are undigeſted juices, whereas they are detected by the heat of the fire, and then they ſhew forth theſe colours, that they would ſhew if they were ripe. If you write with a ſowre Grape that would be black, or with Cervices; when you hold them to the fire, they are concocted, and will give the ſame colour they would in due time give upon the tree, when they were ripe. Juice of Cherries, added to Calamus, will make a green; to ſow-bread, a red: ſo divers juices of Fruits, will ſhew divers colours by the fire. By theſe means, Maids ſending and receiving love-Letters, eſcape from thoſe that have the charge of them. There is alſo a kinde of Salt called Ammoniac; this powdered and mingled with water, will write white letters, and can hardly be diſtinguiſhed from the paper: but hold them to the fire, and they will ſhew black. Alſo,

Letters that cannot be read unleſs the paper be burnt.

For the mixture will be white, and nothing will be ſeen; but when it is burnt, the paper will be black, and the Characters will be white: Take the ſharpeſt vinegar and the white of an Egg: in theſe ſteep Quick-ſilver, and ſtir it well; and with that mixture make Letters on the paper; burn the paper in the fire, and the letters will remain unburnt; or make letters on the paper with Gum, or any kind of Salt or Lime; theſe, being they cannot be ſeen at the fire, when the paper is burnt and made black, they will appear white. If you will, you may

Write letters that cannot be ſeen but by interpoſition of fire.

Do it thus: Mingle Ceruſs, or ſome other white colour, with Gum Traganth, ſoaked, and of this mixture is made a matter of the ſame colour with the paper, that it cannot be diſcerned from it, nor cauſe ſuſpicion: then this being put between the eye and the light of a candle, the eye cannot paſs through where the letters are written, and you ſhall ſee them darkly. This is by reaſon of the Opticks: for that part of thick matter oppoſed againſt outward light, hinders it, that the rays cannot come to our ſight; and ſo the prints of the letters are ſeen as a ſhadow.

Chap.

CHAP. III.

How Letters rub'd with duſt may be ſeen.

NOw I will uſe another artifice, that Letters rubbed with duſt may be read, that were before inviſible, which I read was uſed by the Ancients: wherefore do thus:

That Letters rubbed with mill-duſt may be read.

That as in paper, ſo on ſome unſeen parts of the Body, Letters written may lie hid, and be opened when need is; write ſecretly on your Back or Arms, or other Limbs, with Vinegar or Urine, and dry it that nothing may appear: now, to have it read, rub it over with ſoot or burnt paper; for ſo the Letters will ſhine forth. Or,

Otherwiſe,

If you make Letters with Fat, Tallow or any other fatty ſubſtance, or with Gum, or Milk of a Fig-tree, and ſtrew them with the duſt of cole or burnt paper, they will appear. It may be by this craft, as *Polyænus* the Greek ſaith, *Attalus* uſed the imprinted inſcription in a Beaſt for a ſacrifice. He, to raiſe the valour of his Souldiers, to make them fight valiantly with their Enemies, the French, that were far more in number; ſuppoſing it would be no little advantage to put them in hopes beforehand of the aſſurance of the victory, invented a trivial buſineſs; but otherwiſe profitable, with the Prieſt that was to offer the ſacrifice. Before the day they were to fight, he prepares for the victory: for *Sudinus* the Southſayer, being to offer ſacrifice, pray'd unto the gods, and cuts the Sacrifice in two. But the King uſed powdered Gum, and from the right to the left ſide, he drew theſe words: *Regis Victoria*, The Victory is the King's: and when the Entrails were drawn forth, he thruſt his hand into the hotteſt and moſt ſpungy place, and wiped clean the inſcription. But the Augur, changing the other parts; and doing his Office, turns the part where this inſcription was contained, *Regis Victoria*. This matter was no ſooner publiſhed, but the Souldiers generally rejoyced, and ſhouted exceedingly, to ſhew how ready they were to fight; ſo going on with a certain aſſurance of the Victory, and depending on this promiſe from the gods, they fought courageouſly, and ſubdued the French. But to the matter. Milk of the Fig-tree will do the ſame, if it be written on white paper, and afterwards ſent from a friend, be rubbed with cole-duſt ſtrewed upon it, and made clean again, ſo will the Letters preſently appear black. *Pliny* ſaith, the Milk of Tithynals will do the like, to make the Letters, and duſt ſtrewed on them to ſcowre them: and thus women, as he ſays, had rather ſpeak with Adulterers, then by Letters. *Ovid* confirms this, admoniſhing Maids in his *Arte Amandi*, how they may ſafely write to their Sweet-hearts.

Write with new Milk, it's ſafe, unſeen, but read
The writing with cole-duſt laid on full-right:
Moyſt flax will write as if that none had been,
And letters on your paper paſs the ſight.

Alſo there is an Art that one would not imagine, to write upon Chryſtal: for, being all tranſparent, no man will dream of it, and the letters may lie hid within. Do it thus:

That letters may appear upon Chryſtal by ſtrewing on of fine duſt.

Diſſolve Gum Arabick in water, or Gum Traganth, that it may be cleer; and when it is well diſſolved, it will not foul the Cryſtal, if you write upon it, or upon a Cup or Glaſs; for when the Letters are dry, they are inviſible. No man will imagine the fraud, if a Cup be ſent to one in priſon, or a Glaſs full of wine: when he would ſee the letters, rub burnt ſtraw or paper upon it, and the letters will preſently be ſeen. Here is another ſecret, That

That letters on the paper may be read, not by fire, nor water, or any other thing, but in the duſt only.

This is a ſecret worth knowing: diſſolve Goats ſuet with a little Turpentine: rub the paper with this liquor, and keep it: when you would ſend ſome news to your friend, lay on the paper anointed with the fat upon a letter you would ſend to your friend; write upon that with an iron point, and the ſuet will make the characters on the letter: ſend this away; and if it be intercepted, no water will make the words viſible, or any other Art, but only ſtrewing duſt upon it. Alſo you may make

That upon black paper, white letters may appear.

The reaſon is this: mingle the white and yelk of an Egg together, that it may be liquid as ink: with this liquer, write on the paper what words you pleaſe, and dry them: when the paper is dry, make a black colour over it, and dry it again, and ſend it; but that the letters may be viſible, ſcrape the ſuperficies of the paper with a broad iron: for ſo it will be, that the ink being ſcraped off, where the letters were, they will appear white.

CHAP. IV.

How you may write in an Egg.

BEcauſe when priſons are ſhut, Eggs are not kept by the Papal Inquiſition, and no fraud is ſuſpected to be in them, I will ſhew you how Letters may be writ on the upper ſhell and white of an Egg alſo: for example,

That letters may be writ on the Egg-ſhell.

Wrap the Egg in wax, and with an iron point make letters on it, as far as to the ſhell; but break it not: for if you break the ſhell with your iron, or point, or knife, it may be detected. Soak your Egg one night in ſtrong water of depart, which ſeparates gold from ſilver: in the morning take away the wax, and take off the Egg-ſhells cover, and hold the ſhell between your eye and the light, and the letters will be ſeen very clear quite through the tranſparent ſhell. The ſame is done with the juice of Lemmons: for it ſofteneth the ſhell; but foul it not, and you ſhall have your deſire. Will you

That letters may be ſeen upon the white

yellow, and better when the Egg is boyl'd. Boyl an Egg hard and rowl it in wax, and engrave the letters on the wax with an iron point, that the marks may lie open: put this Egg into liquor with Alom and Galls powdered: then put it into ſharp Vinegar, and they will penetrate; and taking off the ſhells, you ſhall ſee them in the white of the Egg. *Africanus* teacheth it thus: Grinde galls and alom with vinegar, till they be as thick as ink: with this write what you will on an Egg; and when the writing is dried in the Sun, put it into ſharp pickle: dry it, boyl it, and take off the ſhell, and you ſhall read the writing. I put it into vinegar, and could do nothing of it. Perhaps, he means by pickle, capital lees. The cauſe is this: the Egg-ſhell is porous, and hath large holes, which is plain; for being ſet to the fire, it will ſweat, and water will come forth; and looking at it againſt the light, it will ſhew clear: ſo then, vinegar being ſubtile, penerates by the pores, and makes the ſhell tender: and when it is mingled with the Alom & Galls, it carrieth their ſubſtance with it, and makes them appear on the white; and when it is put into cold water, it is condenſed, and comes to be hard as it was. But obſerve, it muſt not ſtay long in vinegar; for that will eat off all the ſhell, and will leave the Egg bare, having nothing but a thin skin to cover it: and if you put that into cold water, the ſhell will not come again. If you will know

How letters writ with water, may be ſeen in an Egg,

Diſſolve Vitriol in the water, and write upon the ſhell, and dry it, and nothing will be ſeen. If you will read it, diſſolve Galls in wine, and ſteep the Egg therein: or, write with Lime-water upon an Egg, and ſteep it in lye where Braſil is infuſed; and ſo the letters will ſeem to be of a violet-color: or, write with ſuet upon the ſhell, and ſteep it in water of vitriol: when it is dry, ſcrape off the ſuet, and nothing will be ſeen: when you afterwards ſteep it in the foreſaid wine, white letters will appear in a black ſhell. I will ſhew, How

How letters may become visible upon an Egg by the fire.

Write on the Egg with juice of Lemmons, or Onyons, or Fig-milk: when you put this to the fire, the Letters will appear yellow: and that must be done on a raw Egg: for if you boyl it, the letters will be seen.

That letters may be seen on the Egg shell by dust.

Make letters on the shell with vinegar, suet, fig-tree-milk, or of Tithymal, or with gums: when you would have them seen, rub them with cole-dust, or burnt straw, or paper, and they will seem black. There is a way

How to put a letter into an Egg.

Make your letter that you send, narrow and long, scarce broader then your middle-finger: write your minde in short characters, and with the edge of a knife, make a cut in the Egg, and break the inward skin, and put in your letter at one end by degrees: for it will easily take it in, were it ten hands breadth: then stop the cut, with lime and gum mingled, that it may not be seen, and with Ceruss and gum-Traganth; for then it is impossible to discern it. But if you will have this done more neatly, put the egge in sharp vinegar three or four hours: and when you finde it soft, open the shell with the edge of your knife, put in your roll of paper: then soak it in cold water, and the shell will grow as hard as it was.

CHAP. V.

How you may write in divers places, and deceive one that can read.

I Have shewed you divers ways of writing invisible; now I come to those ways that will teach you to write letters on divers things, which though they be visible, and intercepted, yet the Readers will be deceived by their secret device. First,

How to write on a small threed.

Let us see how they did this in elder times: *Gellius noct. Attic.* relates, That when the Lacedemonians writ to their Generals, that their letters being intercepted by the enemies might not be read, invented this kinde of writing; yet it is referred to *Archimedes* to be the inventor of it. Two sticks must be made long and round, and polished with the Turners instrument; they must be equal for length, breadth and thickness. One of these was given to the General when he went forth to war, and the other was kept at home by the **Senate**: as oft therefore as need was, a page was rolled about the stick, as large as could contain the matter, that it might make a round volume, and the sides of it were so well joyned, that they were like a collar that exactly fitted the wood, and no chinks between: upon this collar, that thus was rolled about the stick, they writ letters overthwart, from top to bottom. The collar thus written on, being long and narrow, was taken off from the stick, and sent to the General; for they thought, if it was intercepted by the enemy, when they saw bits of letters, and syllables, and of words, so far divided, they would never discern the thing: and they were not deceived in this conjecture. For when they fell among the enemies, the enemy did not imagine any thing was writ on the collar; but let them pass, as with a thing done at all adventures, and insignificant: but he to whom it was writ, applied this band, and rolled it about, as it was at first writ upon: and then the words lay joyn'd as they should be, and so he knew the message. The Greeks call this kird of writing, σκυτάλη. *Plutarch* saith, A letter thus writ, was brought to *Lysander* by *Hellespont*. But I invented to write so with a Threed: make two small sticks alike great and round: one we give to our friend that goes far from us, and hold the other by us: let us make them stick so close together, that they may joyn, and seem to be as one, and the wood not be seen: fit the Threed as it should be, and write long-ways on the stick what you please; the broader the sticks are, the more lines will they receive. If you first steep your Threed in water wherein Alom is dissolved, the Ink will not spread, but the letters will be the clearer: then take your Threed that is about the stick, and wrap it on a heap; or to keep it the more secret, sow it upon the edges of napkins or shirts, and send it to your absent friend: for the curious watch shall discern nothing on the Threed, but some scattered points. Your friend winding the Threed about the same staff, and taking care to make the points meet at the tops and agree well, shall easily read them. I will shew, How

How to write on Parchment, that the Letters may not be seen.

When you have writ on Parchment, put it to the light of a candle, or to the fire, and it will all crumple and run together, and be nothing like what it was; if a man look on it, he will hardly suspect any fraud. If he desires to read what is in it, let him lay it on moyst places, or sprinkle it gently with water, and it will be dilated again, and all the wrinkles will be gone, and it will appear as it did at first, that you may read the Letters upon it, without any hindrance. Now I will shew the way

How in the Sections of Books the Characters shall be hid.

When the Book is well bound, and cut, and coloured black; if we open it, and turn back the leaves, that they may be turned in, we may write at the corners of the leaves what we will: but when the Book is set back again, and the leaves put into their own places, nothing is seen or can be imagined to be writ in them; but he that would read those Letters, must set the Book that way as it was, and the Letters will be read. So may we write on fly-traps, that are made with wrinkles, and then draw them forth. If need be, we may do

The same with Cards to play with.

You may excellent well write on Cards, if you put them in some order, that one may follow the other; and some shall be upright, others turned downwards. When you have set them right together, you may write all things where they divide: mingle the Cards together again, and turn them, and nothing will be seen but some disorderly marks, if any man look curiously upon them. But he that would read them, must set them in order, and they will joyn and be read exactly. Also, we may write in white Pigeons, and other white Birds, feathers of their wings, turning them upwards; for when they return to their own places, they will shew nothing. But if they be brought to their former posture, you will read the Letters; and this is no small benefit for those that shall use them for messengers. There is a way

To hide Letters upon wood.

Any one may make Letters upon wood, and not be suspected; for they shall not be seen, but when we please. Let the wood be fleshy and soft, of Poplar, or Tile-tree, or such like: and with those iron Markers Printers use, when they make stamps upon Brass, commonly called Ponzones, make Letters in the wood, half a finger thick: then hew the wood with a Carpenters hatchet, as deep as the Letters go; when all is made plain, and equal, send the stick to your friend, or board, to him that knows the matter; he putting the wood into the water, the wood will swell out, that was beaten in with the marks, and the Letters will come forth. That we may do in wooden vessels, polished by the turner, if when they are turned, we mark the Letters on them; and then turn them again: when this is done, send it to your friend, and let him soke it in water, *&c.*

CHAP. VI.

In what places Letters may be inclosed.

I Shall speak in what places Letters may be inclosed, and not be suspected; and I shall speak last of Carriers. I shall bring such examples as I have read in Antient Histories, and what good a man may learn by them. First,

How to hide Letters in wood.

Theophrastus's opinion was, that if we cut the green bark of a Tree, and make it hollow within, as much as will contain the Letters, and then bind it about, in a short time it will grow together again, with the Letters shut up within it. Thus he saith, That by including some religious precepts in wood, people may be allured; for they will admire at it. But I mention this out of *Theophrastus*, rather for a similitude,

then for to do the thing I would have, for that would require a long time. But this may be done well in dry wood, as in Firr:thus;the chinks fastning together with common white glew. Also the Antients used

To conceal Letters in Junkets.

I will relate the cunning of the Wife of *Polycretes*; for she, whilst in the Milesian camps they solemnized a Solemn Feast of their Country; when they were all fast asleep, and drunk, took this opportunity to tell her brothers of it, and did thus. She desired *Diognetus*, General of the Erythrei, that she might send some Junkets to her brothers: and when she had leave, she put a leaden scrole into a cake, and she bad the bearer tell her brothers from her, that no man should eat of it but themselves. When they heard this, they opened the cake, and found the Letter, and performed the contents of it. They came upon the enemy by night, that was dead drunk at the Feast, and conquered him. Also the Antients were wont

To shut up Letters in living creatures.

Herodotus saith, That *Harpagus* sent Letters to *Cyrus*, put into the belly of a Hare whose entrails were taken out, by one that counterfeited a shepherd hunting. So

Letters may be hid in Garments.

The secret places of clothes are best, to avoid suspicion; as in your bosom, or under the soles of your feet. *Ovid* in his *Arte Amandi*, writes to this purpose:

Letters may be concealed in your breast,
Wrapt in a clowt, which way is held the best;
Or else you may under your feet provide
A place full closely Letters for to hide.

To hide Letters in your belt.

Those of Campania were wont, when they would discover any thing to the Carthaginians, and the Romans besieged them round; they sent a man that seemed to run from them, with a Letter concealed in his girdle; and he taking occasion to escape, brought it to the Carthaginians. Others carried Letters in their scabbards, and sent them away by messengers, and were not found out. But we use now adays

To hide letters in the Bowels of living creatures.

For we wrap them in some meat, and give them to a Dog, or some other creature to swallow; that when he is killed, the letters may be found in his belly: and there is nothing neglected to make this way certain. The like was done by *Harpagus*. He, as *Herodotus* saith, being to discover to *Cyrus* some secrets, when the ways were stopt, that he could do it by no other means, he delivered the letters to a faithful servant, who went like a Hunter, that had catcht a Hare; and in her belly were the letters put, when the guts were taken forth, and so they were brought to *Persis*. We use also

To shut up letters in stones.

Flints are beaten very fine in brazen Mortars, and sifted; then are they melted in a brass Cauldron, by putting two ounces of Colophonia to one pound of the powder of the stone; and mingling them, put your letters into leaden plates, and hide them in the middle of the composition, and put the lump into a linnen bag, and tye it fast, that it may be round; then sink it into cold water, and it will grow hard, and appear like a flint.

CHAP.

CHAP. VII.

What secret Messengers may be used.

THe Antients used the same craft for Messengers; for they used men that should be disguised by their habits, and some living creatures besides. For

To counterfeit the shape of a Dog,

It was the crafty counsel of *Josippus*, that the Messengers should be clad with skins, and so they past the enemies guards, and were not regarded; for if they were seen, they were in the likeness of Dogs; and this was done until the enemy found out the trick, and compassed the Rampart round about. And mans curiosity was not satisfied here, till they found means for ways to pass, where the Sentinels and Scouts might not discover them; wherefore they left the land, and sent by water: But that the writing might not be spoiled in the water, as *Frontinus* saith, The Souldiers that past over the River Saltella, had leaden plates writ upon, fastned to their arms. But *Lucullus*, as the same *Frontinus* reports, that he might declare to the Cyziceni, that were besieged by *Mithridates*, that he was coming to relieve them, all narrow passages being stopt by the enemies guards, that were joyned to the continent by a small bridge, he sought a way by sea. For a private Souldier appointed for it, sitting on two bladders blown, wherein the Letters were put in two covers, and so like some sea-Monster, he swam seven miles at sea, and told of the coming of the General. So they often used

Arrows for Messengers:

But that seemed not sufficient, for they feared mens cunning, lest some chance or fraud might intercept the messenger, and the secret should be discovered, or they should be racked to make them confess. Sometimes therefore they sought a way in the Air, and used Arrows for messengers, that none might intercept them. *Herodotus* saith, That *Artabazus* and *Timoxenus* did this, when one would declare any thing to the other; for the paper was folded about the foot of the Arrow, and the feathers were put upon it, and it was so shot into the place appointed. To this appertains the example of *Cleonymus* King of the Lacedemonians. He besieging the city Trœzene, commanded many of his best Archers to shoot Arrows into several places; and he writ upon them: I come to relieve your City; and by this means he set ladders, and his Army scaled the walls and went in, and plundered the place, and destroyed it. But when *Cæsar* heard that *Cicero* besieged by the French, could hold out no longer, he sent a Souldier by night, who should shoot a Letter, fastned to an Arrow, over the wall: when he had done this, the watch found the Arrow and the Letter, and brought it to *Cicero*. In it were these words written: *Cæsar* bids *Cicero* be confident, and to expect relief. So *Cæsar* came suddenly, and slaying the enemies, relieved him. We can do it safer, and better now adays with Guns: if the matter to be sent be contained in few words, we may shoot them forth with Muskets; namely, by folding up the paper, and putting it into a case of lead, where they cast bullets, pouring upon it melted lead, but not burning hot; the paper wrapt up in the lead, we shoot away with the Powder to the place. But because the Letters are but small, we may shoot many of them in a day. The way to melt the Ball is, by putting it to a gentle fire, or into quick-silver, and it will soon melt, and the paper not be touched. I shall shew now

How to make Pigeons your Messengers.

We may use Birds for Messengers; as Pigeons, Swallows, Quails, and others: For these Birds carried to other places, when need is, if you bind Letters to their necks or feet, they will return with them: and when any thing was suddenly to be related, the Antients sometimes used these Messengers. *Hircius* being Consul, as *Frontinus* testifies, sent forth Pigeons from the neerest place he could from the walls, which had been long shut up in the dark, and half famished, to *Decimus Brutus*, who was be-

beſieged at Mutina by *Anthony*. They being glad of light, and deſiring meat, flew and ſat upon the higheſt parts of the houſes; *Brutus* catcht them, and ſo was confirmed how things were: wherefore, always laying meat in thoſe places, he call'd them back again. Hence *Pliny*. Nor Ramparts, nor Scouts, nor Nets pitch'd before Rivers, did profit *Anthony*; for the Meſſenger went through the Air. By the ſame way, in the very ſame day, from *Olympia* to *Ægina*, was the victory of *Taurosthenes* declared to his Father; though others ſay it was foreſeen: others ſay, That *Taurosthenes*, when he went forth, took a Pigeon from her yong ones, yet weak and not able to fly, and as ſoon as he had conquered, he ſent her back again, purple-coloured; and ſhe making great haſt to her yong ones, flew that very day from Piſa to Ægina. *Ælian* writes this. Some have ſought to do this by Swallows, taken out of their neſts from their yong, and ſent back again. Some alſo atteſt, that beyond ſea Eaſtward, there are Pigeons that when the way is ſtopt, will fly through the midſt of the enemies, and carry Letters under their wings, a very long way. It may be *Juvenal* meant this, when he ſaid,

As if from divers parts a letter were
Brought with a douſſul wing quite through the Air.

Alſo in old Monuments and Hiſtories it is declared, that there was a King of Egypt, whoſe name was *Marrhes*, who bred up a tame Rook, and this he made uſe of for a winged meſſenger, ſo oft as he had need: for, as if ſhe had reaſon, ſhe would carry the Letter where ſhe was directed; for ſhe was ſo crafty, as to be inſtructed whither to fly, and where to ſtay, or reſt at any time. Mans wit hath invented theſe ſhifts to avoid danger; but by the ſame craft is he wounded ſometimes, as it were with his own weapons. When the Chriſtians with an Army beſieged *Ptolemais*, when *Saladine* had appointed a Pigeon to be ſent thus with Letters to the beſieged, to wiſh them to be conſtant, and expect his coming ſuddenly; the Chriſtians catch'd her, and tied a contrary letter to her, and ſent her away: whence it fell out, that they deſpairing of relief, yielded themſelves: ſo there can be no certain ſecurity in humane affairs, but there may be fraud in all things. *Themiſtius* ſaith, That amongſt Animals, Pigeons have the beſt memory, as having a clear and refined mind. Wherefore, though all other Animals make haſt to their yong ones, when they are taken from them, yet none of them carried far, can come back, becauſe their memory fails. I have ſeen the tryal with Pigeons. When my ſervant came from my Farm, he brought home ſome yong Pigeons taken from their dams, and he wrapt them up in a cloak as we went; and when we came home at night, they were ſhut up in the houſe; but when the morning came, they flew out of the windows; and diſcovering the country afar off, they took upon the wing, and flew all home again. Wherefore in *Geneſis*, *Noah* ſent forth a Pigeon, which returned; but the Raven returned not. For the Raven wants memory. I remember in *Plutarchs* works, what is worth relating that I read there, That by the Pigeon ſent forth of the Ark, in *Deucalions* flood, was ſhewed, that the waters were ſunk down, and the ſtorms paſt. Animals that have newly brought forth yong ones, will do the ſame.

CHAP. VIII.

How Meſſengers may be ſent, who ſhall neither know that they carry letters, nor can they be found about them.

OUr Anceſtors had another Art, that could not be diſcovered, invented by ſtrange craft. *Herodotus* mentions it from *Heſtiæus*, who was the Author of it. He being born in Aſia, when of noble place, when *Darius* ruled, when he was with the King in Perſia, and would privately write to *Ariſtagoras* to fall from him, fearing leſt if he ſhould not do it cunningly, he ſhould be diſcovered, and be in great danger, he invented this way. He ſhaved off his ſervants hair of his head, as though he meant to cure him, who for a long time had been troubled with ſore eyes: and on his

his head, with good ink, he writ letters, that contained what he meant to have done: he kept this fellow at home with him, until his hair was grown again; when that was done, he ſent him away to *Ariſtagoras*, bidding him ſay, when he came to him, that he ſhould do unto him, in ſhaving off his hair, as he did before: When the ſervant came to *Ariſtagoras*, to Miletum, he ſaid what his Maſter bad him ſay to *Ariſtagoras*: he ſuppoſing the buſineſs not to be idle, did what he was ordered, and ſo read the meſſage. The Antients found out theſe inventions, to ſend meſſengers with. Yet that can be no ſafe way, to ſhave off the hair, and to write letters upon the head, for the head will eaſily ſweat, and put them out. And if the skin be pricked with a needle, this will not avoid the ſuſpition, if he that wears the writing, be laid hold on by the way: for then is there moſt diligent ſearch: for fear and neceſſity will make men watchful, and they are never ſatisfied, till they have ſeirched every place. Sometimes they try men by fair promiſes, ſometimes they fright them with threats; and if theſe will not do, they torment and torture them, to make them confeſs: and if this will not do, that letters may not be ſecretly conveyed, not onely their hoſe and ſhooes uſe to be ſearched, their clothes pluckt off, and the ſeams rift, but they will ſearch their very guts; ſo far is it from keeping any ſecret upon the head, that ſhall not be look'd for. But I can ſend Letters, and write ſo, that it can be underſtood by none, but thoſe that the letters are deſign'd for. And he that carrieth them never ſo far off, if he ſhould be taken by the way, and examined by torments, he can confeſs nothing, becauſe he knows nothing of it, and the Letter ſhall always remain ſecret. Nor will length of time, or ſweat in travel, blot out the Letters; nor is it any matter if the meſſenger paſs through Rivers, Seas, or Rain; for wet will not hurt them. What good Princes may get by this, I leave to your cogitations; for they have moſt need of this, when they would declare any thing to their friends, that are beſieged: and oft-times upon one meſſage, may the victory of a City or Army depend. The invention of the Antients, was partly good, and partly bad. They writ Letters on his head, which he could not read; nor would water or ſweat, waſh them off, becauſe they were printed into the head: and when the hair grew out, they could not be ſeen. And that the meſſenger might be ignorant what was writ upon his head, they took occaſion for it, ſaying, he had a pain in his eyes, that they would cure: and thus he knew not the craft they uſed. But this fraud ſeems not very ſecure, for one that ſhould ſuſpect it might ſhave off the hair, and find out the ſecret. Moreover, if the meſſenger were to be ſent ſuddenly, how could he ſtay a moneth, till his hair were grown again? and when his skin was prickt for to make the Letters, he muſt needs ſuſpect ſomething. But let us ſee

How Heſtiæus could make the Letters on his head indelible.

He wounded the skin with the point of a needle, or opened it with a raſor, and caſt in the powder of Colophonia burnt; for ſo we uſe to make the names of Maſters, upon the faces of bond-ſlaves, that they ſhall never come forth, and in time they will look green. Alſo

Letters may be made between the skin, that are indelible, upon any part.

You may ſoon do it thus: Let Cantharides ſteep a whole day in ſtrong water, but ſooner is it done in water of ſeparation; then make the letters with a Pen-knife, or fit inſtrument, upon the upper skin of the Arm, or any other part; the fleſh hurt with the moyſture, will riſe in bliſters, and be exulcerated; ſo by the force of this corroding water, will there always remain the prints of white letters, and they will never be blotted out. And this is beſt done by *Heſtiæus* ſecret, becauſe the letters could not be read under the hair, whereas white letters, like milk, would be ſeen. But would we have them ſtay onely for ſome time, and not always, we may do it many ways. If you make letters with *Aqua fortis*, that hath eaten ſilver or braſs, they will appear many days. So it may be done with oyl of Honey. Now I will ſhew

How a man may carry letters that are indelible and inviſible, and unknown to him; and how to make them viſible when need is.

You

You may do it thus: by writing letters on the meſſengers back, that he may not know of, having firſt given him an Opiat to make him ſleep ſoundly, then write, and let them dry in; when he awakes, ſend him away, the letters dried on will not be ſeen: The Antients knew this. *Ovid* ſaith it:

Write on his back for paper, ſo you ſhall
Better conceal your purpoſe from them all.

But let us ſee whether we can write on the fleſh with any liquour, that paſſing through Rivers and Rain, the letters may not be blotted out with any moyſture, and then by ſtrewing on of duſt, may be made viſible again. Write on a mans back, which ſhall be viſible onely, by being wet with ſome humour, and no man can find out, unleſs he know the ſecret. If you write with water, wherein Vitriol is diſſolved, with a decoction of Galls, it will be ſeen. If it be made very ſharp, it will pierce the skin, and the letters will be delible: we may do the ſame with the oyl of it. Salt Ammoniac with quick Lime, or Sope, will make a blew colour. If they be rubbed with oyl of Litharge, they will appear white, with *Aqua vitæ*, or its equal, diſtilled vinegar, and water and Salt.

CHAP. IX.

How Characters may be made, that at ſet days ſhall vaniſh from the paper.

I Shall attempt to ſhew how letters may be written on paper, or in other matter, that ſhall diſappear at ſet times: and other letters ſhall be made inviſible, that at a time certain ſhall appear, not onely uſeful for ſecret marks, but for other purpoſes neceſſary for our lives. Letters that decay and vaniſh, may be made two ways, either with *Aqua fortis*, that eats the paper, or ſome decaying liquors, that will vaniſh with any light touch, and leave the place where they were, without any ſpot. I ſhall teach

How letters are made, that eat the paper.

If you mingle oyl of Vitriol with common ink or any other black colour, in few days by corroding the paper, or the ink it ſelf, the letters will vaniſh, or in a moneth, as you put in more or leſs of the oyl; and this you may try before you ſend away your letter: If you would have it work more ſlowly, add but a little oyl; if faſter, put in more: you may, when it is too ſtrong, put ſome water to it. The ſame is performed, if you mix a ſtrong lye, they call it the Capital, with your ink; for firſt they will be yellow, and then they will vaniſh. The ſame is done by oyl of Tartar, or Salt Alkali, or Soda, and ſtrong water of ſeparation of Gold; for theſe corrode the letters, and the paper, that nothing of the letters will appear. If you deſire to know

How letters may be made, that will ſoon vaniſh;

Make them with the ſtrongeſt *Aqua vitæ*, or uſe Camphir and burnt ſtraws: for the letters in time, will decay and vaniſh; the tincture will fall off, when the glutinous matter is gone. Make a powder of a very fine touch-ſtone; for the Sandy-ſtone will ſooner decay, that no letter ſhall be ſeen. Alſo it is done

Another way:

Infuſe the ſmall filings of ſteel in water of ſeparation; take a treble quantity of this, and add thereto liquid Pitch, or Soot of Turpentine, to make it the blacker, and cover the veſſel: grind this on a Porphyre-ſtone, write, and they will vaniſh and fall away. This ſecret I thought not fit to overpaſs, becauſe it is the principal thing to be conſidered, to make tryal oft-times; for if it ſtay long on the paper, add more ſtrong water to it; and if you be careful, no mark of the writing will remain. You ſhall do it like to this, another way. If it be good ſo to counterfeit: Take Chryſocolla, Salt Ammoniac, and Alom, all alike; powder them all, and put them into a Crucible,

cible, and make a ſtrong lye of quick-lime, and laying a linnen cloth over the mouth of the veſſel, that muſt receive it, ſtrain it; boil it a little, mingle this with your ink, they will remain a while, but in ſhort time the letters will vaniſh away. Set it up for you uſe. But contrarily, if you will

That inviſible letters after ſome time, ſhall become viſible

and ſhew themſelves; I will give you ſome examples, that you may invent more thereby your ſelf. If you write with juice of Citrons or Oranges, on Copper or Braſs, and leave this ſo for twenty days, the letters will appear green upon the place: the ſame may be done many other ways, namely, by diſſolving ſalt Ammoniac in water, and writing with it upon Braſs, the place will ſooner appear of verdigreeſe-colour.

CHAP. X.

How we may take off letters that are written upon the paper.

IF we would take letters from off the paper, or that ſuch as are blotted out might appear again, we muſt uſe this art. As, if we would

Take letters off the paper,

or from parchment: Take *Aqua fortis*, that is it that parts gold from ſilver: with a penſil wipe ſome of this upon the letters, it will preſently wipe off letters, written with Gall and Copras. If you uſe *Aqua fortis*, wherein ſalt Ammoniac is diſſolved, it will be ſooner done. But printed letters are harder taken out, becauſe that ink hath neither Galls nor Copras: Or rub it with ſalt Alkali and Sulphur, making little balls of them, and that will eat them out, that nothing ſhall be ſeen. But if you deſire to write any thing in the place you have made clean; firſt, wet the place with water, wherein Alom is diſſolved, for the ink will not run about. If you deſire

To renew letters decayed,

or to read ſuch as are vaniſhed: Boil Galls in wine, and with a ſponge wipe over the letters, the letters will preſently be ſeen, when they are once wet thus, and be well coloured as they were at firſt.

CHAP. XI.

How to counterfeit a ſeal and writing.

IT may be of great uſe when places are beſieged, and in Armies, and affairs of great men, to know how to open letters, that are ſealed with the Generals Seal, and ſigned with his Name, to know what is contained within, and to ſeal them again, writing others that are contrary to them, and the like. I will ſhew how

To counterfeit the Seal.

Melt Sulphur, and caſt it into powder of Ceruſs, while it is melted; put this mixture upon the Seal, but fence it about with paper or wax, or chalk, and preſs it down; when it is cold, take it off, and in that ſhall you have the print of the Seal. I will do it another way. Fill an earthen pot with Vinegar, caſt Vitriol into it, and a good deal of Verdigreeſe; let it bubble on the fire, put plates of iron into it; after a ſhort time take them out, and from the out-ſide with your knife, ſcrape off a kind of ruſt it hath contracted, that is durty as it were, and put this into a diſh under it: again, put them into the earthen pot, and ſcrape more off when you take them out; do this ſo often, till you have ſome quantity of this durty ſubſtance: caſt quick-ſilver into this, and make a mixture; and while it is ſoft and tender, lay it on the Seal, and preſs it down, and let it remain in the open Air, for it will grow ſo hard, that you may almoſt ſeal with it; for it will become even like to a Metal. It may be alſo done another way: Take the filings of ſteel, and put them in an earthen Crucible at a ſtrong

ſtrong fire; put ſuch things to it as will haſten the melting of it: when it is melted, caſt it into ſome hollow place, powder it, and mingle quick-ſilver with it, and let it boil in a glazed veſſel ſix hours, till it be well mingled; then preſs the ſeal upon it, and let it cool, and it will become exceeding hard. It is poſſible

To make a great Seal leſs,

if it ſhould happen that we want a leſſer ſeal, we muſt do thus: Take iſinglaſs, and diſſolve it in water; anoynt the figure with oyl, that it may not ſtick to the glew; compaſs the ſeal about with wax, that the matter run not about; put the iſinglaſs to the fire, and melt it, pour it upon the ſeal; after three hours, when it is cold, take it away, and let it dry, for the ſeal when it is dry, will be drawn leſs equally. If you will

Imitate the form of a writing,

do thus: Open the letter upon a looking-glaſs, that wants the foyl: upon the letter lay white paper, and a light under the glaſs; temper your ink as the writing is, and draw your lines upon the lines of the letters you ſee through. We may

Open letters, and ſhut them without ſuſpition.

We uſe to ſeal letters, putting paper upon them, which goes through the letter on one ſide, and wax is put on the other ſide, where it comes forth, and there it is ſealed. You ſhall open the letter thus: Break away that part of the paper, that is put upon the place, where it paſſeth through the letter, and the hole is, the letter opens preſently: read it, and ſhut it again, and put the paper torn off, in its proper place: firſt, anoynting the crack with gum-traganth, diſſolved in water; for the paper will be ſo glewed, that it will be ſtronger there then elſewhere; preſs it with a ſmall weight, till it grow dry; the fraud cannot be diſcovered, becauſe the glew is white, and is not known from the colour of the paper.

CHAP. XII.

How you may ſpeak at a great diſtance.

THere are many ways how we may ſpeak at a very great diſtance, with our friends that are abſent, or when they are in priſon, or ſhut up in Cities; and this is done with ſafety, and without any ſuſpition, as I ſhall ſhew. Two things are declared here, either to do it by open voice reduplicated, or elſe by a Trunk. We may

With open voyce ſhew ſome things to thoſe that are confederate with us.

It is wonderful, that as the Light, ſo the Voyce is reverberated with equal Angles. I ſhall ſhew how this may be done by a glaſs. It is almoſt grown common, how to ſpeak through right or circular walls. The voice paſſing from the mouth goes through the Air: if it goes about a wall that is uniform, it paſſeth uncorrupted; but if it be at liberty, it is beaten back by the wall it meets with in the way, and is heard, as we ſee in an Eccho. I through a circular building, that was very long and ſmooth, ſpake words to my friend, that heard them round the wall, and the words came entire to his ears; but one ſtanding in the middle heard not any noiſe, and yet I heard again what my friend anſwered to me. In the morning whenas I walked by the ſea ſhore, I heard above a mile, what my friends talked in a Boat: the ſea was very calm, and ſcarce moved, and the words came clearly to me, carried on the plain ſuperficies of the water. I hear that at Mantua, and other places, a great Gallery is built, wherein one ſpeaking in the corner, is heard by another that knows the buſineſs, ſtanding in another corner; but thoſe that ſtand in the middle, perceive nothing of it. But more exactly and clearly

To ſignifie to friends all things by a Trunk,

Let

Let the pipe be of Earth (but lead is better) or of any matter well cloſed, that the voice may not get forth in the long paſſage; for whatever you ſpeak at one end, the voice without any difference, as it came forth of the ſpeakers mouth, comes ſo to the ears of him that hearkneth; and I doubt not but this may be done ſome miles off. The voyce not divided or ſcattered, goes whole a long way. I have tried it for above two hundred paces, when I had no other convenience, and the words were heard ſo clear, and open, as the ſpeaker uttered them: Upon this it came into my mind, to intercept words ſpoken by the way, with leaden pipes, and to hold them ſo long as I pleaſed cloſe in; that when I opened the hole, the words ſhould break forth. I perceive that the ſound goes by degrees, and that being carried through a pipe, it may be ſhut up in the middle; and if a very long Trunk ſhould take away the convenience of it, that many winding pipes might ſhut it up in a cloſe place. I read that *Albertus* made an Artificial head, that ſpake at a ſet time: I might hope to do the ſame by this invention; yet I never tried this farther then I have ſaid: yet I have heard by my friends, that lovers have ſpoke a long time through a leaden pipe, from their Houſes that ſtood far aſunder.

CHAP. XIII.

By night we may make ſigns by fire, and with duſt by day.

IT remains to ſhew whether we can make ſigns in the night by fire, and in the day by duſt, to declare our buſineſs. That may fall out two ways: For by fire of a ſudden, we ſhew to our confederate friends, or when we pleaſe, by certain numbers of Torches, we repreſent letters fit to demonſtrate what our purpoſe is, that thoſe that are far off, ſeeing and obſerving the motions may perceive our intent. The firſt way, we read that *Medea*, promiſed to the Argonauts, that if ſhe killed *Pelias*, ſhe would ſignifie ſo much unto them by night with fire from a watch-Tower, and by day with ſmoke. When therefore the buſineſs was effected, as ſhe would have it, ſhe counterfeited, that ſhe muſt pay her vows to the Moon, by making a fire, by lighting Torches in the open Air, from the top of the place, as ſhe had promiſed, and when the Argonauts underſtood it this way, they invaded the Kings palace, and killing the guard, they made her to enjoy her wiſhes. We read alſo that *Maga*, having poſſeſſion of Paretonium, agreed with the watch, that at night in the evening, and again in the morning betimes, they ſhould ſet up the light that was for confederacy; and by that means ſigns were made, that the meſſenger came as far as Clius. Alſo to friends that live out of the City, by fire we may ſignifie our reverew, and the quality of proviſion. It is apparent, that *Annibal*, as *Polybius* writes, when the people of Agrigentum were beſieged by the Romans, by many and frequent fires by night, did ſhew forth the intolerable famine of his Army, and for that cauſe many of his Souldiers, for want of victuals, fell off to the enemy. Alſo the Grecians compacted with Sinon, that by night, when the Trojans were aſleep, thoſe that came to Troy ſhould have a token, when he ſhould open the Trojan Horſe, to let forth the Souldiers that were within. Whence *Virgil*,

When the Kings fleet lift up the flames, juſt then
Did Sinon let forth all the Grecian men.

Alſo by Torches letters may be ſignified, as we find it in the Manuſcript of *Polybius*. Tops of buildings or Towers, are very fit to ſet up the Torches on. Let the letters be divided into two or three parts, if there may be eleven, or ſeven parts of each. If they be ſeven, the firſt letters are ſhew'd by ſingle Torches, the ſecond by double ones, the third by three Torches. The number may be alſo divided into four parts: but in repreſenting them, we muſt obſerve the variety of motion. For one Torch once lifted up, ſhall ſignifie A, the ſame lifted up twice B, thrice C; ſo ſeven times: the laſt of the firſt order G, after that two once H, ſo many twice I, thrice ſignifies L, and ſo of the reſt of the ſame order. Then Q by the third order, once,

R by the same, twice, and thrice as many of the same, signifies S, and so it holds for four. Thus a woman from a watch-Tower, with three lights shewed five times, then with double ones twice, then with treble lights twice, then again with one at once, and with the same four times, then five times with three lights, then thrice, and with as many four times, shall signifie, *vir adest*, the man is come. Also the lights may be of divers colours, if they would shew that friends are neer. Also by smoke, we may shew that our enemies are neer, or some other thing. Hence it was, that by the policy of *Amilcar*, the men of Agrigentum, being drawn off far from the City, amongst their enemies that they pursued, unto an ambuscado, where the enemies lay hid, and a by wood set on fire, suffered a great overthrow: for when they thought they were called back by their friends, by reason of a smoke they supposed to come from the walls; when they turned their course to go to the City, *Amilcar* commanding, the Carthaginians followed them, who fled before, and so slew them.

THE

THE

SEVENTEENTH BOOK OF Natural Magick:

Wherein are propounded Burning-glasses, and the wonderful sights to be seen by them.

THE PROEME.

NOw I am come to Mathematical Sciences, and this place requires that I shew some experiments concerning Catoptrick-glasses. For these shine amongst Geometrical instruments, for Ingennity, Wonder, and Profit: For what could be invented more ingeniously, then that certain experiments should follow the imaginary conceits of the mind, and the truth of Mathematical Demonstrations should be made good by Ocular experiments? what could seem more wonderful, then that by reciprocal strokes of reflexion, Images should appear outwardly, hanging in the air, and yet neither the visible Object nor the Glass seen? that they may seem not to be the repercussion of the Glasses, but Spirits of vain Phantasms? to see burning Glasses, not to burn alone where the beams unite, but at a great distance to cast forth terrible fires, and flames, that are most profitable in warlike expeditions, as in many other things. We read that Archimedes *at Syracuse with burning Glasses defeated the forces of the Romans: and that King* Ptolomey *built a Tower in Pharos, where he set a Glass, that he could for six hundred miles, see by it the enemies Ships, that invaded his Country, and plundered it. I shall adde also those Spectacles, whereby poor blinde people can at great distance, perfectly see all things. And though venerable Antiquity seem to have invented many and great things, yet I shall set down greater, more Noble, and more Famous things, and that will not a little help to the Optick Science, that more sublime wits may increase it infinitely. Lastly, I shall shew how to make Crystal and Metal Glasses, and how to polish them.*

CHAP. I.

Divers representations made by plain Glasses.

I Shall begin with plain Glasses, for they are more simple, and the speculations thereof, are not so laborious, though the apparitions of them be almost common, yet they will be useful for what follows: and we shall add some secret apparitions unto them. The variety of the Images that appear, proceed either from the matter or form of the Glass. Crystal must be clear, transparent, and exactly made plain on both sides: and if one or both of these be wanting, they will represent divers and deformed apparitions to our sight. I shall therefore begin from the matter, and shew

How apparitions may seem to him that looks upon them, to be pale, yellow, or of divers colours.

When the Glass is melted with heat in the furnace, with any little colour it will be tainted; if you cast in yellow, the face of him that looks into it, will seem to have the yellow Jaundies; if black, he will appear wan and deformed; if you add much of it, like to a blackmoore; if red, like a drunkard or furious fellow; and so will it re-

preſent Images of any colour. How to mingle the colours, I taught when I ſpake of Jewels. I have oft made ſport with the moſt fair women, with theſe Glaſſes; when they looked, and ſaw not themſelves as they were: but there are many varieties ariſe from the form.

That the face of him that looks on the Glaſs may ſeem to be divided in the middle,

Let the ſuperficies of the looking-glaſſe that you look on, be plain, and exactly poliſhed by rule; but the backſide muſt have a blunt angle in the middle, that the higheſt part of it may be in the middle; in the outward parts it muſt be ſharp and preſſed down; then lay on the foil: wherefore the Image that falls on your ſight, where the lines meet in the angle, will ſeem divided into two. If you will

That he that looks in the Glaſs, ſhall ſeem like an Aſs, Dog, or Sow;

By variation of the place, the Angles, and the repreſentation of the Form beheld, will ſeem various. If that part of the Glaſs, that is ſet againſt your mouth, ſhall ſtick forth before like a wreathed band or a Boſs-buckler, your mouth will appear to come forth like an Aſſes or Sows ſnout; but if it ſwell forth againſt your eyes, your eyes will ſeem to be put forth like ſhrimps eyes; if the Angle be ſtretched forth by the length of the Glaſs, your Forehead, Noſe, and Chin, will ſeem to be ſharp, as the mouth of a Dog.

That the whole face may ſeem various and deformed.

Let a plain Glaſs not be exactly plain and even: which that it may be done, when the Glaſs is once made plain, put it into the furnace again, and let it be turned by the skilful hand of an Artiſt, till it loſe its right poſition, then foil it. Then the Image on the hollow part of the Glaſs, will repreſent the oppoſite part hollow; ſo it will hold forth one lying along on his face, or crooked, and ſwelling outwardly and inwardly. Then if when the Glaſs is poliſhed, one ſide be rubbed, the face will ſeem long and broad: wherefore it muſt be rubbed, and faſhioned on all ſides, that it may every way repreſent a perfect face. I ſhall ſhew you alſo

How to make a Glaſs to repreſent many Images.

That it may ſhew divers Images one after another, and of divers colours, make the ſolid body of the Looking-glaſs, or Glaſs that is half a finger thick, and let it be ſo plained, that upon one ſide, the thickneſs may not be touched, but on the other ſide, the lines of the two ſuperficies may meet, as the ſharp edge of a Knife. Make alſo another table of a Glaſs the ſame way: or elſe more; lay a foil of Tin upon the laſt, and place one of them upon the other, ſo that the thinner part of the one, may lye upon the thick part of the other: ſo will the face of one that looks into it, appear to be two, one behind the other, and the nethermoſt will always appear darkeſt. So if by the ſame Artifice, you fit three tables of Glaſs, the Image will appear to be three, and the farther he that looks, ſtands with his face from the Glaſs, the farther will thoſe Images or faces ſtand aſunder; but as you come very neer, they ſeem to joyn all in one: If you hold a Candle lighted againſt it, there will be many ſeen together, which comes by the mutual reciprocation of the ſight and the Glaſſe; and if the poliſhers of Glaſſes be not neer-hand, we may make the ſame with common Looking-glaſſes, putting one aptly above another, but let one be diſtant from the other by certain courſes; then ſhut them in a frame, that the Art may not be diſcovered. Nor will I omit

How letters may be caſt out and read, on a wall that is far diſtant;

which we ſhall do with the ſame plain Glaſs; and lovers that are far aſunder, may ſo hold commerce one with another. On the ſuperficies of a plain Glaſs, make Letters with black ink, or with wax, that they may be ſolid to hinder the light of the Glaſs, and ſhadow it; then hold the Glaſs againſt the Sun-beams, ſo that the beams reflecting on the Glaſs, may be caſt upon the oppoſite wall of a Chamber, it is no doubt but the light and letters will be ſeen in the Chamber, the Suns light will be cleareſt,

cleareſt, and the letters not ſo bright; ſo that they will be clearly diſcovered, as they are ſent in.

CHAP. II.

Other merry ſports with plain Looking glaſſes.

NOw I ſhall annex ſome other operations of a plain Glaſs, deſcribed by our Anceſtors, that I may ſeem to leave out nothing: and I will ſo augment them, and bring them to a rule, that they may be eaſily made. I ſhall begin with this,

How by plain Looking-glaſſes, the head may appear to be downwards, and the heels upwards.

If any man by plain Glaſſes, deſires to ſee his head downward, and his feet upward (though it is proper for Concave-Glaſſes to repreſent that) yet I will endeavour to do it by plain Glaſſes. Place two Glaſſes long-ways, that they may ſtick together, and cannot eaſily come aſunder, or move here and there, and that they make a right Angle; when this is ſo done, according to coherence the long way, ſet this againſt your face, that in one, half the face, in the other the other half may be ſeen; then incline the Looking-glaſſe to the right or left hand, looking right into it, and your head will ſeem to be turned, for according to their latitude, they will cut the face into two, and the Image will appear ſo, as if the head were under, and the heels upwards; and if the Glaſs be large, the whole body will ſeem to be inverted. But this happens from the mutual and manifold reflection, for it flies from one to the other, that it ſeems to be turned. We may

Make a plain Glaſs that ſhall repreſent the Image manifold.

A Glaſs is made that will make many repreſentations, that is, that many things may be ſeen at once; for by opening and ſhutting it, you ſhall ſee twenty fingers for one, and more. You ſhall make it thus: Raiſe two braſs Looking-glaſſes, or of Cryſtal, at right Angles upon the ſame baſis, and let them be in a proportion called ſeſquialtera, that is, one and half, or ſome other proportion, and let them be joyned together longways, that they may be ſhut and opened, like to a Book; and the Angles be divers, ſuch as are made at Venice: For one face being objected, you ſhall ſee many in them both, and this by ſo much the ſtraighter, as you put them together, and the Angles are leſs: but they will be diminiſhed by opening them, and the Angles being more obtuſe, you ſhall ſee the fewer: ſo ſhewing one figure, there will be more ſeen: and farther, the right parts will ſhew right, and the left to be the left, which is contrary to Looking-glaſſes; and this is done by mutual reflection and pulſation, whence ariſeth the variety of Images interchangably. We may

Make a Glaſs of plain Glaſſes, wherein one Image coming, is ſeen going back in another.

Take two plain Glaſſes, the length whereof ſhall be double, or one and half to the latitude, and that for greater convenience: for the proportion is not material; but let them be of the ſame length, and equal, and laid on the top of a Pillar, inclining one to the other, and ſo joyn'd together; and let them be ſet upright upon ſome plain place perpendicularly, ſo the Glaſſes faſtned, may be moved on the moveable ſide. It is no doubt but you ſhall ſee the Image to come in one, and go back in the other Glaſs; and the more this comes neer, the farther will the other go; and in one will it be ſeen coming, and in the other going. Alſo you may ſee

In plain Glaſſes thoſe things that are done afar off, and in other places.

So may a man ſecretly ſee, and without ſuſpition what is done afar off, & in other places, which otherwiſe cannot be done: but you muſt be careful in ſetting your Glaſſes. Let there be a place appointed in a houſe or elſewhere, where you may ſee any thing, and ſet a Glaſs right over againſt your window, or hole, that may be toward your face, and let it be ſet ſtraight up if need were, or faſtned to the wall, moving it here

and

and there, and inclining it till it reflect right againſt the place; which you ſhall attain by looking on it, and coming toward it: and if it be difficult, you cannot miſtake, if you uſe a quadrant or ſome ſuch inſtrument; and let it be ſet perpendicular upon a line, that cuts the Angle of reflection, and incidence of the lines, and you ſhall clearly ſee what is done in that place. So it will happen alſo in divers places. Hence it is, that if one Glaſs will not do it well, you may do the ſame by more Glaſſes; or if the viſible Object be loſt by too great a diſtance, or taken away by walls or mountains coming between; moreover, you ſhall fit another Glaſs juſt againſt the former, upon a right line, which may divide the right Angle, or elſe it will not be done, and you ſhall ſee the place you deſire. For one Glaſs ſending the Image to the other tenfold, and the Image being broken by many things, flies from the eye, and you ſhall ſee what you firſt light upon, until ſuch time as the Image is brought to you by right lines, and the viſible Object is not ſtopt by the windings of places or walls: and the placing of it is eaſie. So oft-times I uſe to convey Images of things. But if otherwiſe you deſire to ſee any high place, or that ſtands upright, and your eye cannot diſcern it; fit two Looking-glaſſes together long-ways, as I ſaid, and faſten one upon the top of a poſt or wall, that it may ſtand above it, and the Object may ſtand right againſt it; the other to a cord, that you may move it handſomely when you pleaſe, and that it may make with the firſt ſometimes a blunt, ſometimes a ſharp Angle, as need requires, until the line of the thing ſeen, may be refracted by the middle of the ſecond Glaſs to your ſight, and the Angles of reflection and incidence be equal: and if you ſeek to ſee high things, raiſe it; if low things, pull it down, till it beat back upon your ſight, then ſhall you behold it. If you hold one of them in your hand, and look upon that, it will be more eaſily done. I ſhew you alſo

How to make a Glaſs that ſhall ſhew nothing but what you will.

Alſo a Glaſs is ſo framed, that when you look into it, you ſhall not ſee your own picture, but ſome other face, that is not ſeen any where round about. Faſten a plain Glaſs on a wall upon a plain, ſet upright perpendicularly, and bow the top of it to the known proportion of the Angle: right againſt it cut the wall, according as the proportion of ſome Picture or Image may require, and ſet it by it, according to a fit diſtance, and cover it, that the beholder may not ſee it (and the matter will be the more wonderful) nor can come at it: The Glaſs at a ſet place will beat back the Image, that there will be a mutual glance of the viſible Object and the ſight, by the Looking-glaſſes: there place your eye; you ſhall find that place, as I taught you before. Wherefore the ſpectator going thither, ſhall neither ſee his own face, nor any thing elſe beſides: when he is oppoſed to it, and comes to the ſet place, he ſhall ſee the Image or the Picture, or ſome ſuch thing, which he can behold nowhere elſe. You ſhall now know

How a Glaſs may be made of plain Glaſſes, whereby you may ſee an Image flying in the Air.

Nor is that Glaſs of leſs importance, or pleaſure, that will repreſent men flying in the Air. If any man would do it, it is eaſily done thus: Fit two pieces of wood together like a ſquare or gnomon of a Dial, and being well faſtned, they may make an Angle as of a right angled triangle, or iſoſceles. Faſten then at each foot one great Looking-glaſs, equally diſtant, right one againſt the other, and equidiſtant from the Angle: let one of them lye flat, and let the ſpectator place himſelf about the middle of it, being ſomewhat raiſed above the ground, that he may the more eaſily ſee the form of the heel going and coming: for preſently you ſhall perceive, if you ſet your ſelf in a right line, that cuts that Angle, and it be equidiſtant to the horizon. So the repreſenting Glaſs will ſend that Image to the other, which the ſpectator looks into, and it will ſhake and move the hands and feet, as Birds do when they fly. So ſhall he ſee his own Image flying in the other, that it will always move, ſo he depart not from the place of reflection, for that would ſpoil it.

CHAP.

CHAP. III.

A Looking-glaſs called a Theatrical Glaſs.

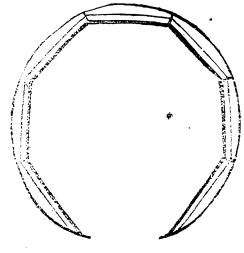
PRudent Antiquity found out a Looking-glaſs made of plain Glaſſes, wherein if one Object might be ſeen, it would repreſent more Images of the ſame thing; as we may perceive by ſome writings, that go in *Ptolomies* name. Laſtly, I ſhall add to this what our age hath invented, that is far more admirable and pleaſant. Wherefore

To make an Antient faſhioned Looking-glaſs of plain Glaſſes, wherein more Pictures will be repreſented of the ſame thing.

The way is this; make a half circle on a plain Table, or place where you deſire ſuch a Glaſs to be ſet up; and divide this equally with points according to the number of the Images you would ſee. Make ſubtendent lines to them, and cut away the arches; then erect plain Looking-glaſſes, that may be of the ſame latitude, and of the ſame parallel lines, and the ſame longitude; glew them faſt together, and fit them ſo, that they may not be pulled aſunder, as they are joyned long-ways, and erected upon a plain ſuperficies. Laſtly, let the ſpectator place his eye in the centre of the circle, that he may have his ſight uniform, in reſpect of them all; in each of them you ſhall ſee a ſeveral face, and ſo quite round, as we ſee it often when people dance round, or in a Theatre, and therefore it is called a Theatrical Glaſs: For from the centre all the perpendicular lines fall upon the ſuperficies, and they are reflected into themſelves; ſo they reflect the Images upon the eye, each of them drawing forth its own. This is the Antients way of making a Theatrical Glaſs; but it is childiſh: I will ſhew you one that is far more pleaſant, and wonderful; for in the former, the Images were ſeen no more than the Glaſſes were in number; but in our Glaſs, by the manifold and reciprocal dartings of the Object and the Glaſs, you may ſee far more, and almoſt infinite Images. The way is this.

How to make an Amphitheatrical Glaſs.

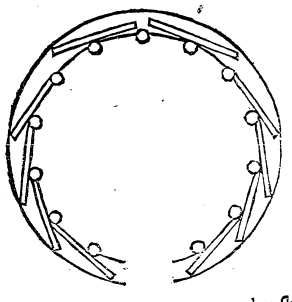
Make a circle on a Table what largeneſs you deſire, and divide it into unequal parts; and in the place where the Object or Face to be ſeen muſt be oppoſed, leave two void ſpaces: over againſt the parts, let a right line be made upon the lines that determine the parts, let Looking-glaſſes be raiſed perpendicularly; for the face that ſhall be againſt the Looking-glaſs, placed in the middle, will fly back to the beholder of it, and ſo rebounding to another, and from that to another, and by many reflections you ſhall ſee almoſt infinite faces, and the more the Glaſſes are, the more will be the faces: If you ſet a Candle againſt it, you ſhall ſee innumerable Candles. But if the Glaſſes you erect, ſhall be of thoſe already deſcribed, from ſo many divers faces of Aſſes, Sows, Horſes, Dogs; and of colours, yellow, Brown, red, the ſpectators ſhall ſee a far more wonderful and pleaſant ſight, for by reaſon of the manifold reflection, and diverſity of the forms of the Glaſſes, and colours, an excellent mixture will ariſe.



But I will now make one that is far more wonderful and beautiful. For in that the beholder ſhall not ſee his own face, but a moſt wonderful, and pleaſant, and orderly form of pillars, and the baſis of them, and variety of Architecture. Make therefore a circle as you would have it for magnitude, but I hold the beſt to be where the diameter is two foot and a half: divide the circumference into equal parts; as for example into fourteen; the points of the diviſions ſhall be the places, where the pillars muſt be erected. Let the place where the ſpectator muſt look, contain two parts; and take one pillar away, ſo there will be thir-

teen

teen pillars: Let one pillar be right againſt the ſight; then raiſe Looking-glaſſes upon the lines of ſpace between, not exactly, but inclined: place then two Looking-glaſſes at oppoſition in a right line, but the reſt about the beginning, where they joyn, and that for no other reaſon, but that the beholders face, being not rightly placed, may not be reflected, as I ſaid before: for thus the Glaſſes will not repreſent races, but pillars, and ſpaces between, and all ornaments. Hence by the reciprocal reflection of the Glaſſes, you ſhall ſee ſo many pillars, baſis, and varieties, keeping the right order of Architecture, that nothing can be more pleaſant, or more wonderful to behold. Let the perſpective be the Dorick and Corinthian, adorned with Gold, Silver, Pearls, Jewels, Images, Pictures, and ſuch like, that it may ſeem the more Magnificent: the form of it ſhall be thus. Let H. G. be the place for the beholder to look: the pillar againſt him ſhal be A, in the Glaſs A B, or A C, the face of the beholder ſhall not be ſeen, but A B is reflected into I H, and I H into B D, ſo by mutual reflections they are ſo multiplied, that they ſeem to go very far inwardly, ſo clearly and apparently, that no ſpectator that looks into it, unleſs he know it, but he will thruſt his hands in to touch the orders. If you ſet a Candle in the middle, it will ſeem ſo to multiply by the Images rebounding, that you ſhall not ſee ſo many Stars in the skies, that you can never wonder enough at the Order, Symmetry, and the Proſpect. I have raiſed and made this



Amphitheatre divers ways, and to ſhew other orders, namely two rank of pillars, ſo that the one ſtuck to the Glaſſes, the other ſtood alone in the middle, bound with the chief Arches, and with divers Ornaments, that it may ſeem to be a moſt beautiful Perſpective or Architecture. Almoſt the ſame way is there made a little cheſt of many plain Glaſſes, covered round: this they call the Treaſury: on the ground, arches and walls, were there Pearls, Jewels, Birds, and Monies hanging, and theſe were ſo multiplied by the reflections of the Glaſſes, that it repreſented a moſt rich Treaſury indeed. Make therefore a Cheſt of wood, let the bottom be two foot long, and one and half broad; let it be open in the middle, that you may well thruſt in your head; on the right and left hand, erect the ſide-boards a foot long, ſemicircular above, that it may be arched, but not exactly circular, namely, divided into five parts, each a hand-breadth. Cover this all about with Glaſſes; where the Glaſſes joyn, there put Pearls, Precious-ſtones, ſpecious Flowers, divers colour'd Birds: above the bottom ſet heaps of Gold, and Silver Meddals; from the Arches, let there hang Pearls, fleeces of Gold; for when the Coffer is moved gently, they will move alſo, and the Images will move in the Glaſſes, that it will be a pleaſant ſight.

CHAP. IV.

Divers operations of Concave-Glaſſes.

BUt the operations of Concave-glaſſes are far more curious and admirable, and will afford us more commodities. But you can do nothing perfectly with it, until you know firſt the point of inverſion. Therefore that you may do it the better, and more eaſily

Know the point of Inverſion of Images in a Concave-glaſs,

Do thus: Hold your Glaſs againſt the Sun, and where you ſee the beams unite, know that to be the point of Inverſion. If you cannot well perceive that, breathe a thick vapour from your mouth upon it, and you ſhall apparently ſee where the coincidence is of the reflected beams; or ſet under it a veſſel of boyling water. When you have found the point of Inverſion, if you will

That

That all things ſhall ſeem greater.

Set your head below that point, and you ſhall behold a huge Face like a monſtrous Bacchus, and your finger as great as your arm: So women pull hairs off their eye-brows, for they will ſhew as great as fingers. *Seneca* reports that *Hoſtius* made ſuch Concave-Glaſſes, that they might make things ſhew greater: He was a great provoker to luſt; ſo ordering his Glaſſes, that when he was abuſed by Sodomy, he might ſee all the motions of the Sodomite behind him, and delight himſelf with a falſe repreſentation of his privy parts that ſhewed ſo great.

To kindle fire with a Concave-Glaſs.

This Glaſs is excellent above others, for this, that it unites the beams ſo ſtrongly, that it will ſhew forth a light Pyramis of its beams, as you hold it to the Sun; and if you put any combuſtible matter in the centre of it, it will preſently kindle and flame, that with a little ſtay will melt Lead or Tin, and will make Gold or Iron red hot: and I have heard by ſome, that Gold and Silver have been melted by it; more ſlowly in winter, but ſooner in ſummer, becauſe the medium is hotter; at noon rather than in the morning, or evening for the ſame reaſon.

To make an Image ſeem to hang in the Air, by a Concave-Glaſs.

This will be more wonderful with the ſegment of a circle, for it will appear farther from the Glaſs. If you be without the point of Inverſion, you ſhall ſee your head downwards. That with fixed eyes, and not winking at all, you may behold the point, until it comes to your very ſight: For where the Cathetus ſhall cut the line of reflection, there the ſpecies reflected will ſeem almoſt parted from the Glaſs: the neerer you are to the Centre, the greater will it be, that you will think to touch it with your hands: and if it be a great Glaſs, you cannot but wonder; for if any man run at the Glaſs with a drawn ſword, another man will ſeem to meet him, and to run through his hand. If you ſhew a Candle, you will think a Candle is pendulous lighted in the Air. But if you will

That the Image of a Concave-Glaſs ſhould go out far from the Centre;

when you have obtain'd the Image of the thing in its point, if you will have it farther diſtant from the Centre, and that the Picture of a thing ſhall be farther ſtretched forth, then you ſhall decline from the point a little toward the right or left hand, about the ſuperficies of the Glaſs, and the Image will come forth the farther, and will come to your ſight: There, namely where the Cathetus doth the fartheſt off that is poſſible touch the line of reflection, which few have obſerved: from which principle many ſtrange wonders may be done. When you have this, you may eaſily

Reflect heat, cold, and the voice too, by a Concave-Glaſs.

If a man put a Candle in a place, where the viſible Object is to be ſet, the Candle will come to your very eyes, and will offend them with its heat and light. But this is more wonderful, that as heat, ſo cold, ſhould be reflected: if you put ſnow in that place, if it come to the eye, becauſe it is ſenſible, it will preſently feel the cold. But there is a greater wonder yet in it; for it will not onely reverberate heat and cold, but the voice too, and make an Eccho; for the voice is more rightly reflected by a polite and ſmooth ſuperficies of the Glaſs, and more compleatly than by any wall. I prove this, becauſe, if a man turn his face to the Glaſs, and his friend ſtand far behind his back, when he beholds his face, he ſhall decline his face from the point of Inverſion; but on the right hand, about the ſuperficies of the Glaſs, and his face will come forth far from the Glaſs, and will ſeem very great about the face of his friend: Whatſoever he ſhall ſpeak with a low voyce againſt the Glaſs, he ſhall hear the ſame words and motions of his mouth, and all motion from the mouth of the reflected Image; and they that ſtand in the middle between them, ſhall perceive nothing at all. But he that would ſend his own Image to his friend, muſt obſerve till his head ſhall come to the Glaſs. It is profitable alſo

By a Concave-Glaſs to ſee in the night what is done afar off.

By this very Glaſs, we may in a tempeſtuous night, in the middle of the ſtreets, caſt the light a great way, even into other mens Chambers. Take the Glaſs in your hand, and ſet a Candle to the point of Inverſion, for the parallel beams will be reflected to the place deſired, and the place will be enlightned above ſixty paces, and whatſoever falls between the parallels, will be clearly ſeen: the reaſon is, becauſe the beams from the Centre to the circumference, are reflected parallel, when the parallels come to a point; and in the place thus illuminated, letters may be read, and all things done conveniently, that require great light. By the ſame Art we may

With a few ſmall lights give light to a great Hall.

In Temples, Watches, and nightly Feaſts, any man may thus with a few lights make a great light. At two or more places of the Chamber ſet Concave-glaſſes above, and let them be ſo ordered, that the place of concurrent parallels may be coincident in the place required; and in the point of Inverſion of them, the light will be ſo multiplied, that it will be as light as noon-day. Lamps are beſt for this purpoſe, becauſe the light varies not from the place. Candles are naught, becauſe they alter the places of reflection. More commodiouſly then by a plain Glaſs, to ſignifie by a Concave-glaſs, ſecretly ſome notes to your friend: Thus, do as I ſaid, make the marks upon your Glaſs ſuperficies with wax or ſome dark ſubſtance, and ſetting it againſt the light, it will caſt the light upon the walls of the Chamber, and there it will be dark where the letters are made: one that knows the craft, may eaſily read them. But this is more admirable for one that knows not the cauſe,

To read letters in a dark night.

A Concave-Glaſs is of great uſe for this, and it may be this may be good in time of neceſſity. Set your Concave-Glaſs againſt the Stars of the firſt magnitude, or againſt *Venus* or *Mercury*, or againſt a fire or light that is afar off; for the light reflected will meet in the point of burning, and reflects a moſt bright light, whereby you may eaſily read the ſmalleſt letters; for putting the point of reflection to every word, you ſhall ſee all clearly. But this is more neceſſary and profitable,

At any hour of the day with a Concave-Glaſs, to ſet a Houſe or Fort on fire.

You may ſo burn the enemies Ships, Gates, Bridges, and the like, without danger or ſuſpicion, at a ſet hour of the day, appointed the day before. Set your Glaſs againſt the Sun, and order it ſo, that the coincidence of the beams may fall upon the point: lay fuel there, and things that will take fire, as I ſhewed you: and if you would blow up Towers, make heaps of Gun-powder: at night ſet your Glaſs, and hide it, that it be not ſeen, for the next day the Sun will fall upon the ſame point, where you ſet fuel for the fire.

CHAP. V.

Of the mixt operations of the plain Concave-Glaſſes.

I Shall ſet down the mixt operations and benefits of both theſe Glaſſes, that what one cannot do alone, it may do by the help of another. If we would

Kindle fire afar off with a plain and a Concave-Glaſs.

It falls out ſometimes that one ſhut up in priſon needs fire, and the Sun beams ſhine not in: or elſe I will ſhew how we may kindle Gun-powder without fire, or make mines and fill them with Gun-powder, to blow up Caſtles or Rocks afar off without danger, ſetting them on fire by a plain Glaſs. A plain Glaſs as it receives the parallel beams of the Sun, it ſo reflects them, and therefore will caſt the beams that are equidiſtant, a great way: but if a Concave-Glaſs receive them, it ſo unites them, that it ſets things on fire. Wherefore, firſt proving where the Concave-Glaſs muſt be placed

placed, that it may fire the fuel caſt in: the next day, at the hour appointed, let the plain Glaſs caſt in the beams upon the Concave-glaſs, that will unite them: ſo without danger, or any ſuſpicion of the enemy, we may kindle fire for our uſe. Nor is it uſeleſs,

That by a plain and Concave-Glaſs the ſmalleſt letters ſhall appear very great,

when letters are ſo ſmall that they can onely be ſeen: For I have ſeen St. *Johns* Goſpel, *In the beginning*, &c. writ ſo ſmall, in ſo little place, that it was no bigger than a ſmall pimple, or the ſight in a Cocks eye. By this Artifice we may make them ſeem greater, and read them with eaſe. Put a Concave-glaſs, with the back of it to your breſt; over againſt it in the point of burning, ſet the writing: behind ſet a plain Glaſs, that you may ſee it: Then in the plain Glaſs will the Images of the Characters be reflected, that are in the Concave-glaſs, which the Concave-Glaſs hath made greater, that you may read them without difficulty. You may

With a plain and Concave-Glaſs, make an Image be ſeen hanging altogether in the Air.

Do thus. I ſaid that by help of a Concave-Glaſs, an Image may be ſent forth: and this is ſeen by none but thoſe that ſtand over againſt it; Set the Concave-Glaſs to your breſt, without the Centre place a Poniard againſt it, and going farther off, ſet a plain Glaſs againſt it; and looking in that, you ſhall ſee the Image reflected from the Concave-glaſs, hanging in the Air, and that exactly. But if an ingenious man obſerve it, he may wonderfully ſee an Image hanging in the Air, that is received in a plain Glaſs, and ſent far out as I ſhewed, without the help of a Concave-glaſs, and a viſible ſpectacle, by the means of a plain Glaſs onely. You may alſo

By a plain Glaſs ſee your face turned the wrong way.

When you have ſet the Glaſs to your breſt, as I ſaid; ſet a plain Glaſs againſt it, and look upon it, it will caſt it upon the Concave-glaſs, and that will beat it backwards on the plain Glaſs: ſo have you your purpoſe.

CHAP. VI.

Other operations of a Concave-Glaſs.

BEfore I part from the operations of this Glaſs, I will tell you ſome uſe of it, that is very pleaſant and admirable, whence great ſecrets of Nature may appear unto us. As,

To ſee all things in the dark, that are outwardly done in the Sun, with the colours of them.

You muſt ſhut all the Chamber windows, and it will do well to ſhut up all holes beſides, leſt any light breaking in ſhould ſpoil all. Onely make one hole, that ſhall be a hands breadth and length; above this fit a little leaden or braſs Table, and glew it, ſo thick as a paper; open a round hole in the middle of it, as great as your little finger: over againſt this, let there be white walls of paper, or white clothes, ſo ſhall you ſee all that is done without in the Sun, and thoſe that walk in the ſtreets, like to Antipodes, and what is right will be the left, and all things changed; and the farther they are off from the hole, the greater they will appear. If you bring your paper, or white Table neerer, they will ſhew leſs and clearer; but you muſt ſtay a while, for the Images will not be ſeen preſently: becauſe a ſtrong ſimilitude doth ſometimes make a great ſenſation with the ſence, and brings in ſuch an affection, that not onely when the ſenſes do act, are they in the organs, and do trouble them, but when they have done acting, they will ſtay long in them: which may eaſily be perceived. For when men walk in the Sun, if they come into the dark, that affection continues, that we can ſee nothing, or very ſcantly; becauſe the affection made by the light, is ſtill in our eyes; and when that is gone by degrees, we ſee clearly in dark places. Now will I declare what I ever concealed till now, and thought to conceal continually. If you put a ſmall centicular Cryſtal glaſs to the hole, you ſhall preſently ſee all

all things clearer, the countenances of men walking, the colours, Garments, and all things as if you ſtood hard by; you ſhall ſee them with ſo much pleaſure, that thoſe that ſee it can never enough admire it. But if you will

See all things greater and clearer,

Over againſt it ſet the Glaſs, not that which diſſipates by diſperſing, but which congregates by uniting, both by coming to it, and going from it, till you know the true quantity of the Image, by a due appropinquation of the Centre; and ſo ſhall the beholder ſee more fitly Birds flying, the cloudy skies, or clear and blew, Mountains that are afar off; and in a ſmall circle of paper (that is put over the hole) you ſhall ſee as it were an Epitomy of the whole world, and you will much rejoyce to ſee it: all things backwards, becauſe they are neer to the Centre of the Glaſs, if you ſet them farther from the Centre, they will ſhew greater and upright, as they are, but not ſo clear. Hence you may,

If you cannot draw a Picture of a man or any things elſe, draw it by this means;

If you can but onely make the colours. This is an Art worth learning. Let the Sun beat upon the window, and there about the hole, let there be Pictures of men, that it may light upon them, but not upon the hole. Put a white paper againſt the hole, and you ſhall ſo long fit the men by the light, bringing them neer, or ſetting them further, until the Sun caſt a perfect repreſentation upon the Table againſt it: one that is skill'd in painting, muſt lay on colours where they are in the Table, and ſhall deſcribe the manner of the countenance; ſo the Image being removed, the Picture will remain on the Table, and in the ſuperficies it will be ſeen as an Image in a Glaſs. If you will

That all ſhall appear right,

This is a great ſecret: many have tryed it, but none could obtain it: For ſome ſetting Plain Glaſſes obliquely againſt the hole, by reverberation againſt the Table, they could ſee ſome things ſomewhat direct, but dark and not diſcernable. I oft-times by putting a white paper obliquely againſt the hole, and looking juſt againſt the hole, could ſee ſome things direct: but a Pyramis cut obliquely, did ſhew men without proportion, and very darkly. But thus you may obtain your deſire: Put againſt the hole a convex Glaſs; from thence let the Image reflect on a Concave-glaſs: let the Concave-glaſs be diſtant from the Centre, for it will make thoſe Images right, that it receives turned, by reaſon of the diſtance of the Centre. So upon the hole and the white paper, it will caſt the Images of the Objects ſo clearly and plainly, that you will not wonder a little. But this I thought fit to let you underſtand, leſt you fail in the work, that the Convex and Concave-glaſſes be proportionable circles: how you ſhall do this, will be here declared often. I ſhall ſhew alſo,

How in a Chamber you may ſee Hunting, Battles of Enemies, and other deluſions.

Now for a concluſion I will add that, then which nothing can be more pleaſant for great men, and Scholars, and ingenious perſons to behold; That in a dark Chamber by white ſheets objected, one may ſee as clearly and perſpicuouſly, as if they were before his eyes, Huntings, Banquets, Armies of Enemies, Plays, and all things elſe that one deſireth. Let there be over againſt that Chamber, where you deſire to repreſent theſe things, ſome ſpacious Plain, where the Sun can freely ſhine: Upon that you ſhall ſet Trees in Order, alſo Woods, Mountains, Rivers, and Animals, that are really ſo, or made by Art, of Wood, or ſome other matter. You muſt frame little children in them, as we uſe to bring them in when Comedies are Acted: and you muſt counterfeit Stags, Bores, Rhinocerets, Elephants, Lions, and what other creatures you pleaſe: Then by degrees they muſt appear, as coming out of their dens, upon the Plain: The Hunter he muſt come with his hunting Pole, Nets, Arrows, and other neceſſaries, that may repreſent hunting: Let there be Horns, Cornets, Trumpets ſounded: thoſe that are in the Chamber ſhall ſee Trees, Animals, Hunters Faces, and all the reſt ſo plainly, that they cannot tell whether they be true or

or deluſions: Swords drawn will gliſter in at the hole, that they will make people almoſt afraid. I have often ſhewed this kind of Spectacle to my friends, who much admired it, and took pleaſure to ſee ſuch a deceit; and I could hardly by natural reaſons, and reaſons from the Opticks remove them from their opinion, when I had diſcovered the ſecret. Hence it may appear to Philoſophers, and thoſe that ſtudy Opticks, how viſion is made; and the queſtion of intromiſſion is taken away, that was anxiently ſo diſcuſſed; nor can there be any better way to demonſtrate both, than this. The Image is let in by the pupil, as by the hole of a window; and that part of the Sphere, that is ſet in the middle of the eye, ſtands inſtead of a Cryſtal Table. I know ingenious people will be much delighted in this. It is declared more at large in our Opticks. From hence may one take his principles of declaring any thing to one that is confederate with him, that is ſecret, though the party be far off, ſhut up in priſon. And no ſmall Arts may be found out. You ſhall amend the diſtance by the magnitude of the Glaſs. You have ſufficient. Others that undertook to teach this, have utter'd nothing but toyes, and I think none before knew it. If you deſire to know

How you may ſee the Sun Eclipſed,

Now I have determined to ſhew how the Suns Eclipſe may be ſeen. When the Sun is Eclipſed, ſhut your Chamber-windows, and put a paper before a hole, and you ſhall ſee the Sun: let it fall upon the paper oppoſite from a Concave-glaſs, and make a circle of the ſame magnitude: do ſo at the beginning, middle, and end of it. Thus may you without any hurt to your eyes, obſerve the points of the diameter of the Suns Eclipſe.

CHAP. VII.

How you may ſee in the dark what is light without by reaſon of Torches.

WE may demonſtrate the ſame without the light of the Sun, not without wonder. Torches, or lights lighted on purpoſe in Chambers, we may ſee in another dark Chamber what is done, by fitting things as I ſaid: but the light muſt not ſtrike upon the hole, for it will hinder the operation; for it is a ſecond light that carries the Images. I will not conceal at laſt a thing that is full of wonder and mirth, becauſe I am faln upon this diſcourſe,

That by night an Image may ſeem to hang in a Chamber.

In a tempeſtuous night the Image of any thing may be repreſented hanging in the middle of the Chamber, that will terrifie the beholders. Fit the Image before the hole, that you deſire to make to ſeem hanging in the Air in another Chamber that is dark; let there be many Torches lighted round about. In the middle of the dark Chamber, place a white ſheet, or ſome ſolid thing, that may receive the Image ſent in: for the ſpectators that ſee not the ſheet, will ſee the Image hanging in the middle of the Air, very clear, not without fear and terror, eſpecially if the Artificer be ingenious.

CHAP. VIII.

How without a Glaſs or repreſentation of any other thing, an Image may ſeem to hang in the Air.

BEfore I part from this Image hanging in the Air, I will ſhew how you may make the Images of all things ſeem to hang in the Air, which will be a wonder of wonders; chiefly being done without the apparition of a Glaſs, or a viſible Object. But firſt we will examine what the Antients writ of this matter. One *Vitellio* deſcribes the buſineſs after his faſhion, thus: Faſten the ſegment of a Cylinder in the middle of the houſe, ſet upon a Table, or Stool, that it may glance perpendicularly up-

upon the ground; then place your eye at ſome hole or chink that is ſomewhat diſtant from the Glaſs, and let it be fixed, that it may not move here and there: over againſt the Glaſs break the wall, and make it like to a window: let it be Pyramidal in ſhape, and let the ſharp point be within, and the baſis without, as men uſe to do, when a Picture or any Image is placed for the eye to look upon; but let it be reflected on by the ſuperficies of the Pyramidal Glaſs, that the Picture placed without, which your eye cannot ſee through the hole, may ſeem to hang pendulous in the Air; which will cauſe admiration to behold. A Pyramidal Convex-glaſs will do the ſame, if you fit it ſo that it may repreſent the ſame Image. It may be done alſo by a Sphærical Convex and Concave. But the matter promiſeth more in the Frontiſpiece written upon it, then it will performe in the concluſion. Wherefore the Image will be ſeen without the Glaſs, but by the means of the Glaſs; ſo that the thing beheld in the Glaſs, will ſeem to be without it. But he is foully miſtaken here, as in other places. He had ſaid better, by a Cylinder of Cryſtal: For as a pillar it would make an irradiation outwardly, yet it would be worſe ſeen than in the pillar, as I ſhall ſhew. But I ſhall diſcover what I purpoſed always to conceal;

That neither the Object nor Glaſs may be ſeen, yet the Image ſhall ſeem to hang alone, pendulous in the middle of the Chamber;

And walking about, you ſhall behold the Image every where. But is ſuch a thing fit to be diſcovered to the people? ſhall I do ſuch an unworthy Act? Ah! my pen falls out of my hand. Yet my deſire to help poſterity, overcomes; for perhaps from this gleaning as it were, greater and more admirable inventions may be produced. Let it be ſo: get not a Sphærical Cylinder, or Convex diſſection of a Pyramidal Concave, the portion of which ſegment is not known; but let it be that which may deſcend upon his right Angle by a half Cylinder and a ſquare, and is parted by an oblique Angle. Of two parts it muſt be received pendulous, and beneath in the half of its diameter it is conveyed from the middle. Let all the windows of the houſe be ſhut: ſtop all the chinks, that the light may not come in beneath. In that place where the ſpectacle is prepared, if the Sun or Moon beams fall in, the whole ſhew is ſpoiled. So place the beams of the Image that are beaten back, that the head of it may by repercuſſion fall right upon the earth. So will the viſible Object that comes by repercuſſion, be reflected above and beneath; It will follow the faſhion of the firſt Glaſs: let a Braſs or Marble Table be ſo placed upon it, as we ſaid; and left the light falling from the window ſhould light upon the plain Cylinder, and the crooked Glaſs, it muſt be ſtopped by a ſhutter of a hands-breath, that is three times as broad as the hole; for it will break forth every way: You ſhall cover the apparition, that the Image may be fitted very deep, that there may ſeem to be a pit: as the beams meet, let the ſpectator come, who cannot be in any great miſtake. But cover your ſight round, that the Glaſs offend not your eye. Then is the Image ſeen, and it ſhall not appear above the Table, where the falling of the Cathetus will cut the line of ſight through the Centre of the Glaſs. I could open the matter no plainer, I have done what I could: I know he that can underſtand it, will rejoyce very much.

CHAP. IX.

Mixtures of Glaſſes, and divers apparitions of Images.

NOw will I try to make a Glaſs, wherein many diverſities of Images ſhall appear: and though ſuch a one be hard to make, yet it will recompence all by the diverſity of Images, and the benefit of it. If then you would

Make a Glaſs that ſhall repreſent much diverſity of Images.

Take a great or ſmall circle, as you would have your Glaſs, and here and there cut off two parts of the circumference, one to the quantity of a Pentagon, the other of a Hexagon, as is clear in the Mathematicks: let the arch of the Pentagon be made hollow with ſome table, or Iron, that it may exactly receive it into it, and may ſeem to be cut out of it; but the ſide of the Hexagon ſhal be contrary to this, for the quantity of that muſt be received by a Convex Table, that the arch of it may ſo ſtick forth: Then take a foil of Wax or Lead, of a convenient thickneſs, that exceeds the breadth of the arch of the Hexagon, and in length exceeds them both: Then crook this plate ſo, that it may exactly ſtand in the hollow of the wood, that there be no ſpace or chink left between them; then let the Convex ſuperficies that is preſerved prominent, be applied inwardly, according to the breadth of it; that the form of the Concavity may not be againſt the Convexity, but that the ſame plate may receive both portions without impediment: Having thus made your model, make your Glaſs of ſteel, or of ſome other mixture, as I ſhall ſhew you; and when it is poliſhed, it will ſhew you many diverſities of Images. Firſt, the right parts will ſhew right, and the left the left, whereas the nature of plain Glaſſes, is to ſhew the right ſide as left, and the left ſide as right: and if you go backwards, the Image will ſeem proportionable, and will come forward: if you come more towards the Convex ſuperficies, the Image will ſhew ugly; and the neerer you come, the uglier will it ſhew, and be more like a horſes head. If you incline the Glaſs, that will incline too; and by varying the Glaſs, and the ſituation of it, you ſhall perceive divers variations; ſometimes the head down, and the heels up; and you ſhall ſee many other things that I think not needful to relate now: for being placed on a voluble ſet, that it may ſhew both parts before and behind, the ſpectator of himſelf may ſee all things. We may

Make a Glaſs out of all,

that in that alone all Images may be ſeen, that are ſeen in all: many mouths; ſometimes greater, ſometimes leſs, ſometimes right, ſometimes left, ſome neerer, ſome farther off, ſome equidiſtant. If a crooked be ſet in one place, in another a Concave, and a plain one in the middle, you ſhall ſee great diverſity of Images. Theſe are

The operations of a Convex Cylindrical Glaſs.

When your face is againſt it, the more deformed it appears in length, the more ugly it is for ſlenderneſs: if the length of it cut the face overthwart, it ſhews a low preſſed down face like a Frogs, that you ſhall ſee nothing but the teeth: almoſt the ſame way, as you ſhall ſee it in a Sword, or any other long and poliſhed ſteel: if you incline it forward, the forehead will appear very great, the chin ſmall and ſlender like a horſes. But contrary to theſe are

The operations of Cylindrical Concave-glaſſes.

If you look into the Concave, you ſhall ſee more Images of the ſame thing, imitating the ſaid Glaſs. If you ſet your eye to the Centre, you ſhall ſee it all the breadth of the Glaſs; ſo your forehead, mouth, and the reſt. If you turn ſuch a Glaſs, that it may cut your face broad-ways, you ſhall preſently ſee your head inverted, and the reſt that I related in the Concave-glaſs.

The operations of a Pyramidal Glaſs turned,

are theſe: You ſhall ſee a ſharp forehead, and a large chin. But the contrary way, a long forehead, with a very long noſe. In a Concave you ſhall behold many faces, if according to the concavity you fit many portions of plain Glaſſes: for one looking into it, ſhall find them as many as there are Glaſſes, and all moving alike; and again, what Glaſs ſoever it be, if it be not plain, it ſhall ſhew always different from the Image.

CHAP.

CHAP. X.

Of the effects of a Lenticular Cryſtal.

MAny are the operations of a Lenticular Cryſtal, and I think not fit to paſs them over in ſilence. For they are Concaves and Convexes. The ſame effects are in ſpectacles, which are moſt neceſſary for the uſe of mans life; whereof no man yet hath aſſign'd the effects, nor yet the reaſons of them. But of theſe more at large in our Opticks. That no ſpace may be empty, I ſhall touch ſome things here; I call Lenticulars, portions of circles compacted together, of Concaves and Convexes. I will firſt ſhew

How with a Convex Cryſtal Lenticular to kindle fire.

A Convex Lenticular kindleth fire moſt violently, and ſooner, and more forcibly then a Concave-glaſs: I gave the reaſons in my Opticks. For being held againſt the Sun, when the beams meet in the oppoſite part, it will kindle fire it is oppoſite to, melt Lead, and fire Metals. Moreover, if you will

By night give light afar off with a Lenticular Cryſtal,

Set a Candle a little behind the point of burning, ſo it will caſt parallels a very great way to the oppoſite part, that you may ſee men paſs the ſtreets, and all things done in Chambers that are far from you. The ſame way as I ſaid of a Concave-glaſs, we may

In a dark night read a letter by a Lenticular Cryſtal:

Put the letter behind the Glaſs, againſt the Stars or Candles a great way from you; where the beams meet, the words that are oppoſite will be clearly ſeen in a dark night, and the Chamber ſhut. But that which follows, will afford you a principle far better for your conſideration: Namely,

By a Lenticular Cryſtal to ſee things that are far off, as if they were cloſe by.

For ſetting your eye in the Centre of it behind the Lenticular, you are to look upon a thing afar off, and it will ſhew ſo neer, that you will think you touch it with your hand: You ſhall ſee the clothes colours, mens faces, and know your friends a great way from you. It is the ſame

To read an Epiſtle a great way off with a Lenticular Cryſtal.

For if you ſet your eye in the ſame place, and the Epiſtle be at a juſt diſtance, the letters will ſeem ſo great, that you may read them perfectly. But if you incline the Lenticular to behold the Epiſtle obliquely, the letters will ſeem ſo great, that you may read them above twenty paces off. And if you know how to multiply Lenticulars, I fear not but for a hundred paces you may ſee the ſmalleſt letters, that from one to another the Characters will be made greater: a weak ſight muſt uſe ſpectacles fit for it. He that can fit this well, hath gain'd no ſmall ſecret. We may

Do the ſame more perfectly with a Lenticular Cryſtal.

Concave Lenticulars will make one ſee moſt clearly things that are afar off; but Convexes, things neer hand; ſo you may uſe them as your ſight requires. With a Concave you ſhall ſee ſmall things afar off, very clearly; with a Convex, things neerer to be greater, but more obſcurely: if you know how to fit them both together, you ſhall ſee both things afar off, and things neer hand, both greater and clearly. I have much helped ſome of my friends, who ſaw things afar off, weakly; and what was neer, confuſedly, that they might ſee all things clearly. If you will, you may

By a Convex Lenticular Cryſtal ſee an Image hanging in the Air.

If you put the thing to be ſeen behind the Lenticular, that it may paſs thorow the Centre, and ſet your eyes in the oppoſite part, you ſhall ſee the Image between the Glaſs and your eyes; and if you ſet a paper againſt it, you ſhall ſee it clearly: ſo that a lighted Candle will ſeem to burn upon the Paper. But

By a Concave Lenticular to deſcribe compendiouſly how long and broad things are.

A Painter may do it with great commodity, and proportion: for by oppoſition to a Concave Lenticular, thoſe things that are in a great Plain are contracted into a ſmall compaſs by it; ſo that a Painter that beholds it, may with little labour and skill, draw them all proportionably and exactly: but to leave nothing concerning ſpectacles, I will ſhew

How a thing may appear multiplied.

Amongſt ſports that are carried about, a ſpectacle is of no ſmall account: that Glaſs Inſtrument we put to our eyes, to ſee the better with. For of thoſe things that delude the ſight, there can be no better way invented, then by the medium; for that being changed, all things are changed. Wherefore prepare that of very ſolid thick Glaſs, that it may be the better worked by a wheel into proportions: wherefore fit it into many Forms and Angles, whereby we deſire to multiply any thing: but in the middle of them, let the Angles be Pyramidal, and let it agree with the ſight; that from divers Forms, Images may be retracted to the eyes, that they cannot diſcern the truth. Being now made of divers ſuperficies, ſet them to your eyes; and if you look upon any mans face hard by, you will think you ſee *Argus*, one that is all Eyes. If his noſe, you ſhall ſee nothing but noſe; ſo his hands, fingers, arms, that you ſhall ſee no man, but *Briareus* the Poet, faigned to have have an hundred hands. If you look upon Money, you ſhall ſee many for one, that you cannot touch it with your hands, but it will often deceive you; and it is better to pay with it then to receive. If you ſee a Galley afar off, you will think it is a fleet of war: If a Souldier walks, that it is an Army marching. And thus are things doubled, and men ſeem to have two faces, and two bodies. Thus are there divers ways to ſee, that one thing may ſeem to be another: and all theſe things will be evident to thoſe that ſeek and enquire after them by tryal.

CHAP. XI.

Of Spectacles whereby one may ſee very far, beyond imagination.

I Will not omit a thing admirable and exceeding uſeful; how bleare-ey'd people may ſee very far, and beyond that one would believe. I ſpake of *Plotomies* Glaſs, or rather ſpectacle, whereby for ſix hundred miles he ſaw the enemies ſhips coming; and I ſhall attempt to ſhew how that might be done, that we may know our friends ſome miles off, and read the ſmalleſt letters at a great diſtance, which can hardly be ſeen. A thing needful for mans uſe, and grounded upon the Opticks. And this may be done very eaſily; but the matter is not ſo to be publiſhed too eaſily; yet perſpective will make it clear. Let the ſtrongeſt ſight be in the Centre of the Glaſs, where it ſhall be made, and all the Sun beams are moſt powerfully diſperſt, and unite not, but in the Centre of the foreſaid Glaſs: in the middle of it, where diameters croſs one the other, there is the concourſe of them all. Thus is a Concave pillar-Glaſs made with ſides equidiſtant: but let it be fitted by thoſe Sections to the ſide with one oblique Angle: but obtuſe Angled Triangles, or right Angled Triangles muſt be cut here and there with croſs lines, drawn from the Centre, and ſo will the ſpectacle be made that is profitable for that uſe I ſpeak of.

CHAP. XII.

How we may ſee in a Chamber things that are not.

I Thought this an Artifice not to be deſpiſed: for we may in any Chamber, if a man look in, ſee thoſe things which were never there; and there is no man ſo witty that will think he is miſtaken: Wherefore to deſcribe the matter, Let there be a Chamber whereinto no other light comes, unleſs by the door or window where the ſpectater looks in: let the whole window or part of it be of Glaſs, as we uſe to do to keep out the cold; but let one part be poliſhed, that there may be a Looking-glaſs on both ſides, whence the ſpectator muſt look in; for the reſt do nothing. Let Pictures be ſet over againſt this window, Marble ſtatues, and ſuch-like; for what is without will ſeem to be within, and what is behind the ſpectators back, he will think to be in the middle of the Houſe, as far from the Glaſs inward, as they ſtand from it outwardly, and ſo clearly and certainly, that he will think he ſees nothing but truth. But leſt the skill ſhould be known, let the part be made ſo where the Ornament is, that the ſpectator may not ſee it, as above his head, that a pavement may come between above his head: and if an ingenious man do this, it is impoſſible that he ſhould ſuppoſe that he is deceived.

CHAP. XIII.

Of the operations of a Cryſtal Pillar.

NOr ſhall the operations of a Cryſtal Pillar go unſpoken of, for in it there are ſome ſpeculations not to be deſpiſed. Firſt,

To kindle fire with a Cryſtal Pillar,

by oppoſing it to the Sun, it will kindle fire behind it about the circumference: oftimes left above the Chamber, when the Sun ſhined, it burnt the Blankets. They that will at ſet hours and places burn the enemies camps, if it be laid upon fuel for fire, it will certainly kindle it. We may alſo

With a Cryſtal Pillar, make an Image hang in the Aire.

It will ſhew the Image hanging in the Air, both before and behind. Let the Object be behind the Pillar, let the Pillar be between that and the eye, the Image will appear outwardly hanging in the Air, above the Pillar, parted every where from the Pillar, clearly and perſpicuouſly; and if the viſible Object be between the eye and the Pillar, the Image will appear behind the Pillar, as I ſaid. If it be a very viſible Object, as fire or a candle, the matter is ſeen more clearly without any difficulty: I gave the reaſons in my Opticks. We may alſo

In a Cryſtal Pillar ſee many Rain-bows.

Make a ſolid Pillar in a Glaſs furnace, ſo great as a Walnut, and let it be made round onely by the fire, as the manner is, as Glaſs-makers uſe to do, that without any help of the wheel, the outward ſuperficies may be moſt polite: where the Iron touched it, there leave a Pedeſtall. It is no matter for pure Glaſs, for impure is beſt: place this upon your eye, and a burning candle over againſt it; the light refracted by bladders will ſhew infinite Rain-bows, and all the light will ſeem Golden-colour'd, that nothing can be more pleaſant to behold.

CHAP

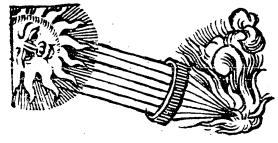
CHAP. XIV.

Of Burning-Glaſſes.

I Proceed to Burning-Glaſſes, which being oppoſed againſt the Sun beams, will kindle fire upon matter laid under them; In theſe alſo are the greateſt ſecrets of Nature known. I ſhall deſcribe what is found out by *Euclide*, *Ptolomy*, and *Archimedes*; and I ſhall add our own inventions, that the Readers may judge how far new inventions exceed the old. Fire is kindled by reflection, refraction, and by a ſimple and a compound Glaſs. I ſhall begin from a ſimple reflection, and from

A Concave-Glaſs that ſhall kindle fire behind it:

which few have obſerved. Know, that a Concave-glaſs will burn from its middle point, unto the hexagonal-ſide above the Glaſs, as far as a fourth part of its diameter; from the hexagonal-ſide, as far as the tetragonal without the Glaſs, on the lower part of it: Wherefore cut off that part of the ſemicircle, which is ſituate from a pentagon as far as a tetragon, as it were the band of the circle; and this being poliſhed, and oppoſed againſt the Sun, will caſt fire far from it, behinde it. I will ſay no more, becauſe I ſaid more at large in my Opticks concerning this. So alſo we may



With a Concave Pillar or Pyramidal, kindle fire:

but very ſlowly, with delay onely, and in the Summer-Sun; it kindles in the whole line, and not in a point, but being extended by the point of accenſion of its circle. The ſame will fall out by a Pyramidal Concave.

CHAP. XV.

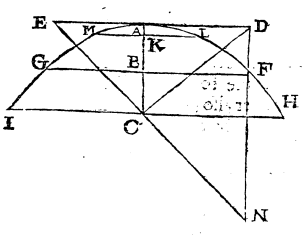
Of a Parabolical Section, that is of all Glaſſes the moſt burning.

THat is called a Parabolical Section, that more forcibly farther off, and in ſhorter time, will ſet matter on fire, that is oppoſite to it: it will melt Lead and Tin: My friends related to me, that Gold and Silver alſo; but I have made them red hot. By which invention of *Archimedes*, as appears by the teſtimony of *Galen*, and many more, We read that he ſet the Roman Navy on fire, when *Marcellus* beſieged *Syracuſe*, his Country. *Plutarch* in the life of *Pompilius* ſaith, The fire that burnt in *Diana's* Temple, was lighted by this Glaſs, that is, by inſtruments that are made of the ſide of right triangle, whoſe feet are equal: Theſe made hollow, do from the circumference reſpect one Centre. When therefore they are held againſt the Sun, ſo that the beams kindled may be gathered from all parts, and be united in the Centre, and that they do ſever the Air rarified, it ſoon ſets on fire all fuel that is combuſtible oppoſed againſt it, by kindling firſt the lighteſt and drieſt parts; the beams being as ſo many fiery darts falling upon the Object. In a Concave ſpherical Glaſs the beams meeting together, kindle fire in a fourth part of the diameter under the Centre, which are directed within the ſide of a Hexagon from the ſuperficies of the circle. But a Parabolical Section, is, wherein all the beams meet in one point from all the parts of its ſuperficies. *Cardanus* teacheth how ſuch a Glaſs ſhould be made. If we would kindle fire at a mile diſtance, we muſt deſcribe a circle, whoſe diameter muſt be two miles long; and of this we muſt take ſuch a part, that the roundneſs of it may not lye hid, namely, a ſixtieth part, to which we muſt add a dimetient, according to the altitude in one point, and upon the fixt diameter muſt we bring about part of the circle, which ſhall deſcribe the portion of a Sphere; which when we have poliſhed,

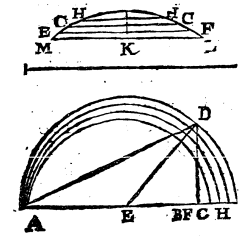
liſhed, if we hold it againſt the Sun, it will kindle a moſt violent fire a mile off. 'Tis ſtrange how many follies he betrays himſelf guilty of, in theſe words. Firſt, he promiſeth a Glaſs ſhould burn a mile off; which I think is impoſſible to burn thirty foot off, for it would be of a wonderful vaſtneſs; for the ſuperficies of the Cane is ſo plain,& to receive any crookedneſs, it can hardly be made ſo great. Moreover, to deſcribe a circle, whoſe diameter ſhould be two miles long, what compaſſes muſt we uſe, and what plate ſhall we make it on, or who ſhall draw it about? And if it be true, that *Archimedes* by a Parabolical Glaſs did burn ſhips from the wall, the diſtance could not be above ten paces, as appears by the words of the Authors themſelves; for in the ſame place he raiſed ſhips, and threw them againſt the Rocks: and his engines were Iron bars, the greateſt part whereof lay backward; and by reaſon of thoſe iron crows, it is manifeſt it could be done no other ways. There are other fooleries, but I paſs them for brevity ſake, that I might not ſeem tedious: the cauſe of his error was, that he never had made any ſuch Glaſſes; for had he tried it, he would have ſpoke otherwiſe. But I will now ſhew how

To make a Glaſs out of a Parabolical Section.

The way to deſcribe it is this: Let the diſtance be known how far we would have the Glaſs to burn, namely, A B ten foot; for were it more, it could hardly be done: double the line A B, and make A B C, the whole line will be A C: from the point A, draw a right line D A, and let D A and A E be equal one to the other, and cut at right Angles by A C, but both of them muſt be joined to the quantity A C, as D C E, which in C make a right Angle, D C E. Therefore the Triangle D C E is a right angled Triangle, and equal ſides: and were this turned about the Axis C D, until it come to its own place whence it parted, there would be made a right angled Cane, E D N C, whoſe Parabolical Section will be A B C: the right line D C will be the Axis of the Cane, and C E ſhall be the ſemidiameter of the baſis of the Cane: Through the point C you muſt draw a line parallel to D E, and that is H I of the length of C E and C D; and by the point B draw another parallel to the ſaid line E D, which is F B G; and let B G and B F be both of them equal to A C: ſo F G ſhall be the upright ſide, and H I the baſis of the Parabolical Section: If therefore a line be drawn through the points H E A G I, that ſhall be a Parabolical Section,



the Diagram whereof is this that follows. But if you will burn any thing, you muſt not make your Parabolical Glaſs to the bigneſs of the whole line H F A G I, but onely take a part thereof, as if we would take the top part of it L A M, that the line L M may cut A C in K, or greater or leſſer: if you will make one greater, cut off A K beneath it; for the bigger it is, the more quickly and vehemently will it burn; if you will have it leſs, take it above A K. But thus you muſt do, that the crooked line L A M may be more exactly deſcribed, that you may not commit the leaſt error. Wherefore on a plain Table I protract the line A B C, and let A B be double the diſtance, that we intend to burn any thing, that is, the length of the line A B C: from the point B, I raiſe a perpendicular line B D, the altitude whereof muſt be of the ſame ſemidiameter of the Section to be made, that is the line L M, the half whereof is L K; from thence deſcribe a ſemicircle, whoſe beginning A muſt paſs through the point D. But you ſhall find the Centre thus: Let the points A D be joyned by a line, and let the Angle B A D be made equal to A D E, and the line D E drawn forth, ſhall cut A C in F, that ſhall be the Centre: ſo draw the ſemicircle A D C. If therefore we ſhall cut the line B C into ſmaller parts, ſo much the leſſer Parabolical line muſt be deſcribed. Divide it into four parts, and let the points of the diviſions be H G F: then deſcribe three circles, that ſhall be termined by A from the three points H G F: the firſt is A F, the ſecond A G, the third A H: and they ſhall cut the

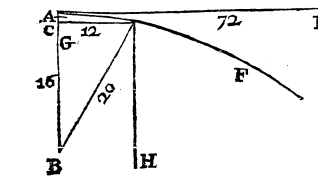


line B D; the firſt in F, the ſecond in G, the third in H; thence I take my Section to be perfected L K M, and I cut the line K A into four parts, and thorow thoſe points I draw parallel lines to L M. Let B H be the neereſt to the top of the Parabolical Section, the ſecond B G that follows next, and the third B F next to that, and after ſhall be L M. Thence by the lines L F G H A, draw a crooked line, and do the ſame on the other part ſo far as M, and that ſhall be the line ſought for, to make the Parabolical Section, and from that muſt be made the Glaſs, as I ſhall ſhew.

CHAP. XVI.

How a Parabolical Section may be deſcribed, that may burn obliquely, and at a very great diſtance.

I Have deſcribed a Parabolical Section, which might be made by rule and compaſs, becauſe we may uſe it at a ſhort diſtance; but in greater diſtance we muſt proceed by numbers: as for forty or for ſixty foot, and not much more, leſt the Glaſs ſhould be made of an unuſual magnitude. The foreſaid Glaſs burns between it and the Sun; and if the Sun be not as you deſire it, the operation is loſt: ſo alſo by an oblique Glaſs, that is between the Sun and the combuſtible matter, or over againſt it. Whence according to the ſituation you may uſe them all, namely, wherein they anſwer your expectation; and eſpecially when the Sun is in the Meridian, they burn with more vehemency. This I muſt tell you, that you may not be deceived; for when you erre, you commonly draw others into error with you. A Parabolical Glaſs made from the top, if the Section ſhall be from the top, if we would burn far, the Glaſs will be plain; and that it may have ſome crookedneſs, it will be wonderful great. And if the Section be about the baſis, that will be worſt of all; for from the leaſt diſtance, it will be almoſt flat: wherefore that we may have it with ſome crookedneſs, we muſt take a line about the neck of the Section, not the head, nor the feet. Wherefore being to make a Glaſs of a Parabolical Section, about the neck of the Section, where the greateſt crookedneſs of the Parabolical Section is made, and that may burn far from its ſuperficies, to twenty foot diſtance; Let the line A B be the *ſinus verſus* eighteen foot long: from the point A, I raiſe a line to right Angles with A B, which ſhall be the line by which, the fourth part whereof is A B: cut A B in C, and let it be two foot, and C B ſixteen foot: I multiply twice ſeventy two, and that makes one hundred forty and four: the ſquare root of this is twelve; wherefore the line erected perpendicularly from the point C, unto the circumference of the Parabolical Section, will be D I of twelve foot, wherefore C I will be the line appointed: joyn



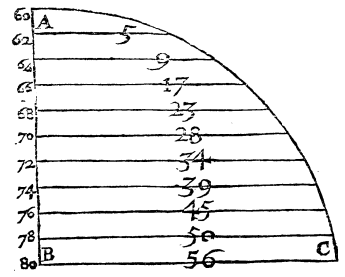
I B, and the Radius that muſt burn, will be in the point B that was ſought for: Wherefore the ray of the Sun, that is equidiſtant to the *ſinus verſus* H I, is reflected by I B in B; the Latitude whereof will be about twenty foot: for the line I C of twelve foot, multiplied into it ſelf, will make one hundred forty and four; and C B is ſixteen foot, which multiplied into it ſelf, makes two hundred fifty and ſix; adde theſe together, and they make four hundred: the ſquare root of it is twenty foot, thus. Wherefore I am reſolved to take the part of the Glaſs, intercepted between the points I and F, and I ſeek two thirds of one foot, from C toward B, and I divide one foot into thirty parts, that the crookedneſs may be taken more preciſely; and let C G be twenty parts of a foot,

a foot, from A to C ſixty parts, becauſe they are two foot: wherefore from A to G, where we ſhall make our Glaſs, will be eighty parts. Wherefore let us begin from A C ſixty parts, to which I always add four cyfers 0000. for this purpoſe, that when numbers come forth, whoſe roots cannot be extracted, thoſe that are taken may be to the leaſt loſs: wherefore we ſhall make the Table under written. In the firſt line are the points of the *ſinus verſus*: in the ſecond, the ſqares, the lines to which; from the multiplication of the *ſinus verſus*, namely, the length A E, is ſeventy two foot: if we ſhall reduce theſe to parts, by multiplying by thirty, there comes forth 2160: multiply by the parts of the *ſinus verſus* A C, there will ariſe 129600: in the third line are roots of the foreſaid number, namely, the lines appointed: adding therefore to 129600, four cyfers, they make 1296000000: the ſquare root of this is 36000; of which laſt cyfers, one ſignifies the tenth part of a foot, another the tenth of a tenth part: thus, 360.0.0.0. ſo will be the foreſaid Table made.

The points of ſinus verſus.	*Multiplication of ſinus verſus with the line to which.*	*The ſquare roots.*	*Tenth parts.*	*Tenths of tenth parts.*
60	129600	360	0	0
61	131760	362	9	8
62	133920	365	9	3
63	136080	368	8	9
64	138240	371	8	1
65	140400	374	7	6
66	142560	377	5	
67	144720	380	4	2
68	146880	383	2	4
69	149040	386	0	5

The points of ſinus verſus.	*Multiplication of ſinus verſus with the line to which.*	*The ſquare roots.*	*Decimal parts.*	*Decimals of decimals.*
70	151200	388	8	4
71	153360	391	6	1
72	155520	394	3	6
73	157680	397	0	8
74	159840	399	7	9
75	162000	402	4	8
76	164160	405	1	6
77	166320	407	8	2
78	168480	410	4	6
79	170640	413	0	8
80	172800	415	6	9

Theſe



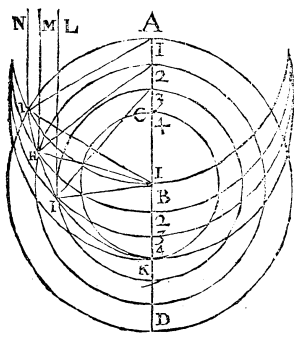
Theſe things being done, I take the differences of the roots, of the greateſt to the ſmalleſt, for they are from 160.0.0. to 415.6.9. Make choice of the meaſure of a foot, according to which diſtances we would make our Glaſs: let it be A B, which we divide into thirty parts; and take twenty parts, namely, two thirds: I adde a line to it at right Angles, namely B, and let it be B C, which I divide into fifty five parts. I divide one part into ten, and that one into ten parts more, and thoſe are tens of tens. Let A be nul, that is a cyfer, and there place ſixty; the ſecond part ſixty one: the line joyned to right Angles, will be two; the third part ſixty two; the line joyned to it will be five: ſo the twentieth part will be eighty, and the line joyned to the Angle fifty ſix: to the extremities of theſe lines I faſten a pin, and I put a braſs Cithern-wire upon them, and upon it I draw a line, and the Parabolical line is exactly deſcribed by it; for ſhould we draw it without the help of this cord, it will be wavering, and not perfect. Then take a braſs Table of convenient thickneſs, and draw the line now found upon it, filing away all that that ſhall be above the line C A. Theſe things being done, take an iron rod of an exact length, namely, twelve foot, as the line D C, and at the end faſten a plate, which ſhall be for the circumvolution of the axis; at the other end faſten a ſpike, that it may be faſtned ſomewhere, and be handſomely turned about. So being well fixed, we turn it about, by adding clay mingled with ſtraw, that it may excellent well make a hollow place, like to the form of a Parabolical Section; which being dried, we muſt make another ſolid one, that it may contain the liquid Metal, as the maner is.

CHAP. XVII.

A Parabolical Section that may burn to infinite diſtance.

ZOnaras the Greek, writes in the third Tome of his Hiſtories, That *Anaſtaſius* moved ſedition againſt *Vitalianus* a Thracian, and he got thoſe of Myſia, and the Scythians to ſtand with him; and in the Country by Conſtantinople, he plundered the people, and beſieged the City with a Fleet. *Marianus* the Depury oppoſed him; and there being a fight at ſea, by an engine made by *Proclus* a moſt excellent man, for he then was famous for Philoſophy and Mathematicks; for he not onely knew all the ſecrets of the moſt eminent Artificer, *Archimedes*, but he found out ſome new inventions himſelf; the enemies Navy was vanquiſhed. For *Proclus* is reported to have made Burning-Glaſſes of braſs, and to have hanged them on the wall againſt the enemies Ships; and when the Sun beams fell upon them, that fire brake forth of them like to lightning, and ſo burnt their Ships and men at ſea, as *Dion* reports that *Archimedes* did formerly to the Romans beſieging *Syracuſe*. But I will ſhew you a far more excellent way than the reſt, and that no man as ever I knew writ of, and it exceeds the invention of all the Antients, and of our Age alſo; and I think the wit of man cannot go beyond it. This Glaſs doth not burn for ten, twenty, a hundred, or a thouſand paces, or to a ſet diſtance, but at infinite diſtance: nor doth it kindle in the Cane where the rays meet, but the burning line proceeds from the Centre of the Glaſs of any Longitude, and it burns all it meets with in the way. Moreover, it burns behind, before, and of all ſides. Yet I think it an unworthy act to divulge it to the ignorant common people: yet let it go into the light, that

that the immenſe goodneſs of our great God may be praiſed, and adored. Becauſe a proportional Radius doth proceed from the greater Section, from the leſs is made the greater: to avoid this, make it of a Cylindrical Section, for it is the mean, and let it be ſet for the axis of the ſmall and of the greater diſſection, which may paſs through the middle parallels: this held againſt the Sun, doth make refraction of the beams ſent into it, very far, and perpendicularly from the Centre of a Cylindrical Section; and in this Art the reaſon cannot be found, that the beams uniting ſhould part again: Wherefore it receives them directly, which it ſends back again obliquely into beams far from the ſuperficies of it. For the beams paſſing through the narrow hole of a window, are forthwith dilated; nor is their proportion kept, by being far removed, therefore it may reverberate and burn where the Cane ſeems cleareſt, which will be neer the Centre, nor is it far diſtant from the point where the rays meet; but neer the ray coming forth from that point, from the ſuperficies of the Glaſs, called Parabolicall, which muſt remain firm in that place which I ſaid before. Let experiment be made of its vertue, by threds paſſing from its Centre, or iron wire, or hair; and it is no matter whether it be Parabolical or Sphærical, or any Section of the ſame order: then let it be excellent well fitted upon the Centre of the ſaid Section: If the rays go forth above, or a little beneath, it is no matter, if not much money, or much money be laid out to make it. The making of it depends meerly on the Artificers hand; the quantity is nothing, be it ſmall or great. The Latitude of the hollow is not neceſſary, onely let it be ſent forth from the middle, that the rays may meet excellent well in the Centre. Let the window be made open aſlaunt, that it may receive a Parabolical Glaſs; and thus ſhall you have a Glaſs, if that be well done I ſpake of. *He that hath ears to hear, let him hear*; I have not ſpoken barbarouſly, nor could I ſpeak more briefly, or more plainly. But if a ſmall one do not anſwer a great one in proportion, know that you will operate nothing: let it be large about the baſis, ſmall at the top, equidiſtant to the firſt. Let it not be a ſteel Glaſs, becauſe it cannot ſuſtain the heat of the burning, and by burning it loſeth its brightneſs. Let it be therefore of Glaſs a finger thick: Let the Tin foil be of purged Antimony, and Lead, ſuch as they make in Germany: let the form be of clay: put the Glaſs upon it, and melt it in a Glaſs furnace, that it may take its form. This is a wonder, that that which cauſeth ſo much burning in the work, is cold, or at moſt but luke-warm. If you would have it burn before, of the Section which is about the baſis, make a circle, in the middle point whereof fit the Artifice, that the ray returning, may come forth to the fore part. This I have ſaid; and I have obſerved, that we may uſe this Artifice in great and wonderful things, and chiefly by inſcribing letters in a full Moon. For whatſoever we have written by this Glaſs, as I ſaid of a plain Glaſs, we may ſend letters of it to a very great diſtance: and becauſe I ſaid it ſends forth to infinite diſtance, it is ſent as far as the Moon, eſpecially being helped by its light.

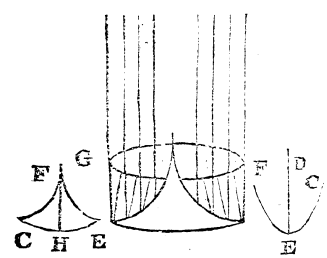


CHAP. XVIII.

To make a Burning-Glaſs of many Spharical Sections.

Vitellio deſcribes a certain compoſition of a Burning-glaſs, made of divers Sphæral Sections: but what he writes he proves not, nor doth he underſtand what he ſays: whilſt I was ſearching for that, I found this. Propound the diſtance of combuſtion, let it be C B, let it be doubled, C A ſhall be the ſemidiameter of the Sphære, whoſe

whoſe Centre B muſt be extended to D, and the Diameter will be A D. Divide C A into four points, but the more the parts are, the more preciſe will be the deſcription of the line, and ſet the numbers to the diviſions: ſo ſetting the foot of the compaſs faſt in I, and the moveable foot in B, make the ſemicircle E F, and mark it B I: and ſetting it in the 2. Centre at the ſame wideneſs, and the other moveable foot in the line B D, deſcribe another ſemicircle and mark it 3. and ſo to the fourth and mark it 4. Then ſetting the foot firm in B, at the diſtance of B C, or B 4, make a circle, and the immoveable foot ſtanding on the Centre B, upon the diſtance B 3, deſcribe another: ſo there is the third B, and the fourth B A, as B I. Then from the point, A, draw a line, and another from the point B; and let them meet in a point where the circle I meets, with the ſemicircle 1. for let them be cut in G; then draw the ſecond line from circle 2. and another from the ſame A the Centre, and let them meet, where the ſecond circle cuts with the ſecond ſemicircle in H; then from the third circle, and from B the Centre, and where they meet in, I, by the meeting of the ſemicircle: ſo from the fourth, where the fourth begins in K, and from K I H G draw a line, which ſhall be the Section to be deſcribed. The ſame may be done on the other part of the circle, the reaſon is this: The beam of the Sun L I falling upon the point I, of the Glaſs, is reflected to B, becauſe B 3. and B I are equal from the ſame circle: therefore the Angle B 3 I, is equal to B I 3. But B 3 I is equal to 3 I L, becauſe it is ſubalternate, for the ray of the Sun L I is equidiſtant to the diameter of the circle, wherefore the Angles L I 3 and 3 I B, are equal, therefore it is reflected upon B. The ſame is to be ſaid of the beam M H and N G, and this Glaſs is contrary to a Sphæral Glaſs: From divers points of the circumference, the rays are reflected upon different parts of the diameter, and all the diameters are from the Centre: but in this the reflected beams unite, not in one point, and the diameter are various from the fourth of the diameter. But of this more largely in my Opticks. Laſtly, I will not omit that the Cane doth kindle fire circularly, when that as far as this circle it kindles in a point. Divide the Parabolical line by *ſinus verſus*, and let them meet upon contrary parts. For example, let the Parabolical Section be C E F, the *ſinus verſus* D E: cut this circumference in E, and let C F meet together in the manner they ſtood before, that it may be E G F E, and about the axis G H turn it round, there will be made a round Cane, make it of Steel, or other Metal; and poliſh it, and it will kindle fire round about.



CHAP. XIX.

Fire is kindled more forcible by refraction.

I Have ſpoken of Burning-glaſſes by reflection: Now I ſhall ſpeak of thoſe which burn by refraction; for theſe kindle fire more violently, I ſhall ſhew my reaſon in the Opticks. Wherefore

By a Cylindre of Cryſtal to kindle fire.

We may do it by ſetting it againſt the Sun, but very ſlowly and by leaſure; for all the beams do not meet in one point, but in a line. The ſame way almoſt are we wont

To burn with a Pyramidal Cryſtal Glaſs.

But this burns about a line, yet both burn more ſtrongly than a pillar Glaſs of a Pyramidal, in the place of this we may uſe a Vial full of water. But the moſt violent of them all, is with

A Cryſtal Sphære, or portion of it.

And if a Sphære be wanting, we may ſupply it with a Vial full of water, that is round and of Glaſs, ſet againſt the Sun: if you ſet behind it any combuſtible matter, that is friendly to the fire, ſo ſoon as the rays unite about the ſuperficies, it forthwith kindleth fire, to the wonder of the Spectators: when they ſee fire raiſed from water, that is extreme cold, ſo will the portions of Sphæres, as ſpectacles, lenticulars, and ſuch like, which we ſpeak of already.

A Cryſtal parabolick-Glaſs will kindle fire moſt vehemently of all,

we ſhall ſee it, becauſe the beams all meeting, it kindles more than a Glaſs. We may alſo, as I ſaid of a Glaſs

By refraction, kindle fire afar off,

And almoſt to infinite diſtance, as is demonſtrated by Obtick reaſons; and the more by how much as refractions work more forcibly than reflections: and I ſhall perform this many ways, as I ſaid before, not onely by reaſon, but by experience. *Almeon* ſaid, That he made the ſame way parallel lines cut a croſs. I have ſaid alſo, that if they be oppoſed in place, Cryſtal Sphæres are ſo perfectly oppoſite by coition, as are Sphæral and Cylindrical portions. Nor do they caſt forth fire ſo far, that it is hard to believe it, and more than imagination can comprehend. Behold, I ſhall ſhew you a more forcible way to kindle fire. It ſends forth alſo unequal, and combuſt parallels. Let a uniform Section fall in, and it will carry forth oblique beams, you ſhall ſee the fire by a hidden and open beam, falling upon a right ſuperficies, and it will come forcibly and uniformly into that place, where the beams unite moſt in a fit combuſtible matter: for if that combuſtible matter that is oppoſite, be not dry, it is in vain to ſet a Glaſs againſt it, either a Convex Cylindrical, or Concave Sphærical; for the matter will be found almoſt pierced through with ſtrong fire, and if it be not truly oppoſite it will burn, whether it be ſmall or great. But it is conſiderable, the portion of which it is. It will do alſo the ſame thing, if the thing be oppoſite, and be ſmall or great, if need be.

CHAP. XX.

In a hollowed Glaſs how the Image may hang without.

BEfore I depart from a plain Glaſs, it is performed by the later Artiſts induſtry, that in the ſame Glaſs many faces may be ſeen, or likeneſſes of the ſame Image, without any hindrance to the firſt: for behind it they make the Glaſs hollow, and make a little Concave, whence a foil being laid on, as I ſhall ſhew, and fitted well, it will hold another forth without. Hence comes it to paſs by this excellent invention, that a man looking in a Glaſs, may ſee the upright Image of ſome other thing, and wonders at it, for catching at it, he can catch nothing but Air. I remember that I have often ſeen it, and the matter is thus. A Glaſs being made of Cryſtal, they make a hollow place on the backſide like an Image, as curiouſly as they can; then they foil it over, and ſet it in its place, now as deep as the hollow is with in, ſo much will it ſhew it ſelf without the ſuperficies; and you cannot ſatisfie your ſelf, unleſs you touch it with your hands, whether it truly ſtick without the Glaſs or not. So Letters are truly read, that they will ſeem to be made in Silver upon the Cryſtal; nor is the eye ſo quick, but it may be deceived when it looks on. Nor will I omit the Artifice,

To ſee in a plain Glaſs that which appears no where.

I have often much delighted my friends, and made them admire with this Glaſs. Provide thirty or forty little Tables ready, of a foot and half long, and two fingers broad, and a third part of a finger thick; ſo artificially hewed, that the thickneſs may be upon the one ſide, and the thinneſs on the other ſide, like the edge of a knife. Place

Place all theſe boards together, that the ſolid parts may ſtand altogether, as to make a perfect plain: Then paint your own Picture, or of ſome other thing upon it: yet by this artifice and great obſervation, that if the Image be neer the Glaſs, it muſt be drawn as it were afar off. If you would have it far diſtant, let the forehead be unmeaſurably long, the noſe ſomewhat longer, and the mouth, and the chin, likewiſe. The manner how to draw this Form exactly in Tables, I ſaid in my Opticks. When the Image is now deſcribed, faſten the little boards upon a plain Table, that the head may be ſet downwards, and the chin upwards; and place the firſt Table after the ſecond, and the ſecond after the third, till they be all faſtned. Hang the Table above a mans height, that no man may ſee into it, above the degrees of the Tables: and place a Glaſs over this, diſtant two foot from the Table, ſo long lifting it up, and putting it down till you ſee the perfect Image. Now when any man comes neer the Glaſs to ſee his own Image, he ſhall ſee the Image of ſome other thing that appears no where. In the breadth of the Tables you may draw ſome Picture, leſt they ſhould give ſome occaſion to ſuſpect.

CHAP. XXI.

How Spectacles are made.

WE ſee that Spectacles were very neceſſary for the operations already ſpoken of, or elſe lenticular Cryſtals, and without theſe no wonders can be done. It remains now to teach you how Spectacles and Looking-glaſſes are made, that every man may provide them for his uſe. In Germany there are made Glaſs-balls, whoſe diameter is a foot long, or there abouts. The Ball is marked with the Emrill-ſtone round, and is ſo cut into many ſmall circles, and they are brought to Venice. Here with a handle of Wood are they glewed on, by Colophonia melted: And if you will make Convex Spectacles, you muſt have a hollow irondiſh, that is a portion of a great Sphære, as you will have your Spectacles more or leſs Convex; and the diſh muſt be perfectly poliſhed. But if we ſeek for Concave Spectacles; let there be an Iron-ball, like to thoſe we ſhoot with Gun-powder from the great Braſs Cannon: the ſuperficies whereof is two, or three foot about: Upon the Diſh, or Ball there is ſtrewed white-ſand, that comes from Vincentia, commonly called Saldame, and with water it is forcibly rubbed between our hands, and that ſo long until the ſuperficies of that circle ſhall receive the Form of the Diſh, namely, a Convex ſuperficies, or elſe a Concave ſuperficies upon the ſuperficies of the Ball, that it may fit the ſuperficies of it exactly. When that is done, heat the handle at a ſoft fire, and take off the Spectacle from it, and joyn the other ſide of it to the ſame handle with Colophonia, and work as you did before, that on both ſides it may receive a Concave or Convex ſuperficies: then rubbing it over again with the powder of Tripolis, that it may be exactly poliſhed; when it is perfectly poliſhed, you ſhall make it perſpicuous thus. They faſten a woollen-cloth upon wood; and upon this they ſprinkle water of Depart, and powder of Tripolis; and by rubbing it diligently, you ſhall ſee it take a perfect Glaſs. Thus are your great Lenticulars, and Spectacles made at Venice.

CHAP. XXII.

How upon plain Concave and Convex Glaſſes, the foils are laid on and they are bended.

NOw it remains that I ſpeak of ſome few things, not to be overpaſſed of the bending of Convex Glaſſes, and of foiling plain Glaſſes, and Convex Glaſſes, that ſo I may ſet down the perfect Science of Looking-glaſſes. Firſt, for the terminating of Looking glaſſes, that are made of Cryſtal and Glaſs, then of other mixtures, and poliſhings, that a knowing Artificer may know, and know how to make them: For though amongſt many things, that ſhew the Images of things, as water, ſome Jewels, and poliſhed Metal do it; yet nothing doth ſo plainly repreſent Images, as

as Lead foil'd upon Glaſs. Plain Looking-glaſſes are prepared of Cryſtal, and of Glaſs: thoſe of Cryſtal are poliſhed by wheels, and require another Artifice. But at Venice

How Glaſs Looking-glaſſes are made,

I have ſeen it. They take the melted Glaſs out with an Iron; with their blaſt they frame an empty Pillar; they open it on one ſide with their tongs, and whilſt it is red hot they lay it upon a plain plate of Iron, that is equally made; and they put it into the furnace again, to make it ſofter; and that it may get the perfect plainneſs of the iron plate, they leave it over the furnace to cool by degrees: When it is cool, they do thus

Poliſh plain Glaſſes.

They faſten it upon a plain Table with Gyp; underneath lyeth a moſt polite plain plate of iron; they caſt upon it the foreſaid ſand; they rub it with water by a ſtick, leaning thereon, until it be perfectly plain; they take it from the Table, and glew it on the other ſide, to poliſh them both: then they make them perſpicuous, as I ſaid they did. Now will I ſhew

To terminate plain Glaſs Looking-glaſſes.

Glaſs or Cryſtal Looking-glaſſes, when they are made plain and equal, the Artiſt makes a foil of the ſame bigneſs of Tin, that is level and thin, as perfectly as he can. For if Cryſtal or Glaſs had no foil of Lead behind it, by its ſtrength and thickneſs it could never terminate our ſight, nor ſtay the Image Printed upon it, but it would let it ſlip away; for Glaſs is pure and tranſparent, and ſo would not contain it, by reaſon of its brightneſs; and ſo the Image would vaniſh in it, as light in the Sun. Wherefore upon this foil you ſhall wipe over with Quick-ſilver, by the means of a Hares foot, that it may appear all as Silver: and when you ſee it faſt on the ſuperficies, you ſhall put it upon a fair white paper, and ſo upon the Glaſs; but firſt made clean with a linen clout, and poliſhed: for if you handle it with your hands, the foil will not ſtick to it: with your left hand preſs down the Glaſs, and with the right take away the Paper, that the foil may cleave every where, and they bind faſt together; laying a weight upon it for ſome hours, and ſo let it ſtand and ſtir it not. Now I will ſhew

How a foil is put upon a Concave Glaſs.

But it is more laborious to lay a foil on a Concave-Glaſs: Prepare then a foil of the bigneſs of your Glaſs, that you ſhall lay upon the Convex ſuperficies; and holding it faſt with a finger of your left hand upon the Centre, with your right hand you ſhall fit the foil round about, and ſhall extend it on the ſaid ſuperficies, until it become of the ſame form with that convex ſuperficies, and ſtick every where even unto it. Then of moiſt Gyp ſhall you prepare a form of the Glaſs, namely, by pouring Gyp upon the Convex ſuperficies; and when the Gyp is dry, you have the form. Upon the form extend a foil of Tin, and let it agree perfectly with the form every where, becauſe the form and the foil are made after the ſame ſuperficies: ſtrew quick-ſilver upon the foil, and as I ſaid, make it ſtick by means of a Hares foot. The Artiſts call this *Avivare*: put paper upon it, and preſſing this upon the Glaſs, take away the paper; when you know it ſticks faſt, take away your hand, and lay on a weight, and after take it away, but with a careful balancing of your hand, leſt it take wind, and that the quick ſilver may all ſtick faſt every where. Now remains how

To terminate Convex-Glaſſes.

Make Glaſs Balls, but of pure Glaſs, and without bladders as much as you can, as the receivers for diſtillations; and from the hollow iron that it is blown in by, let this liquid moiſture be projected, namely, of Antimony and Lead; but the Antimony muſt be melted twice or thrice, and purged, and caſt Colophonia in. So ſtir the mixture in the hollow veſſel, and what remains caſt forth: and ſo in Germany they make Convex-Glaſſes. Chap.

CHAP. XXIII.

How Metal Looking-Glaſſes are made.

BUt Metal-Glaſſes are made another way. Wherefore if a Parabolical-Glaſs be to be made, draw a Parabolical line upon a braſs or wooden Table; what is without it, muſt be filed away, that it may be equal, ſmooth, and poliſhed: faſten it upon an Axis in the middle, and fit it with Inſtruments, that may be fitly turned about, let there be clay with ſtraw under it, made up with dung, that the Table being turned about, it may receive a Concave form exactly; then let it dry, ſtrew aſhes upon it, and plaiſter clay above that, of a convenient thickneſs; let it dry by the fire, or if you will, by heat of the Sun, take it off, for it will eaſily part from the aſhes: unite them together, that as much ſpace may be between both forms, as you think fit, for the thickneſs of the Glaſs: when it is dry, cover it with this, leaving an open orifice on the top, and ſome breathing places, that the Air may breathe forth at it. Then make ſuch a mixture; let them be put into a new pot that will endure the fire, and lute it well within, that it may hold the faſter; let it dry well, and do this twice or thrice over: ſet it to the fire, and melt in it two pounds of Tartar, and as many of white Arſenick; when you ſee them fume, pour in fifty pounds of old braſs, often uſed, and let it melt ſix or ſeven times, that it may be pure and cleanſed; then adde twenty five pounds of Engliſh Pewter, and let them melt together: draw forth ſome little of the mixture with ſome Iron, and try it, whether it be brittle or hard; if it be brittle, put in more Braſs; if too hard, put in Pewter: or elſe let it boil, that ſome part of the Pewter may evaporate: when it is come to the temper it ſhould be, caſt upon it two ounces of Borax, and let it alone till it diſſolve into ſmoke; then caſt it into your Mold, and let it cool: When it is cool, rub it with a Pumice-ſtone, then with powder of Emril. When you ſee that the ſuperficies is perfectly poliſhed and equal, rub it over with Tripolis. Laſtly, make it bright and ſhining with burnt Tin; moſt adde a third part of Pewter to the Braſs, that the maſs may be the harder, and become more perſpicuous.

THE

THE

EIGHTEENTH BOOK

OF

Natural Magick:

Treating of things heavy and light.

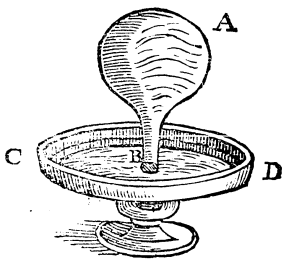
The Proeme.

Many miracles worth relating and to be contemplated do offer themſelves when I begin to deſcribe heavy and light; and theſe things may be applied to very neceſſary and profitable uſes, and if any man ſhall more deeply conſider theſe things, he may invent many new things: that may be employed for very profitable ends. Next after theſe follow wind Inſtruments, that are almoſt from the ſame reaſon.

Chap. I.

That heavy things do not deſcend in the ſame degree of gravity, nor light things aſcend.

Before I ſhall come to what I intend to demonſtrate, I muſt premiſe ſomethings neceſſary, and ſet down ſome actions, without the knowledge whereof we can make no proof, nor demonſtration. I call that heavy that deſcends to the Centre, and I ſay it is ſo much the heavior the ſooner it deſcends, contrarily; that is light that aſcends from the Centre, and the lighter that aſcends ſooneſt. I ſay that bodies yield one to the other, and do not penetrate one the other, as wine and water, and other liquors: Moreover, this action muſt be premiſed, that there is no body that is heavy in its own kind, as water in the element of water, or Air in Air. Alſo *vacuum* is ſo abhorred by Nature, that the world would ſooner be pulled aſunder than any vacuity can be admitted: and from this repugnancy of *vacuum* proceeds almoſt the cauſe of all wonderful things, which it may be I ſhall ſhew in a Book on this Subject. It is the force of *vacuum* that makes heavy things aſcend, and light things deſcend contrary to the rule of Nature, ſo neceſſary it is that there can be nothing in the world without a Body. Therefore theſe things being premiſed, I ſhall deſcend to ſomethings. And firſt, a moſt heavy body ſhut up in a veſſel, whoſe mouth is turned downwards into ſome liquor that is heavior, or of the ſame kind. I ſay it will not deſcend. Let the veſſel turned with the mouth downwards, be A B filled with water, the mouth of it beneath muſt be put into a broad mouth'd veſſel C D full of water, be it with the ſame liquor, or with another that is heavior. I ſay the water will not deſcend out of the veſſel A B. For ſhould the water contained in the veſſel A B deſcend, it muſt needs be heavior than the water contain'd in the broad mouth'd veſſel C D, which I ſaid was of the ſame kind or heavior,



heavior, if then it ſhould fall down it would be againſt the firſt action. The ſame would fall out if both veſſels were filled with wine or water. For if the water contained in the veſſel A B, ſhould deſcend into the place of C D, there would remain vacuity in A being there is no place for the air to come in; and that were againſt the ſecond axiom: wherefore by reaſon of *vacuum*, and becauſe the body is no heavior, it falls not into the bowl beneath. But ſhould one make a hole in the bottom of the veſſel A, that the air might come in, no doubt the water would not fall down into the bazon: Alſo, if the veſſel A B were filled with any light liquor, and the broad bazon with one that is heavior, they would not ſtir from their places. Let therefore the veſſel A B be filled with wine, and the mouth of it turned downwards into a bazon full of water; I ſay both liquors will keep their places, and will not mingle; for ſhould the wine deſcend, either *vacuum* muſt needs be in the body A, or a heavy body muſt aſcend out of the veſſel C D, which would be againſt the Nature of Gravity: and the ſecond axiom, namely, that heavy ſhould aſcend, and light deſcend: wherefore they will not remove from their places. Hence comes that which is often done by great drinkers and gluttons, who pour by drops into a cup half full of water, ſo much wine as will fill the cup, they come ſo cloſe together, that onely a line parts thoſe liquors. And thoſe that would ſooner cool their wine, they dip a Vial full of wine into a veſſel full of water, with the mouth turned downward, and hold it down under the water: for when the water toucheth the ſuperficies of the wine, they cannot mingle, and the wine grows ſooner cool, though it is neceſſary that the Vial ſhould be lifted up to the ſuperficies of the water, and ſuddenly turned about, poured forth and drank; then fill them again, and ſet in the bottle as before. From this advantage I complain of thoſe, who firſt drink water, then pour in wine, for wine being the lighter, and water the heavior, they can hardly mingle: wherefore ſome drink at firſt the ſtrongeſt wine, then mingled, and laſt of all, water. At great mens Tables they firſt bring wine in a Glaſs, then they pour in water, that the water by its weight may mingle with the wine, and get to the bottom, and taſt equally. *Theophraſtus* bids men firſt pour in wine, then water.

Chap. II.

How we may by drinking, make ſport with thoſe that ſit at Table with us.

When friends drink together, if we would by ſuch a merry deceit delude the gueſts that are ignorant of the cauſe hereof, we may provoke them to drink with ſuch a Cup; Let there be a great Cup made like a tunnel, let the mouth be broad above, and beneath narrow Pyramidally, and let it be joyn'd to a Glaſs-Ball, by a narrow mouth; Firſt pour in water, till the whole Ball be filled; then put in wine by degrees, which by reaſon of the narrowneſs of the mouth will not mingle, and the water is heavy, and the wine lighter; He that drinks firſt, ſhall drink the wine; then give it your frind to drink, for he ſhall drink nothing but water. But if your friend ſhall challenge you to drink thus with him, and will have you drink firſt; fill the Ball of the Cup with wine, and pour water upon it, and ſtay awhile, and hold him in diſcourſe; for the water will ſink down by the narrow mouth, and the wine by degrees will aſcend as much, and you ſhall ſee the wine come up through the middle of the water, and the water deſcend through the middle of the wine, and ſink to the bottom; ſo they change their places: when you know that the water is gone down, and the wine come up, then drink, for you ſhall drink the wine, and your friend ſhall drink the water. Hence it is, that to great inconvenience of thoſe that drink it, when we plunge our wine into a well in veſſels of earth, or braſs, ill ſtopt, to cool it, the water being the heavior comes in at the leaſt chink, and forceth out the wine, ſo in a little time the veſſel is full of water, and the wine is gone, that there is not the leaſt taſte of wine in it: wherefore ſtop the mouth very cloſe.

CHAP.

CHAP. III.

How to part wine from water it is mingled with.

FRom theſe I ſhall eaſily ſhew two things, that a heavy body ſhut up in a Glaſs veſſel, having the mouth of it put within a lighter liquid body, they will mutually give place, the lighter will aſcend the heavier will deſcend, and that without any hindrance one of the other, which I ſhall demonſtrate from the former principals. Let the Glaſs be turned downwards, and full of water, be, A B, the water is heavior than the wine: Let the mouth of it B, be put into the veſſel C D, that is full of wine. Theſe are bodies that will mutually yield one to the other as I ſhewed. I ſay the water will deſcend into the veſſel C D, and the wine will aſcend into the veſſel A B, where the water was before. For the water, becauſe it was contain'd in the veſſel A B, it being heavy, preſſeth the wine in the veſſel C D, that is lighter; and becauſe there is no body between them, the water deſcends on one ſide into the veſſel C D, and the wine aſcends on the other ſide into the veſſel A B. Now if the wine be red, that you may ſee the difference of their colours, you ſhall ſee the wine aſcend through the middle of the water, as far as the bottom of the upper veſſel that is put downward into the other, and the water to deſcend haſtily to the bottom of the veſſel C D, and one deſcends as low as the other riſeth high; and if the liquors cannot be ſeen diſtinguiſhed, yet one goes without any hindrance of the other, and without mingling, into its own place; and it will be a pleaſant ſight to behold the wine going up, and the water falling down; and when they reſt, they will be ſo well parted, that not the leaſt wine can remain with the water, nor water with the wine. Wherefore, if you put into a Hogſhead full of wine, a long neck'd Glaſs full of water, in a ſhort time the veſſel turned downwards will be full of wine, and the water will go down into the Hogſhad. By this any man may eaſily conjecture

How to part water from wine,

becauſe oft-times Country people and Vintagers uſe deceit, and bring wine mingled with water, to be ſold to the Merchant: we may eaſily prevent their craft by this Art. Let there be underneath a veſſel filled with wine, that is mixed with water, and we would ſeparate the water from the wine: But firſt there muſt be a veſſel that can receive all the wine, that is mingled in the other veſſel; and if we know not the quantity, we muſt conjecture at it, how much it may be, of ſomething leſs: then fill the ſaid veſſel with water, and ſet it with the mouth downwards on the other veſſel, that is full of wine and water, mingled together; and let the upper part of the veſſel turned downwards, touch the upper part of the lower liquour, that no Air may enter, for then the water will preſently deſcend into the veſſel underneath, and the lighter part of the mingled liquor will aſcend, and the water will ſink down; and if it be all wine, it will all aſcend, no wine will ſtay with the water; if any thing ſtay behind, you muſt know that ſo much water was mingled with the wine, which may eaſily be known by the ſmell and taſte, if you do it as it ſhould be done. Then take a veſſel that will hold more of the ſame liquor, and put it into a veſſel underneath, till it takes it all in, whence by the proportion of the wine aſcended, and of the water, any man may know eaſily how much water is mingled with the wine. But for convenience, let the Vial that ſhall hold the water be of a round belly, and the hole not very great, and let the veſſel under, that contains the wine, have a narrow mouth, that the upper round mouth may the better joyn with the undermoſt, and no Air come in. But becauſe it happeneth oft, that the upper Ball, when it hath drank in all the wine, the wine will not fill it, and we would part the water from the wine; take therefore the round Glaſs in your hand, and turn it about with the mouth upwards, then will the wine preſently turn about and come uppermoſt, which may by a tongue laid in, be all call'd forth. Be careful to ſee when the wine is all drawn out, remove the tongue, and the water will remain pure.

Chap.

CHAP. IV.

How otherwiſe you may part water from wine.

I Can do this another way, not by levity and gravity, as I ſaid, but by thinneſs and thickneſs; for water is the thinneſt of all liquors, becauſe it is ſimple, but wine being coloured, and colour comes from the mixture of the Elements, it is more corpulent: Wherefore to part wine from water, we muſt provide a matter that is full of holes, and make a veſſel thereof, into which the wine poured with the water, may drean forth; for the water will drean forth through the pores of the matter, that is opened by a mingled and corpulent body. And though many kinds of wood be fit, yet Ivy is the beſt, becauſe it is full of pores and chinks: wherefore if you make a veſſel of Ivy wood that is green, and pour into it wine mingled with water, the water will in a ſhort time drean out; Yet I ſee that all the Antients and modern Writers thought the contrary, yet both reaſon and experience are againſt them. For *Cato* ſaith, If you would know whether there be water put to your wine, make a veſſel of Ivy, put your wine you think is mixed with water, into it: if there be any water, the wine will run forth, and the water ſtay behind, for an Ivy veſſel will hold no wine. And *Pliny* from him: The Ivy is ſaid to be wonderful for proof of wine. If a veſſel be made of Ivy-wood, the wine will run forth, and the water will ſtay behind, if any were mingled with it: Whereupon both of them are to be noted for a twofold error, becauſe they ſay it comes from the wonderful faculty of the Ivy, whereas every porous wood can do the ſame: Again, he ſaith that the wine will run forth, and the water ſtay behind, whereas it is the contrary. But *Democritus* thought what was trueſt and more probable, who uſed not an Ivy veſſel, but one full of holes; ſaith he, they pour it into a new earthen pot not yet ſeaſoned, and hang it up for two days, the pot, ſaith he, will leak, if any water be mingled with it. *Democritus* uſed another Art for the ſame purpoſe. Some ſtop the mouth of the veſſel with a new Spunge dipt in Oyl, and incline it, and let it run forth; if there be water in it, onely the water will run forth, which experiment alſo he uſeth in Oyl: For the Spunge is full of holes, and open enough, and being dipt in Oyl, that hinders that the liquor cannot run forth ſo eaſily. *Africanus* adds another reaſon: Put liquid Alom into a veſſel of wine, then ſtop the mouth with a Spunge dipt in Oyl, and incline it, and let it run forth; for nothing but the water will run out: For the Alom binds the liquore, that they drean forth very ſlowly.

CHAP. V.

Another way to part a light body mingled with a heavy.

I Have another Art to ſeperate a light body from a heavy, or wine from water, or by another way. Make a linnen tongue, or of bombaſt, and dip it into the veſſel, where wine is mingled with water, and let the tongue ſwim above without the liquor, and aſcend above it, and ſo hang pendulous out of the veſſel, for the lighter liquor will aſcend by the tongue, and drop on the outſide; but when the lighter aſcends, it attracts the heavy alſo: wherefore, when you ſee the colour change, take the veſſel away, for the water runs forth. It is evident that the wine being lighter, will always aſcend to the top of the veſſel, and run forth by the tongue; though all Vintners ſay the contrary, that the water will run forth by the tongue, and that the wine will ſtay within.

CHAP. VI.

How light is mingled in heavy, or heavy in light.

WE can easily know whether any light matter is mingled with heavy, or any heavy matter with light: And I will expound the manner out of *Archimedes* his Book, concerning things that swim above water; the cause whereof is, that if Wood, Stone, or any heavy Metal, be equal in weight to the same quantity of water, the utmost superficies of the body will be equal with the superficies of the water; if it weigh heavior, it will sink to the bottom; if it be lighter, the lighter it is then the water, so much of it will swim above the water. Since therefore this is true, and wine is heavior then water, one and the same thing will sink more in wine, than in water, and in thicker water the less. Wherefore vessels are more drown'd in Rivers, than in the Sea; for Sea-water is thicker and more heavy, by reason of its salt mingled with it; as also we have it in *Alexander*. If therefore you would know

Whether water be mingled with wine.

Put the wine you suspect to be mingled with water, into some vessel, and put an Apple or Pear into it; if the Apple sink, the wine is pure; but if it flote, the wine hath water mingled with it, because water is thicker than wine: Which *Democritus* saith is contrary and false. He saith it is necessary sometimes to commit the Care of the wine of new wine to Stewards and Servants, also the Merchant hath the like reason to try, whether his wine be pure. They use to cast an Apple into the vessel, but wilde Pears are the best; others cast in a Locust; others a Grashopper, and if they swim, it is pure wine, but if they sink, it is mingled with water. But if you seek to know

If new wine have any water mingled with it,

it will be the contrary for the contrary reason. For wine that is pure and sincere is thin, but new wine at first is thick, feculent, gross, clammy, because the feces are not yet sunk down, but in time it will grow clear and thin. Wherefore if you put Apples or Pears into new wine, and the new wine be most pure, the Apples will flote above it; but if there be water mingled with it, the Apples will sink to the bottom: for freeze-water is thinner than new wine, and lighter, it causeth the Apple to sink, which is excellent well described by *Sotion*, and very curiously. He saith, That we may know whether new wine be mingled with water, cast wilde Pears, that is green ones, into new wine, and if there be any water, they will sink to the bottom. For when you fill the vessel with new wine, if you cast in Services or Pears they will swim, the more water you put to it, the more will the Apple sink. But we shall adde this for an addition,

When new wine is mingled with water, to know which part is the best, the upper or lower part.

The Country people use after the pressing forth of the wine, when the clusters are pressed forth, to cast in a certain quaintity of water, and so they make drink for laborers in the Countrey. This new wine they divide, the Country man hath half, and the Landlord the other half: The question is which part is the best, the first, or last, that runs forth of the press. But if you well remember what I said before, the wine being the lightest will come uppermost, and the water being heaviest, will always sink to the bottom. Wherefore the first that comes forth is the wine, that which remains, and is pressed from the clusters, is watry. When water is cast on the clusters, it goes into the inmost parts of the Grapes, and draws forth the wine that is in them, and so they mingle; but being lighter, it chooseth the upper place, therefore the upper part is best, because it contains most wine: but if you turn the Cock beneath, the water will first run forth, and the wine last

CHAP.

CHAP. VII.

Other ways how to part wine from water.

THere are other ways to do it, as by distilling. For in distilling the lightest will ascend first, then the heaviest, when the fire is not too strong; and that is but reason: wherefore that the liquor may ascend, it must first be attenuated into thin vapours, and become lighter: therefore wine being thinner than water, if it be put in a still in Balneo, the lightest vapour of wine will ascend by degrees, and fall into the receiver: You shall observe the *Aqua vitæ* that distills into the vessel, and by the quantity of that, you may judge of the proportion of water mingled with the wine. Also note, that when the lightest part of the wine is ascended, the heavy feces remain, as water, or as part of the wine. Oft-times in our distillations, when *Aqua vitæ* was distilled in Balneo, by chance the vessel brake that contain'd the *Aqua vitæ*, and mingled with the water in the kettle: I put the mingled liquor into a Glass vessel, and putting a soft fire to it, first came forth the pure *Aqua vitæ*, simple without any water, the water stayed in the bottom, and kept not so much as the smell of the *Aqua vitæ*. By the veins running in the cup, I knew the water ascended. I will not omit (though it be for another reason) for pleasure and ingenuity to shew

The manner to part water from wine,

that by this means we may know how much water is mingled in the vessel. Take the quantity of the wine, and put it into a Glass Vial, and put the Vial into very cold water, that all that is in the Vial may freeze, as I shew'd: If the wine be sincere and pure, it will be the harder to freeze, and longer; if it have much water, it will freeze the sooner: When the wine is frozen, break the Vial upon a dish, the ice must melt by degrees; first the wine, because that is hotter: than the water will remain frozen; Part the wine from it, for it will be longer thawing: by proportion of this, you may know what part of water was put into the vessel.

CHAP. VIII.

How the levity in the water and the air, is different, and what cunning may be wrought thereby.

NOw I will speak of heavy and light, otherwise than I spake before; namely, how it is in the air, and how in the water, and what speculation or profit may rise from thence. And first how we may know whether a Metal be pure, or mingled with other Metals, as Gold and Silver, as in Gilded cups, or else in moneys: where Silver or Gold is mingled with Brass, and what is their several weights: which speculation is useful not onely for Bankers, but also for Chymists, when they desire to try Metals in fixing of Silver, or other operations, which I will attempt to declare plainly. But first I will see whether the Antients speak any thing hereof. *Vitruvius* saith *Archimedes* did write of this: For when *Hiero* purposed to offer a Golden Crown to the Gods in the Temple, he put it to the Goldsmith by weight; he made the work curiously, and maintain'd it for good to the King, and by weight it seemed to be just: but afterwards it was said, that he had stolen part of the Gold, and made up the Crown with Silver to the full weight. *Hiero* enraged at this, bade *Archimedes* to consider of it: He then by chance coming into a Bath, when he had descended into it, he observed that as much of his body as went into the Bath, so much water ran over the Bath: when he considered the reason of it, he leaped forth for joy, running home and crying *Eureka, Eureka*, that is, I have found it, I have found it. Then they say he made two lumps of equal weight with the Crown, one of Gold, the other of Silver; then he filled a large vessel to the very brims with water, and he put in the lump of Silver; the bigness of that thrust into the water, made the water run over: wherefore taking out the lump, what flowed over he put

in a air, having measured a fixt part, and re found what certain quantity of water answered to the quantity of the Silver: then he put in the lump of Gold into the full vessel, and taking that forth, by the same reason he found that not so much water ran forth, but so much less of the body of the Gold was less than the same weight in Silver. Then he filled the vessel with water, and put in the Crown, and he found that more water ran forth by reason of the Crown, than for the mass of Gold of the same weight, and from thence because more water run over by reason of the Crown, than for the Gold lump, he reasoned that there must be a mixture in the Crown. This was the Greeks invention, that is worthy of praise, but the operation is difficult; for in things of small quantity the theft cannot be discerned, nor can this reason appear so clear to the eye, where the obscure fashion of the vessel was wanting. Now a way is invented how for all money, be it never so small, we can tell presently, and we want not many instruments, that we may cry, We have over-founded *Uperemeka*, *Uperemeka*, we have gone beyond *Archimedes* his *Eureka*. The way is this

To know any part of Silver mingled with Gold.

Take a perfect ballence, and put in one scale any Metal, in the other as much of the same Metal, but the purest of its kind; and when the scales hang even in the Air, put them into a vessel full of water, and let them down into water about half a foot: Then will it be a strange wonder, for the balances that hung equal in the Air, will change their nature in the water, and will be unequal: for the impure Metal will be uppermost, and the pure will sink to the bottom. The reason is, because pure Gold compared with that kind, is heavier than all impure Gold, because pure Gold taketh less place; wherefore it will way heavier by the former reason. If then we would know how much Silver is in that Gold, put as much pure Gold in the other scale, as will make the ballances equal under the waters; when they are equal take them up, and the weight you added under water, will be the weight of the mixture. If you would know how much Gold is upon a vessel Gilded, put the Cup in one scale, and as much pure Silver in the other, that the scales may hang equal in the Air; then put them into the water, and the vessel will sink down; put into the other scale as much pure Gold, as will make them equal under water, draw them forth, and that is the weight of the Gilt of the place: You shall do the same for Silver, Brass, Iron, white or black Lead. But would you know whether in Money, Brass be mingled with Silver, or Coin be adulterated with Copper; put the Money into one scale, and as much of the finest Silver into the other, ballance them equal; then put them under the water, the Money will go down; adde as much Brass as will make the scales equal, then take them forth, and it will be the weight of the mixture. Now will I set the weights of Metals, how much they weigh more in the waters, than in the Air, whereby without any other experiment we may know mixtures. An Iron-ball that weighed eighteen ounces in the Air, will weigh fifteen in the waters; whence it is that a Ball of the same magnitude must owe three ounces to the water; wherefore the proportion of Iron in the Air to the same in the waters, is as fifteen to nineteen. A Leaden Bullet of the same magnitude, weighs 31 ounces in the Air, in the water but 27: A Marble Bullet little less for bulk, weighs 7 in the Air, and 5 in the water: Copper weighs 16 in the Air, and 12 in the waters: Silver weighs in the Air 125, in the waters 113: Brass in the Air weighs 65 Karats, and one grain, in the waters 50 Karats and two grains: Crown Gold in the Air weighs 66 grains, in the waters 62: Gold called Zechini in the Air weighs 17 Karats, under water 16 Karats: Turkish Ducat Gold weighs in the Air 34, under waters 32: Common French Crown Gold weighs in the Air 67, under waters 60: Common Crown Gold of Hungary that is old, in the Air weighs 17, in the water 16: Crown Gold of Tartary weighs 16 in the Air, and 14 under water.

THE

THE NINETEENTH BOOK OF Natural Magick:

Concerning VVind-Instruments.

THE PROEME.

I Have spoken concerning light and heavy, now follow experiments by wind: for these seem to follow the reasons of Mathematicks, and of the Air, and water, and a Philosopher who seeks, to find things profitable, and admirable for mans use, must insist on these things, contemplate and search them out, in no thing doth the Majesty of Nature shine forth more. There are extant the famous Monuments of the most learned Heron *of Alexandria, concerning wind Instruments, I will adde some that are new, to give an occasion to search out greater matters.*

CHAP. I.

Whether material Statues may speak by any Artificial way.

I Have read that in some Cities there was a Colassus of Brass, placed on a mighty high Pillar, which in violent tempests of wind from the nether parts, received a great blast, that was carried from the mouth to a Trumpet, that it blew strongly, or else sounded some other instrument, which I believe to have been easie, because I have seen the like. Also, I read in many men of great Authority, that *Virtus Magnus* made a head that speak: Yet to speak the truth, I give little credit to that man, because all I made trial of from him, I found to be false, but what he took from other men. I will see whether an Image can be made that will speak. Some say that *Albertus* by Astrological elections of times, did perform this wonderful thing: but I wonder how learned men could be so guld; for they know the Stars have no such forces: Some think he did it by Magick Arts. And this I credit least of all, since there is no man that professeth himself to know those Arts but Impostors and Mountebanks, whilst they cheat ignorant men and simple women; nor do I think that the Godly man would profess ungodly Arts. But I suppose it may be done by wind. We see that the voice or a sound, will be conveighed entire through the Air, and that not in an instant, but by degrees in time. We see that Brass-guns, which by the force of Gun-powder, make a mighty noise, if they be a mile off, yet we see the flame much before we hear the sound: So hand-Guns make a report, that comes at a great distance to us, but some minutes of time are required for it, for that is the nature of sounds; Wherefore sounds go with time, and are entire without interruption, unless they break upon some place. The Eccho proves this, for it strikes whole against a wall, and so rebounds back, and is reflected as a beam of the Sun. Moreover, as I said in this work, words and voices go united together, and are carried very far entire, as they are spoken at first. These therefore being laid down for true grounds; if any man shall make leaden Pipes exceeding long, two or three hundred paces long (as I have tried) and shall speak in them some or many words, they will be carried true through those Pipes, and

and be heard at the other end, as they came from the ſpeakers mouth: wherefore if that voice goes with time,& hold entire,if any man as the words are ſpoken ſhall ſtop the end of the Pipe,and he that is at the other end ſhall do the like,the voice may be intercepted in the middle, and be ſhut up as in a priſon; and when the mouth is opened, the voice will come forth, as out of his mouth that ſpake it: but becauſe ſuch long Pipes cannot be made without trouble, they may be bent up and down like a Trumpet, that a long Pipe may be kept in a ſmall place; and when the mouth is open, the words may be underſtood. I am now upon trial of it: if before my Book be Printed the buſineſs take effect, I will ſet it down; if not, if God pleaſe, I ſhall write of it elſewhere.

CHAP. II.

Of Inſtruments Muſical made with water.

OLd Water-Inſtruments were of great eſteem, but in our days the uſe is worn out: Yet we read that *Nero* took ſuch delight in them, that when his Life and Empire were in danger, amongſt the ſeditions of Souldiers and Commanders, and all was in imminent danger, he would not forſake the care of them, and pleaſure he took in them. *Vitruvius* teacheth us how they were made, but ſo obſcurely and myſtically, that what he ſays is very little underſtood. I have tryed this by many and ſundry ways, by mingling air with water, which placing in the end of a Pipe, or in my mouth, where the breath of the mouth ſtrikes againſt the air; and though this made a pleaſant noiſe, yet it kept no tune: For whilſt the water bubbles, and trembles or warbles like a Nitingale, the voice is changed in divers tunes, one note is ſweet and pleaſant, two, ſquele and jar. But this way it will make a warbling ſound, and keep the tune. Let there be made a Braſs bottom'd Cheſt for the Organ, wherein the wind muſt be carried; let it be half full of water, let the wind be made by bellows, or ſome ſuch way that muſt run through a neck under the waters; but the ſpirit that breaks forth of the middle of the water, is excluded into the empty place: when therefore by touching of the keys, the ſtops of the mouths of the Pipes are opened, the trembling wind coming into the Pipes,makes very pleaſant trembling ſounds, which I have tried and found to be true.

CHAP. III.

Of ſome Experiments by Wind-Inſtruments.

NOw will I proceed to the like Wind-Inſtruments, but of divers ſorts that ariſe by reaſon of the air, and I ſhall ſhew how it is dilated, contracted, ratified by fire, condenſed by cold. If you will

That a veſſel turned downwards ſhall draw in the water,

do thus: Make a veſſel with a very long neck; the longer it is, the greater wonder it will ſeem to be: Let it be of tranſparent Glaſs, that you may ſee the water running up; fill this with boiling water, and when it is very hot, or ſetting the bottom of it to the fire, that it may not preſently wax cold, the mouth being turned downwards that it may touch the water, it will ſuck it all in. So ſuch as ſearch out the nature of things ſay, That by the Sun beams the water is drawn up, from the Concave places of the Earth to the tops of Mountains, whence fountains come forth. And no ſmall Arts ariſe from hence, for Wind-Inſtruments, as *Heron* affirms. *Vitruvius* ſpeaks the like concerning the original of Winds: but now it is come to be uſed for houſes. For ſo may be made

A veſſel to caſt forth wind.

You may make Braſs Bowles, or of ſome other matter: let them be hollow, and round, with a very ſmall hole in the middle, that the water is put in at: if this be hard,

uſe the former experiment: when this is ſet at the fire it grows hot, and being it hath no other vent, it will blow ſtrongly from thence, but the blaſt will be moiſt and thick, and of an ill ſavour. You may alſo make

A veſſel that ſhall caſt forth water,

There is carried about with us a Glaſs veſſel, made Pyramidal, with a very narrow long mouth, with which it caſts water very far off. That it may draw water, ſuck out the air with your mouth, as much as you can, and preſently thruſt the mouth into the water, for it will draw the water into it, do ſo until a third part of it be filled with water. When you will ſpout the water afar off, fill the veſſel with air, blowing into it as hard as you can; preſently take it from your mouth, and incline the mouth of the veſſel, that the water may run to the mouth, and ſtop the air; and the air ſtriving to break forth, will caſt the water out a great way. But if you will without attraction of Air, make water fly far with it, heat the bottom of the veſſel a little: for the air being rarefied ſeeks for more place, and ſtriving to break forth, drives the water before it. Thus drunkards making a little hole in a veſſel of wine, becauſe the wine will not run out, the mouth being ſtopt, whereby the air might enter, they will blow hard into that hole; then as they leave off, the wine will come forth in as great quantity, as the air blowed in was. Now I will ſhew

How to make water aſcend conveniently.

We can make water riſe to the top of a Tower: Let there be a leaden Pipe that may come from the bottom to the top of the Tower, and go down again from the top to the bottom, as a Conduit; let one end ſtand in the water that we deſire ſhould riſe, the other end that muſt be longer and hang down lower, muſt be faſtned into a veſſel of wood or earth that it may take no air at all: let it have a hole above the veſſel, whereby the veſſel may be filled with water, and then be ſtopt perfectly. Set a veſſel on the top of the Tower, as capacious as that beneath, and the leaden pipe now ſpoke of, muſt be faſtned at one end of the veſſel, and go forth at the other end, and muſt be in the upper part of the veſſel, and let the pipe be divided in the middle, within the veſſel, and where the pipe enters, and where the pipe goes out, they muſt be joynted, that they take no air: when therefore we would have the water to aſcend, fill the veſſel beneath with water, and ſtop it cloſe that it take no air, then opening the lower hole of the veſſel, the water will run forth; for that part of water that runs out of the veſſel, will cauſe as much to riſe up at the other end by the other leaden pipe, and aſcend above the Tower; the water drawn forth is filled up again, we may make our uſe of it, and the hole being ſtopt, the lower veſſel may be filled again with water, and ſo doing we ſhall make the water to aſcend always. We may alſo

By heat alone make the water riſe,

Let there be a veſſel above the Tower, either of Braſs, Clay, or Wood, Braſs is beſt: let there be a pipe in the middle of it, that may deſcend down to the water beneath, and be ſet under it, but faſtned that it take no air: let the veſſel above be made hot by the Sun,or fire,for the air that is contained in the veſſel rarefies and breathes forth; whereupon we ſhall ſee the water riſe into bubbles: when the Sun is gone, and the veſſel grows cold, the air is condenſed, and becauſe the air included cannot fill up the vacuity, the water is called in, and aſcends thither.

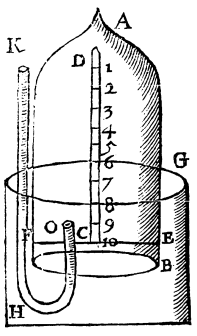
CHAP. IV.

A diſcription of water Hour-glaſſes, wherein Wind or Water-Inſtruments for to ſhew the Hours are deſcribed.

THe Antients had Hour-Dials made by water, and Water-Dials were uſual, and famous. *Heron* of Alexandria writ Books of Water-Dials, but they are loſt. I have writ a Book of them, and that this part may not be deficient, I ſhall ſhew two that

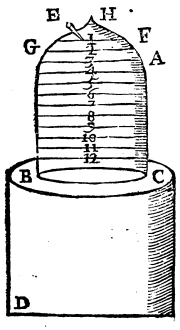
that are made by contraries, one by blowing in the air, the other by ſucking it out. This ſhall be the firſt.

A Water-Dial.



Take a veſſel of Glaſs like a Urinal, it is deſcribed by the letters A B: On the top is A, where there is a very ſmall hole, that the point of a needle can ſcarce enter it; at the bottom neer the mouth, let there be ſet a ſtaff E F, that in the middle hath a firm Pillar going up to the very top of the veſſel, let the Pillar be divided with the Hour-lines. Let there be alſo a wooden or earthen veſſel G H, full of water: Upon the ſuperficies of that water, place the Glaſs veſſel A B, that by its weight will preſs toward the bottom, but the air included within the veſſel, keeps it from going down: then open the little hole A, whereby the air going forth by degrees, the veſſel will gradually deſcend alſo. Then make by another Dial, the marks on the ſtaff C D, which deſcending will afterwards ſhew the Hour-marks. When therefore the veſſel goes to the bottom of the wooden veſſel, the Dial is done, and it is the laſt Hour: But when you would have your Dial go again, you muſt have a crooked empty pipe, O K, the upper mouth K muſt be ſtopt with the finger K; ſo K being ſtopt with the finger, that the air may not enter, ſink it under the water, that it may come within the veſſel A B: then put your mouth to K, and blow into it, for that will raiſe the veſſel upward, and it will come to its former place and work again. I ſhall alſo deſcribe for my minds ſake

Another Water-Dial,



contrary to the former, namely, by ſucking in the air. Let there be a Glaſs veſſel, like to a Urinal as I ſaid A B, and being empty ſet faſt on it the veſſel C D, that it cannot ſink down: then fill it with water, as far as B: Let there be a hole neer the top, E, wherefore ſucking the air by the hole E, the water comes into the veſſel A B from the veſſel C D, and will riſe as high as F G: when therefore A B is full of water, ſtop the hole E, that no air enter, and the water will fall down again: In the top of the veſſel A B, let there be another very ſmall hole, that the air may come in by degrees, and ſo much as there comes in of air, ſo much water will go forth. On the ſuperficies of the veſſel, make Hour-lines that may ſhew the Hours marked, 1, 2, 3, *&c.* or if you will let the Still faſtned to a Cork ſwim on the top of the water, and that will ſhew the Hours marked on the outſide of the veſſel.

CHAP. V.

A deſcription of Veſſels caſting forth water by reaſon of Air.

NOw I will deſcribe ſome Fountains, or Veſſels, that by reaſon of air caſt forth water: and though *Heron* ingeniouſly deſcribed ſome, yet will I ſet down ſome others that are artifically found out by me and other men. Here is deſcribed

A Fountain that caſts forth water by compreſſion of the Air,

Let there be a veſſel of water-work cloſe every where, A B, make a hole through the middle, and let a little pipe C D go up from the bottom of the water-work veſſel D, ſo far from the bottom that the water may run forth. Upon the ſuperficies of the Tympanum let there be C a very little hole with a cover to it, or let it have as the Greeks call it, Smeriſmation, to ſhut and open it handſomely, and in the upper ſurface of the Tympanum, bore the baſis quite through with a little pipe, which enters into the hollow of the Tympanum, and having in the hole beneath a broad piece of leather or braſs, that the air coming in may not go back: wherefore pour in water at E, that it may be three fingers above the bottom; then blow in air as vehemently as you can: when it is well preſſed in, ſhut the mouth; then opening the mouth A, the water will fly up aloft, until the air be weak. I at Venice made a Tympanum with pipes of Glaſs, and when the water was caſt forth very far, the Lord *Eſtens* much admired it, to ſee the water fly ſo high, and no viſible thing to force it. I alſo made another place neer this Fountain, that let in light, and when the air was extenuated, ſo long as any light laſted the Fountain threw out water, which was a thing of much admiration, and yet but little labor. To confirm this, there is

An Artifice whereby a hand-Gun may ſhoot a bullet without fire,

For by the air onely preſſed is the blaſt made. Let there be a hand Gun that is made hollow and very ſmooth, which may be done with a round inſtrument of lead, and with Emril-powder beaten, rubbing all the parts with it. Then you muſt have a round Inſtrument that is exactly plained on all parts, that may perfectly go in at the mouth of the wind Gun, and ſo fill it that no air may come forth: let it be all ſmeer'd with oyl, for the oyl by its groſsneſs hinders any air to come forth. So this lead Bullet being put into the Guns mouth, and thruſt down with great force and dexterity, then preſently take away your hands (but you muſt firſt ſhut the little hole that is in the bottom of the hole) and the bullet and little ſtick will fall to the bottom, and by the violence of the air preſſed together it will caſt out the Bullet a great way, and the ſtick too, which is very ſtrange. Alſo I will make

A Veſſel, wherewith as you drink, the liquor ſhall be ſprinkled about your face.

Make a veſſel of Pewter, or Silver, like to a Urinal; then make another veſſel in the faſhion of a Tunnel, or a round Pyramis: let their mouths be equal, and joyn'd perfectly together, for they muſt be of the ſame bredth: let the ſpire of it be diſtant from the bottom of the Urinal a fingers breadth, and let it be open: then pour water into the veſſel, and fill the Urinal unto the hole of the ſpire end, and fill the Tunnel to the top, and the reſt of the Urinal will be empty, becauſe the air hath no place to get forth: when therefore any man drinks, when the water is drank up as far as the hole of the ſpire end, by the air preſſed within, is the water thruſt violently forth, and flies in the face of him that drinks. Alſo there is a veſſel that no man can drink out of it, but he who knows the art. Make an earthen or metal veſſel, in form of a Bottle or Flagon, and make it full of holes from the neck to the middle of the belly: From the bottom let a pipe aſcend by the handle of the veſſel, and the handle being round about it, let it come above the brims of the veſſel, empty: under the handle in a place not ſeen, make a little hole, that any man holding the veſſel by the handle, may with his finger ſtop and unſtop this hole when he pleaſe: under the brim of the veſſel, where you ſet it to your mouth, let there be another ſecret hole. Then pour water into the veſſel: if now any man put the bottle to his mouth, and raiſeth it to drink, the water will run forth at the neck that is open, and at the belly; but he that knows the trick, taking the veſſel by the handle, ſhuts the hole with his thumb, and not moving the veſſel, he draws the air with his mouth, for the water follows the air, and ſo he drinks it all up; but if any man ſuck, and ſhut not the hole, the water will not follow.

CHAP. VI.

That we may use the Air in many Arts.

WE may use Air in many Artifices, I shall set down some, that I may give a hint to others to invent more. And chiefly

How wind may be made in a chamber, that guests may almost freeze,

Make a deep pit, and put in a sufficient quantity of river or running water; let the pit be close stopt, onely let a pipe convey it through the walls, that it may be brought into the chamber. Let the water be let down into the pit by a kind of Tunnel, lest the air should come forth at the place where it goes in: by the water is the air of the pit expelled, and comes by the pipe into the chamber, that not onely those that sleep there, but such as converse there are extream cold, and benummed. I will shew

How Air may serve for Bellows,

I saw this at Rome. Make a little cellar that's close on all sides, pour in by a Tunnel from above, a quantity of water; on the top of the wall let there be a little hole, at which the air may break forth with violence; for it will come so forcibly, that it will kindle a fire, and serve for bellows for Brass and Iron-melting furnaces; the Tunnel being so made, that when need is, it may be turned, and water may be put in.

THE

THE

TWENTIETH BOOK OF Natural Magick:

The Chaos, wherein the Experiments are set down without any Classical Order.

THE PROEME.

I Determined at the beginning of my Book, to write Experiments, that are contain'd in all Natural Sciences, but by my business that called me off, my mind was hindred, so that I could not accomplish what I intended. Since therefore I could not do what I would, I must be willing to do what I can. Therefore I shut up in this Book, those Experiments that could be included in no Classes, which were so diverse and various, that they could not make up a Science, or a Book; and thereupon I have here heaped them altogether confusedly as what I had overpassed; and if God please, I will another time give you a more perfect Book. Now you must rest content with these.

CHAP. I.

How Sea-water may be made potable.

IT is no small commodity to mankinde, if Sea-water may be made potable. In long voyages, as to the Indies it is of great concernment: For whilst Sea men, by reason of tempests are forced to stay longer at Sea than they would, for want of water they fall into great danger of their lives. Galleys are forced all most every ten days to put in for fresh water, and therefore they cannot long wander in enemies countries, nor go far, for enemies stop their passages. Moreover, in sea Towns and Islands, when they want water, as in our days, in the Island Malta, and in the Syrtes, Souldiers and Inhabitants endured much hardness, and Histories relate many such things. Hence I thought it necessary to search curiously, whether Sea-water might be made potable. But it is impossible to finde out any thing for this, how it may be done, unless we first finde out the cause of its saltness, and what our Ancestors have said concerning that matter; especially since *Aristotle* saith, That the salt may easily be taken from the Sea, because the sea is not salt of its own Nature, but by the Sun that heats the water, which draws out of it, cold and dry earthly exhalations to the top of it, and these being there burnt cause it to be salt, when the moist subtile parts are resolved into thin vapors. We therefore imitating Nature, by raising the thin parts by Chymical Instruments, may easily make it sweet. For so the Nature of the Sea, makes sweet waters for the Rivers. There are also veins of the Sea, in the deep parts of the earth, that are heated by the Sun, and the vapours are elevated to the tops of the heighest Mountains, where by the cold superficies they meet with, they congeal into drops; and dropping down by the vaulted roots of Caves, they run forth in open streams. We first fill a hollow vessel like a great Ball, with Sea-water, it must have a long neck, and a cap upon it, that live coles being put under, the water may resolve into thin vapors,

pors, and fill all vacuities, being carryed aloft: this ill ſented groſſneſs, when it comes to touch the coldneſs of the head or cap, and meets with the Glaſs, gathers like dew about the skirts of it; and ſo running down the arches of the cap, it turns to water, and a pipe being opened that pertains to it, it runs forth largely, and the receiver ſtands to receive it as it drops: ſo will ſweet water come from ſalt, and the ſalt tarryeth at the bottom of the veſſel, and three pound of ſalt water, will give two pounds of freſh water; but if the cap of the limbeck be of Lead, it will afford more water, yet not ſo good. For *Galen* ſaith, That water that runs through pipes of Lead, if it be drank, will cauſe an excoriation of the inteſtines. But I found a way

How to get a greater quantity of freſh water, when we diſtil ſalt water.

Make a cap of earth, like to a Pyramis, all full of holes, that through the holes, Urinals of Earth or Glaſs may be brought in. Let their mouths ſtick forth, well luted that the vapor may not exhale; the cap after the faſhion of the limbeck, muſt have its pipe at the bottom running round, and let it drop forth at the noſe of it. Set this upon a braſs Cauldron, that will hold much water; fill it with ſalt water, after that the Urinals; and putting on their caps, when fire is put under, both the Urinals will drop, and the cap that contains others, by its pipe will drop out water alſo: for the vapors riſing from the Cauldron of hot water, will make the Urinals drop, and the cap will drop withal. But if at Sea the commodity of ſuch a veſſel cannot be had. We may

Diſtil ſalt water otherwiſe,

though but little. *Dioſcorides* ſhews the old way of diſtillation; we may that way diſtil ſea water in ſhips, which *Pliny* ſhews alſo. Fleeces of wool extended about the ſhip, are made wet by the vapors riſing from the Sea, and ſweet water is preſſed out of them. But let us ſee, whither

Salt water may be made freſh another way.

Ariſtotle ſaith it, and *Solomon* before him, That all Rivers came from the Sea, and return to the Sea; for by the ſecret paſſages under ground, the waters that are ſent forth, leave their earthly and dry parts mixed with the earth, and they come forth pure and ſweet. He ſaith, The cauſe why the ſalt water comes not forth, is, becauſe it is ponderous, and ſettles, and therefore onely hot-waters of ſalt-waters, can run forth, for they have a lightneſs that overſways the weight of the ſalt; for what is hot, is lighteſt: Adde, that waters running through the earth are much ſtrained, and therefore the heavior and thicker they are, the more do they continually ſink down, and are left behind; and the lighter they are, the more pure do they come forth and are ſevered. For as Salt is heavy, ſo ſweet water is light; and ſo it comes, that they are ſweet waters that run forth. This is the very cauſe why ſalt-water, when it moves and is changed, is made the ſweeter, for motion makes it lighter and purer. Let us ſee now if we can imitate Nature: Fill then great veſſels with earth, and ſet them ſo one above another, that one may drean into another; and thus ſalt-water dreaning through many veſſels, may leave the ſalt behinde. I tried it through ten veſſels, and it remain'd ſtill ſalt: My friend ſaid, that he made it ſweet through twenty veſſels. Yet thus I thought to warn you of, that all earth is not fit for this uſe. *Solinus* ſaith, That ſea-water ſtrain'd through clay will grow ſweet; and it is proved that the ſalt is taken away, if you ſtrain it often through thin ſand of a River. Earth that lies in covered places, and under roots, is naught, for that is commonly ſalt; as alſo where Cattle are ſtalled, which *Columella* ſaith is naught for Trees, for that it makes ſalt-water, what is ſtrain'd from it. Black earth is naught, for it makes the waters ſharp, but clay grounds make ſweet waters. *Paxamus*, *Anaxagoras* ſaid, That the ſaltneſs of the ſea came from the Rivers, running through ſalt places, and communicating that quality to the ſea. Some approve River-gravel for this uſe, and their reaſon is, becauſe always ſweet waters are found by the ſhores, and they ſay this happens, becauſe they are ſtrain'd through the ſand, and ſo grow freſh coming from the ſalt-ſea: for the ſweet water that is found neer the ſea, is not of the ſea, but ſuch water as comes from the tops of hills, through the ſecret channels of the earth,

earth, thither. For waters that drean forth ſweet, are ſweet though they lye even with the ſea, and in plain places; as *Apulia*, where the waters drean not from the hills, they are ſalt. So on the ſhores of Africa. But *Ariſtotle* brings an experiment from a veſſel of wax; for if one make a Ball of wax that is hollow, and ſhall dip it into the ſea, it being of a ſufficient thickneſs to contain, he ſhall finde it full of freſh water, becauſe the corpulent ſaltneſs cannot get in through the pores of the wax. And *Pliny*, by letting down little nets into the ſea, and hollow balls of wax, or empty veſſels ſtopt, ſaith, they will draw in freſh water; for ſea-water ſtrain'd through clay will grow freſh. But I have found this to be falſe. For I have made pots of clay, as fine and well as I could, and let them down into ſalt-water, and after ſome days I found ſalt-water in them. Alſo, if it were true, it is of no uſe, when as to ſweeten one pound of water, a thouſand Balls of wax a day were not ſufficient. But for this many veſſels might be invented of porous wood and ſtones. A veſſel of Ivy, that parts, as I ſaid, wine from water, will not part ſalt from water if it drean through it. But ſtones are brought from Portingal, made into veſſels, into which ſea water put will drean forth ſweet, if not the firſt, yet the ſecond time, they uſe it to break the ſtone; alſo, for that many pumex and porous ſtones may be tried. *Leo Baptiſta Albertus* ſaith, That an earthen pot well ſtopt, and put into the ſea, will fill with potable water. But I have tried all earthen veſſels, and I always found ſalt-water. *Ariſtotle* in his *Problems*, ſaith, It may be done

Another way,

If ſalt-water cannot be drank cold, yet hot, and cool again, it is better to drink. It is becauſe a thing uſeth to change from contrary to contrary, and ſalt-water is contrary to freſh, and when it is boil'd, the ſalt part is boil'd off, and when it is cold ſtays at the bottom. This I tried and found it falſe, and more ſalt, for by heat the thin vapors of the water that are ſweet exhale, and the ſalt ſtay behinde; and in leſſer water, the ſame quantity of ſalt makes it ſalter, as I ſaid in my diſtillations. I wonder ſuch a wiſe man would relate ſuch falſities. *Florentinus* borrowing it from him, ſaith, If water be not good nor potable, but ill, let it be boiled, till a tenth part of it be conſumed, then purge it, and it will be good, For ſea-water ſo boil'd, will grow ſweet. Let me ſee whether it can be made ſo

Another way,

and that in great quantity. There is a thing that being caſt into large veſſels filled with ſea-water, by faſtning the ſalt will make it fall to the bottom, or by curdling it, and ſo it frees the water from it. Wherefore we muſt think on things that have a ſtiptick quality, the Antients tried this, the Moderns have effected it. *Pliny*. *Nitrous* of bitter waters; if you put Barley-flower dried to them, they are tempered, that you may drink of them in two hours: therefore is Barley-flower put into wide ſacks, and elſwhere. Thoſe that go to the Red-ſea through the Deſarts, make nitrous, and ſalt, and bitter waters fit to drink in two hours, by putting in of Barley-meal, and they eat Barley-meal. The like force hath the Chalk of the Rhodes, and our Clay. Alſo, Cooks with Catlings, and Meal of Wheat, will take ſalt out of very ſalt meat. I tried this oft but found it falſe, yet ſome of the ſaltneſs was taken away. *Pliny*. If you muſt drink ill waters, ſtrew in powder of Penniroyal. *Leo Baptiſta Albertus*, when they take up the water of Nilus muddy, if they do but rub the edge of the veſſel with an Almond, it preſently grows clear: I tried this too, and found it falſe: when common ſalt is caſt into *Aqua fortis*, that parts Gold from Silver, the Silver will preſently deſcend. We ſee alſo, that in the making of that they call read Alac, caſting but Alom into Lye, the ſalt and colour will preſently precipitate to the bottom, and nothing will remain but clear water. We ſee that milk will curdle with many Herbs, which we ſpeak of elſewhere. We ſhall uſe therefore for this purpoſe, coagulaters and aſtringents. Cooks ſay, That a Spunge put into a pot of ſalt-water, will draw the ſalt to it; but preſſed forth again, and caſt in once more will take it all out. So wood wrapt about with fillets of linnen, and put into the pot, will draw the ſalt to it. Others binde in a clout Wheat-meal, and put it into the pot, and draw forth the

the ſalt. *Palladius* where he ſpeaks of ſeaſoning of wines, ſaith, The Greeks bid men keep ſea-water that is clean, and taken out of the calm ſea the year before, whoſe Nature is that in this time, it will loſe its ſaltneſs or bitterneſs, and ſmell ſweet by age. It remains to ſhew

How ſweet waters may be mended.

Leo Baptiſta ſaith, If you place a glazed veſſel full of ſalt, and well ſtopt with lime, putting oyl under that no water may penetrate into it, that it may hang in the middle of the waters of a Ciſtern; theſe waters will in no time corrupt. Others adde alſo Quick-ſilver. If water begin to corrupt, caſt in ſalt to purge them; and if ſalt be wanting, put in ſome ſea-water, for ſo at Venice they draw water from St *Nicolas* Well, for Mariners that go long voyages, becauſe it ſtands ſo neer the ſea, and ſalt lyes hid in it, by communicating with thoſe waters. We read in Scripture, that *Elizeus* did this, who at Jericho or Paleſtina, caſt in ſalt into a Fountain, and made it potable water, which was before bitter and corrupt. If water breeds worms caſt in quick Lime, and they will dye. When we would make wine clear, beat the white of an Egge, and the troubled wine will deſcend, if you put it in. Others caſt in the duſt that is on the catlings of ſmall nuts, and the Spaniards caſt in Gyp, to make it clear and all theſe we may uſe in waters.

CHAP. II.

How to make water of Air.

IF all other means fail, we may make water of air onely by changing it into air, as Nature doth; for ſhe makes water of air or vapors: Therefore when we want, water we may make it of air, and do as Nature doth. We know when the Sun heats the earth, it draws forth the thinneſt vapors, and carrieth them on high, to that region of the air where the cold is, thoſe vapors are condenſed into drops, and fall down in Rain. Alſo we ſee in ſummer, that in Glaſs veſſels well rinced, and that are full of cold water, the air by coming to the outermoſt ſuperficies, will preſently clow'd the the Glaſs, and make it loſe its cleanneſs; a little after it will be all in a dew and ſwell into bubbles, and by degrees theſe will turn to drops, and fall down, which have no other reaſon for them; but becauſe the cold air ſticking to the Glaſs, grows thick, and is changed into water. We ſee alſo in Chambers at Venice, where theſe windows are made of Glaſs, when a groſs and thick vapor ſticks to the Glaſs within, and a cold vapor prevails without, that within will turn to dew, and drop down. Again, in winter, in Braſs Guns, which are always very cold, and are kept in Cellars, and vaulted places, where men alſo uſe to be, that the air will grow thick, and lighting upon the cold ſuperficies of them, they will be all of a dew, and drop with water. But to ſay no more: Make a large round veſſel of Braſs, and put into it Salt-Peter, unrefined, what will fill it; men call it Solazzo, mingled with Ice: for theſe two mixed, as I ſaid in this Book, make a mighty cold, and by ſhaking them, with the wondeful force of the cold, they gather air about the veſſel, and it will preſently drop into a veſſel underneath. A deligent Artiſt will adde more, that he may get a greater quantity of water. It ſufficeth that I have ſhewed the way.

CHAP. III.

How one may ſo alter his face that not ſo much as his friends ſhall know him.

SUch as are taken priſoners, or ſhut up cloſe and deſire to eſcape, and ſuch as do buſineſs for great men, as ſpies, and others that would not be known, it is of great moment for them to know how to change their Countenances: I will teach them to do it ſo exactly, that their friends and wives ſhall not know them. Great men do not a little enquire for ſuch ſecrets, becauſe thoſe that can diſſemble their own perſons, have done great matters, and lovers have ſerved their Miſtreſſes, and Parents have

have not ſuſpected it. *Ulyſſes* attempting to know what the Trojans did, clothed in counterfeit garments, and his face changed, did all he would, and was not diſcovered. *Homer.*

With many ſcars he did transform his face,
In ſervants clothes, as from a beggars race.
He went to Troy, ——

And when he deſired to know what *Penelope* and her ſuters did, he transformed himſelf again. I ſhall ſhew how this may be done many ways, by changing the Garments, Hair, Countenance, Scars, Swellings; we may ſo change our Faces, that in ſome places it may riſe in bunches, in other places it may ſink down. And firſt,

How to dye the Fleſh.

But to begin with the colouring of the Fleſh. The Fleſh may be dyed to laſt ſo long, or to be ſoon waſhed out. If you will have it ſoon waſh'd off, Steep the ſhells of Walnuts, and of Pomegranates in Vinegar, four or five days; then preſs them forth by a Preſs, and dye the face; for it will make your face as black as an Ethiopian, and this will laſt ſome days. Oyl of honey makes a yellow colour, and red, and it will laſt fourteen days or more. The fume of Brimſtone will diſcolour the face, that it will ſhew ſickly, as if one had long kept his bed, but it will be ſoon gone. But if you will have it laſt many days firm, and very hardly to come off: Uſe water of Depart, that ſeperates Gold from Silver, made of Salt-Peter and Vitriol, and eſpecially if it have firſt corroded any Silver; this will laſt twenty days, until the skin be changed. But if you will

Change the Hair,

I taught elſewhere how to do this: yet I will take the pains to do it again. Oyl of honey dyes the Hair of the head and beard, of a yellow or red colour; and this will hold a moneth. But if they be hoary, white, or yellow, we may dye them black with a ſtrong Lixivium, wherein Litharg is boiled. Alſo, it will notably alter the Countenance,

To adde or take off Hair,

An Unguent uſed in Stoves and Hot-houſes, is good for that purpoſe, made of Orpiment and quick Lime; for this will preſently make the part bald, ſo the eyelids and eyebrows being made ſmooth, will ſtrangely metamorphiſe a man. We can alſo make the Hair grow ſuddenly, with water of honey, and the fat of an eel and horſe, as I ſaid. One may thus

Make his face ſwelled, preſſed down, or full of ſcars,

Nothing doth more deform the viſage then the ſtinging of Bees. We can make ſcars with cauſtick Herbs, by applying them, and letting them lye on for a little time. Tumours and Cavities are made by uſing to the part milk of Tithymal, as to the Mouth, Noſe, Eyes, eſpecially where the skin is off, that by this remedy alone the face is deformed; ſo you may do the Cods and Teſticles: water of Cantharides ſmeered on, doth preſently cauſe bladders and humours. Turbith beaten, and boiled, and anointed on, makes all ſwell where it toucheth, chiefly the Teſticles. The powder of the Yew, doth ſo exulcerate the skin, that the people will think the man is moſt miſerable, and in a ſad condition. The remedy is the juyce of the Poplar, or the oyl of Poplar. The fume of Brimſtone and burnt ſtraw, will diſcolour the face, as Hypocrites do, who by ſuch means alter their countenance. Mingle together the feces of *Aqua fortis* one ounce, Pickle and Curcuma, of each one drachm, with Oyl to the form of an unguent, and anoint your face, it will make it black. When you will waſh it with cold water, it will come to its former complection. Comedians and Tragedians, when they Act on the Stage, they ſmeer their faces with lees of Oyl to change them, that ſuch as are their acquaintance may not know them. Becauſe the ſtinging of Bees, Waſps, Hornets, do ſo change the face, making the Noſe, Mouth, and

and other parts to ſtand awry, and to be full of ſwellings and depreſſions: If any man waſh his ſkin with the decoction of Hornets or Waſps, the place will ſo ſwell, that it will make men ſuſpect ſome diſeaſe, yet it is without pain. The remedy is Theriot drank, or ſmeered on the part: and this is the fraud that falſe women uſe to counterfeit themſelves to be with child. Beat together Oyl-lees, coles of a Vine and Pomegranate-Pills; and mingle them, and if you touch your face with this liniment, you ſhall make it exceeding black: but the juyce of ſowre Grapes or Milk will waſh it off.

CHAP. IV.

That ſtones may move alone.

THe Antients ſay, that the ſtones called Prochites and Aſtroites, laid upon ſome other plain ſtone, will move of themſelves, if you put Vinegar to them. The way ſhall be this: let a plain well poliſhed, on the outward ſuperficies, Porphyr Marble ſtone, lye beneath; lay upon this the ſtone Trochites or Aſtroites, whoſe outward ſuperficies is made ſmooth alſo; then put to them a little vinegar or juyce of Lemons, preſently of themſelves will the Trochites, as well as the Aſtroites, without any thing moving them, go to the declining ſuperficies: and it is very pleaſant to ſee this. *Cardan* ſaith, That ſuch ſtones have a thin moiſture in them, which by the force of the vinegar, is turned into a vapor; and when it cannot get forth, it tumbles the ſtone up and down: There is the beginning of a thin vapor, but it comes not forth, becauſe it is credible that the paſſages are very narrow: I ſhould think that air is ſhut up in the veins of it, for it is probable, where you ſhall ſee ſubſtances of divers colours. Wherefore vinegar, becauſe it is ſubtile of parts, goes in, and drives out the air, which paſſing out by the vinegar, moves the ſtone. Yet I have found that all ſtones will move themſelves, that are mingled of divers ſtones, & have divers open paſſages in their veins. For the vinegar entring in at the joynts, forceth the ſtone to move it ſelf. The Alabaſter ſtone, called vulgarly Lodognium, moves excellently, for it is diſtinguiſhed by divers veins, and varieties of ſtones; and I have ſeen a piece, not onely of one pound, but of four pounds to move it ſelf, and it was like a Tortois; and when the ſtone began to move, it ſeemed like a Tortois crawling. That kinde of Marble moves by it ſelf with vinegar, which is called Brocadello, which is compounded of divers and mingled parts. Alſo with vineger doth that ſpotted Marble walk, which is ſpotted with red, yellow, and brown ſpots; they call it the Lowſie ſtone. and it makes the beholders to wonder at it. I muſt tell you this before I leave off, becauſe I would omit nothing. If the Marble be ſpotted underneath, and be above all of one colour and hard, or beneath all of one colour and hard, and above of divers colours; when vinegar is poured on, or any ſharp liquor, it runs preſently to the declining part; ſometimes in circles, ſometimes by jumps, and ſometimes haſtily moving it ſelf.

CHAP. V.

How an Inſtrument may be made, that we may hear by it a great way.

IN my Opticks I ſhewed you Spectacles, wherewith one might ſee very far. Now I will try to make an Inſtrument, wherewith we may hear many miles; and I will ſearch out a wood, wherewith that may be performed better and with more eaſe. Therefore to finde out the form of this Inſtrument, we muſt conſider the ears of all living Creatures, that bear beſt. For this is confirmed in the Principles of Natural Philoſophy, that when any new things are to be invented, Nature muſt be ſearched, and followed. Therefore to conſider of Animals, that have the quickeſt hearing, we muſt think of thoſe that are the moſt fearful; For Nature takes care for their ſafety, that as they have no great ſtrength, yet they might exceed others in hearing, and ſave themſelves by flight; as the Hare, Coney, Hart, the Aſs, Ox, and the like. Theſe Creatures

Creatures have great ears, and always open toward their foreheads; and the open paſſages are to carry the ſound from the place whence it comes. Hares therefore have long ears ſtanding up high. *Pollux.* But *Feſtus* calls the Hare, *Auritum*, becauſe of its great ears, and quickneſs of hearing. The Greeks call the Hare *Lagos* from the great ears; for *La* in compoſition augments, and *Os* ſignifies an ear, and it was fit that a fearful creature ſhould hear well, that it might perceive dangers farther off, and take care for it ſelf in time. The Egyptians thought the Hare ſo quick of hearing, that it was their Hieroglyphick for hearing. The Coney is of the ſame Nature, and hath the ſame kinde of ears. Cows have great hairy ears: ſhe can hear a Bull rore when he ſeeks to Bull a Cow, thirty furlongs off, as giving this token of his love. *Ælian.* A Hart hath greater and longer ears, as it is a fearful Creature: If he holds his ears right up, he perceives ſharply, and no ſnares can take him; but if he let his ears down, he is eaſily ſlain. *Ariſtotle*, and *Pliny* from him. When they raiſe their ears, they hear quickly; when they let them fall, they are afraid: and not to go over all Creatures that have large right up open ears, I ſay thoſe that have ſuch ears, they raiſe them and direct them forward, when they would hear afar off, and they are of moſt perfect hearing. I ſhall ſhew now by the contrary, that ſuch Creatures which have ſhort ſmall ears, and not ſo viſible, are of dull hearing. Great part of Fiſhes want ears, and ſuch as have onely holes and no ears, muſt needs hear more deafly; for the outward ears are made by Nature, that the ſounds might be conveyed to the ears by them. *Adrianus* Conſul of Rome, is a moſt clear witneſs of this, who having this ſenſe hurt, made hollow catches to hear better by; and theſe he faſtned to his ears, looking forward. And *Ariſtotle* ſaith, That Horſes, Aſſes, Dogs, and other Creatures that have great ears, do always ſtir them about, and turn them to hear noiſe, Nature teaching them the uſe of thoſe parts; and we finde that they hear leſs that have their ears cut off: wherefore it is fit, that the Form of the Inſtrument for hearing, be large, hollow, and open, and with ſcrews inwardly. For the firſt, if the ſound ſhould come in directly, it would hurt the ſence; for the ſecond, the voice coming in by windings, is beaten by the turnings in the ears, and is thereby multiplied, as we ſee in an Eccho. The ſea-Periwinkle is an argument to prove it, which being held to the eare makes a light noiſe. Now it remains to ſpeak of what matter it muſt be made. I think of porous Wood, for the holes and pores are paſſable every way; and being filled with air, they ſound with every ſmall ſtroke: and amongſt the porous Wood, is the Ivy, and eſpecially the tree called Smilax or Woodbind, for a Diſh made with Ivy, will let out the water, as I ſaid. Wherefore *Pliny* ſpeaking of the Woodbind, ſaith, It is proper to this matter, that being ſet to the ears, it will make a ſmall noiſe. And in another place, I ſaid that the Woodbind-Ivy would ſound, if ſet to the ear. Therefore fit your Inſtrument to put into your ear, as Spectacles are fitted to the eyes.

CHAP. VI.

How by ſome Impoſtures we may augment weight.

I Have ſet down ſome Impoſtures here, that ſuch as handle with wicked men, may take heed that they be not deceived. As

To augment the weight of Oyl,

water is mingled with the Oyl, that the fraud may not be known, let it be done with troubled waters, as with the decoction of Wood, Rapes, Aſphodills, that it may the harder be diſcerned from it. Or elſe they put the choiſeſt Gumtragant into water for two days: then they bray it in a Mortar, always putting water to it, to melt the Gum: adde theſe to the Oyl dropping forth, and they will be turn'd to Oyl. By the like fraud almoſt,

Silk is made to weigh more,

They put it upon the vapour that riſeth from boiling water, and this makes it ſwell with moiſture, and grow heavier. Others bray one ounce of Gum Arabick, and be-

ing well paſſed through a ſieve, they mingle it with the decoction of Honey; they diſſolve this mixture into water, and wet the Silk with it, and then let it dry. Others keep it in the green leaves of Walnut-tree. If you will

Increaſe the quantity of Honey,

Adde to it the Meal of Cheſtnuts of Millet, and that augments it, and it cannot be known. So you may

Increaſe the weight of Wax:

Adde to the Wax Bean-meal, excellent well beaten; and this will burn in Candles without any excrement; for it increaſeth the weight and bigneſs, and the fraud is ſcarce diſcerned. So you may

Augment Sope.

If you mingle the Aſhes of Oxens ſhank-bones, well burnt it Potters ovens, or white Brimſtone. For you ſhall augment the weight and quantity, without and diſtinction of it. If you would

Counterfeit Pepper,

You may gather green Juniper-berries, and let them dry till they ſhrivel; then mix them with grains of Pepper. Others gather great black Vetches, and firſt they boil them with wilde Pepper; for ſwelling in the water, when they come to be dried, they become wrinkled. I did ſophiſticate them ſo, that I deceived in ſport the beſt Apothecaries; and afterwards, I did in mirth diſcover the fraud. Take the Berries of the ripe red Sanguinaria; theſe when they are dried, will be ſo ſhriveled, and like to Pepper, that any man almoſt may be deceived by it, unleſs he taſts of it. So we may

Increaſe the weight of Wheat,

By ſetting a veſſel of Wood within it, full of water or vinegar. For as *Pliny* ſaith, It will drink it in.

CHAP. VII.

Of the Harp and many wonderful properties thereof.

THe Harp hath ſome properties in it, and things worthy to be obſerved, which I ſhall propound here. Firſt, I ſhall mention ſome wonderful effects, that the Antients ſpeak of: then how they may be done, or how the Antients did them. Since Muſick is now more Adorned and Noble, than it was amongſt the Antients (for then it was more rude and imperfect) and yet in our days it doth not perform thoſe operations. It is certain that Muſical Tunes can do much with men, and there is no heart ſo hard and cruel, but convenient and ſweet harmony will make it yield, and on the otherſide, harſh Muſick will vex and harden a mans minde. *Muſæus* diſcovers, that Verſe and Songs are a moſt delightful thing to Mortal man: and the Platoniſts ſay, That all things living are charmed by Muſick; and there are many effects obſerved of it. Drums ſound in the wars to provoke thoſe that are ſlow to fight; and we read that the Antients did ſuch like things. One *Timotheus* a Muſician, as oft he he pleaſed would play a Phrygian Tune, and ſo enrage the mind of *Alexander*, that he ran preſently to the wars; and when he would do otherwiſe, he changed his tune, and took off all his courage making him laſie, and would then draw him being grown effeminate, to Banquets and Feaſts: And *Plutarch* ſaith, That when he heard *Antigenida* playing Melodies with a Pipe, that they called Harmatii, he was ſo inflamed, that he roſe in his Arms, and laid hold of him that ſat next to him. *Cicero* reports, That *Pythagoras* made a yong man more calm by a ſlower tune, who was a Tancomonite, and was whitled with wine, and mad for a whore, and ſpurred forward by a Phrygian tune; for being a corrival, he ſought to ſet the houſe on fire where

where the whore was. And the ſame Author ſaith, If yong men are provoked by the ſound of Flutes to commit any wickedneſs, if the Piper play but a ſlower tune they are called off again; for by the gravity of the Muſick their petulant fury is alayed. *Empedocles*, when one ſet upon his Hoſt, that provoked him with reproaches and ill language turned the burden of his Song, and ſo aſſwaged the fury of his anger. *Theophraſtus* is reported to have uſed Muſical Tunes to repreſs the paſſions of the minde. And *Agamemnon* departing from his Country to go to Troy, doubting of the chaſtity of *Clitemneſtra*, left a Harper, who with Muſick did ſo incite her to continency and chaſtity, that *Egiſtus* could not enjoy her till he had killed the Harper. The *Thracian Orpheus* by the playing on his Harp, made barborous Nations civil who were as hard as ſtones to be ſoftned. Muſick charms the tender ears of children, and Rattles will make them quiet, and hold their peace when they cry. Wherefore *Chryſippus* is reported to have written a peculiar Song for Nurſes. Alſo wilde Beaſts are tamed with Muſical Tunes. *Arion* the Harper made friends of the Dolphins that want reaſon, and they carried him ſafe to the ſhore, when he was caſt into the Sea. *Strabo* ſaith, That Elephants are allured with drums. Stags are held with ſounds, and catched with ſweet Muſick. The Swans under the North-winde are conquered by the Harp and Muſical Tunes: Little birds are enticed to the Net with Pipes; and the Shepherds Pipe commands the Sheep, when they wander too far to field, to ſtand ſtill. In Myſia, when Horſes back Mares, a man ſings to them as it were a marriage Song, and the Mares are ſo taken with the Muſick, that they become great with Fole, and they bring forth moſt gallant Colts. *Pythocaris* a Muſician, when he ſang earneſtly ſwift Notes to his Pipe, is ſaid to have made Wolves become more tame; and which is far more wonderful, Antiquity cured Wounds, Diſeaſes, and Poyſons by Melody, as Hiſtories related. *Terpander* and *Aaron* of Methymna, cured the men of Lesbos and Jonia of great Diſeaſes. *Aſclepiades* a Phyſitian cured deaf people by a Trumpet, and by ſinging he ſtilled the ſedicious people. In time paſt there was great ſtore of Spiders in Aquilia, which they commonly call Tarantulæ, when the Sun is extreme hot they bite moſt peſtilently, and venemouſly; for this danger this healthful remedy is onely found out, that he that is bit muſt be charmed with much ſinging of Muſicians, and many muſical Inſtruments. The ſick though he want all ſenſe, ſo ſoon as he hears the Flute play, as if he roſe from a dead ſleep, ariſeth from the earth, and danceth after the Muſick; and if the Muſician ceaſe to play, he preſently faints, & grows ſtupedt and as the Muſick ſtrikes up, ſo he doth dance the more. So to ſeveral Diſeaſes the Antients appointed ſeveral Muſick; for the Dorick Melody cauſed Prudence, Chaſtity, and Learning; the Phrygians made men fight, and grow furious, which the flute will do alſo. Therefore *Ariſtoxenus* in his Plays, when he could not prevail with Dorick Muſick, he changed to Phrygian melody that agreed with them. The Lydian Harmony ſharpens wit to thoſe that are dull, and brings in a deſire of heavenly things, upon thoſe that are oppreſſed with a love of earthly things. *Ariſtotle* in his *Politicks*, Do we not reade that the Lacedemonians rejected that kinde of Muſick called Chromaticum, becauſe it made thoſe that heard it too effeminate? Whence I think it is not againſt reaſon, that the ſame may be done by the Lute or Harp alone, but what is done by art or cunning, is more to be wondred at, which none can deny. But if we would ſeek out the cauſe of this, we ſhall not aſcribe it to the Muſick, but to the Inſtrument, and the wood they are made of, and to the skins; ſince the properties of dead beaſts are preſerved in their parts, and of Trees cut up in their wood, as I ſaid elſewhere in this Book. And to take the moſt noted examples, if we will

Fright Sheep,

There is Antipathy between Sheep and Wolves, as I ſaid often, and it remains in all their parts; ſo that an Inſtrument ſtrung with Sheep ſtrings, mingled with ſtrings made of a Wolfs guts, will make no Muſick, but jar, and make all diſcords. *Pythagoras.* If you will

Drive away Horſes,

Horſes are frighted in battle by Elephants, and a Camel Naturally hates a Horſe, as

Ariſtotle and *Pliny* ſay, and ſome report that Horſes will burſt if they tread upon the Wolfs footing, when the Horſemen rides them. So that if drums be made of an Elephant, Camel, or Wolves skin, and one beat them, the Horſes will run away and dare not ſtand. By the ſame reaſon, if you will

Drive away Bears,

A Horſe, that is a Creature made obedient to man, hath a Capital hatred with a Bear, that is a Beaſt hurtful to man; he will know his enemy that he never ſaw before, and preſently provide himſelf to fight with him, and he uſeth arc rather than ſtrength for it; and I have heard that Bears have been driven away in the Wilderneſs by the ſound of a Drum, when it was made of a Horſe skin. Again, if we would

Make Horſes gentle,

Ælian writes that by the playing on a Flute, the Lybian Horſes are ſo allured, that by this means they will become gentle for mans uſe, and will not be ſo furious; they will follow the Groom that feeds them, whitherſoever he pleaſe to lead them with his Muſick; when he plays and ſtands, they ſtand ſtill, and if he play eagerly on the Flute, they are ſo raviſhed with it, that they cannot hold crying, and let tears fall. Thoſe that keep Horſes make a hollow pipe of the Tree called Roſe-Laurel, and they go amongſt the herd with this, and playing on it they charm them all. *Theophraſtus* hath told us that the Herb Oenothera will tame wilde Beaſts, and make them drunk; and as I ſaid elſewhere, *Theophraſtus* his Oenothera is our Roſe-Laurel, againſt *Dioſcorides*. It is reported, that

Women will miſcarry,

if Fiddle-ſtrings be made of Serpents, eſpecially of Vipers, for being put on a Harp and play'd on, if women with childe be preſent, they ſuffer abortion, and Vipers are wont to do as much by meeting them, as many write. *Hermenias*, a Theban, endeavoured

To cure many of the Sciatica

in Beotia, by Muſick; and it may be his Inſtrument was made of Poplar, for *Dioſcorides* ſaith, That the juyce of the Poplar-tree-bark will cure them, or of Willow. Alſo Hellebore is good

For mad men

And *Xenocrates* cured mad men with Muſical tunes, which Inſtruments might be eaſily made of Horſes Shank-bones, or the hollow ſtalks of Hellebore. *Thales Milerius* uſed a Harp

Againſt the Plague,

which could be of no other Wood than the Vine-tree; ſince Wine and Vinegar are wonderful good againſt the Peſtilence, or elſe of the Bay-tree, whoſe leaves bruiſed and ſmelled to, will preſently drive away Peſtilent contagion. *Theophraſtus* writes that ſome are excellent

Againſt the bitings of Vipers,

with Harps, Flutes, or other Inſtruments, which Inſtruments might be made of Juniper, Aſh, Bays, the Stags-bones, Ferula, Elder, Vine, and ſuch like many more. *Pythagoras*

Againſt Drunkenneſs

uſed Muſick alſo: for he withheld a yong man that was drunk from burning the houſe of his corrival, may be with an Inſtrument of Ivy, or Almond-tree-wood, eſpecially that as it is of the wilde Tree, for theſe afford great remedy for drunkenneſs. *Timotheus* did ſo enflame the minde of *Alexander* the Great, that he was mad to fight, and when he would he changed his minde, and drew out all his courage; and he endeavoured

To

To draw his ſluggiſh and yielding thoughts from Battle to Banquets,

and ſo carried him which way he pleaſed, which could not be done, but by Vine-wood, or Wood-Laurel. The Inſtrument of the Harper, who when *Agamemnon* went from Greece to Troy, did keep *Clilemneſtra* chaſte by, his Muſick was made of Willow, called *Agnus Caſtus*; for the women in the Feaſts of *Ceres*, amongſt the Athenians, put Willow-Park-leaves under them, to keep them chaſte when they lay in bed, for ſo they extinguiſhed the deſire of venery. The Pythagoreans uſed ſome Tunes

For ſleep and waking;

For when they would by ſleep overcome divers cares, they play'd certain Tunes, that eaſie and quiet ſleep might come upon them; and when they aroſe, ſo ſoon as they went out of their Chambers, with ſome Muſick they would diſpel all confuſion and dulneſs of ſleep, that they might ſet to their work. It is ſaid that the Æolian Muſick doth ſtill the tempeſts of the minde, and rocks men a ſleep: they provoked men to ſleep with Almond-tree, or Vine-tree-wood, and they drove ſleep off with Hellebore. Take this experiment that is common,

A Harp that is play'd on, will move another Harp ſtrung to the ſame height.

Let the ſtrings be ſtretched alike, that both may come to the ſame melody perfectly; if you ſhall ſtrike one of the baſe ſtrings, the other will anſwer it, and ſo it is in the trebles, yet they muſt be at a moderate diſtance; and if this be not very clear, lay ſtraw upon it, and you ſhall ſee it move. But *Suetonius Tranquillus*, in his Book, *De Ludicra Hiſtoria* ſaith, That in Winter ſome ſtrings are ſtruck, and others ſound. Thus any ignorant man may tune a Herp, if one Harp be rightly tuned for Muſick, and lye ſtill, he by ſtretching the ſtrings of the other, and by ſlackning them, and ſtriking as the ſtring of the Harp that lyes ſtill guides him; ſo of the reſt, But if you will

That a deaf perſon may hear the ſound of the Harp,

or elſe ſtop your ears with your hands, that you may not hear the ſound. Then take faſt hold of the Inſtrument by the handle with your teeth, and let another ſtrike on it, and it will make a Muſical noiſe in the brain, and may be a ſweeter noiſe. And not onely taking hold of the handle with your teeth, but the long neck, neer the Harp, and by that you ſhall hear the ſound perfectly, that you may ſay that you did not hear the Muſick, but taſte it. Now remains what I think is very pleaſant

To make a Harp or other Inſtrument be play'd on by the winde,

Do thus: When the windes are very tempeſtuous ſet your Inſtruments juſt againſt it, as Harps, Flutes, Dulcimers, Pipes the wind will run violently into them, and play low upon them, and will run into the holes of the reeds; whence if you ſtand neer and liſten, you will hear moſt pleaſant Muſick by conſent of them all, and will rejoyce.

CHAP. VIII.

To diſcover Frauds whereby Impoſtors working by Natural means, pretend that they do them by conjuration.

NOw will I open Cheats and Impoſtors, whereby Jugglers and Impoſtors, who fain themſelves to be Cujurers, and thereby delude fools, knaves, and ſimple women. I, to caſt down their fraud, by admoniſhing ſimple people not to be deceived by them, ſhall open the cauſes thereof. And firſt,

By what means they fain, that they can diſcover Treaſures,

The greater part of Cozners, when they are themſelves very poor and moſt miſerable of all men, they profeſs themſelves able to finde our Treaſures, and they promiſe to other men what they want themſelves; and they uſe four Rods that are double forked, the tops whereof ſticking cloſe together croſſways, they hold the lower parts

of

of them with their hands open, neer their belly, they ſeem to mumble ſome Verſes, and the Rods fall down, and where they fall, they bid thoſe men to dig that would find Treaſures. The cauſe is, for that the Rods ſeem to ſtand faſt in their hands, and yet have no hold at all, and they ſeem always ready to fall; and if they remove never ſo little from their place, they preſently fall down. Alſo, there are in mens arms and hands pulſations of Arteries, which although they ſeem immovable, yet they do move the hands unſeen, and make them to tremble: Yet ſome Metal-Maſters who report that theſe forked Rods are a great help to them in finding out of Mines: For with a Knife they cut the Hazel-tree, which they ſay is the fitteſt of all to finde out Veins, eſpecially if the Hazel come upon any Mineral Vein. Others uſe divers Trees, as the Metals are divers; for they uſe wands of Hazel for Veins of Silver, Aſh for Braſs, Wilde Pilch-tree for Lead, chiefly white-Lead, or Braſs, or Gold: then they take the Rod by both ends, and clinch their fiſts, but they muſt hold their fingers clinched upwards toward heaven; and that the Rod may be lifted up there where the ends meet, thus they wander here and there through Mountainous places, and when they ſet their foot upon a Vein, the Rod will preſently turn about, and diſcover a Vein in any place; when they come off from it, the Rod will be quiet, and they ſay the Veins have ſo great force, that they will bend the Boughs of Trees that grew neer, towards them, as *Agricola* writes more largely.

Another merry conceit remains, that three Schroles of Paper not touched, ſhall change their places.

This cannot be done but an ignorant man will admire it. Make three long Schroles of Paper, or of linen, and let them be one longer then another, equally; for all of them being made equal at the lower end, and turn'd about equally, they take one the others place, and change their ſituation; put the longeſt in the middle or in the firſt place, they change their ſituation; if the longeſt be put laſt, they hold as they were. No man but will think this to be done by the Divel, yet this proceeds from no other cauſe, but becauſe in the end of the revolution, the longer remains, and the laſt from whence it riſeth ſtays behinde. *Ariſtotle* in his Problems ſeems to mean this, why the Section of a Paper, if any man cut it off ſtraight from the plain baſis in meaſuring, it will be ſtraight when it is turned about; but if it be bended, it will be twiſted? whether this falls out, that when the rounds of another Section are placed on the ſame plain, that Section declining, is not equally oppoſite, but ſomewhat leſs: wherefore when you part them, thoſe rounds that are contain'd in the ſame plaie, will make a line, that belongs to their own order, *&c.* Some were deceived, who thought this proceeded from the force of words, and they anſwered all queſtions by it as from an Oracle: for if they changed their places, all ſhould go well and proſper, otherwiſe they ſhould have ill ſucceſs; and they would not change their ſuperſtitious belief, with reaſon and experience, becauſe they had ſo believed many years. If you will have

Money to turn about upon a point,

I oft have ſeen Impoſtors that to cheat women uſed this fraud, that two Schroles of Paper, or ſome other light matter upon a plain, ſhould lift up themſelves, and move alone. If you ſearch in Barley, you ſhall finde a ſmall ear of wilde Oates, that is black and wreſted, like the foot of a Locuſt; and if you binde this with wax to the top of a Knife, or point of a Stile, and ſhall ſprinkle ſoftly ſome drops of water upon them, when it feels the wet, it will twiſt like a Harp ſtring, and the Paper will riſe, and ſo will Money turn on the point of a Stile. If we will

Diſcover theft,

we may do it thus, and recover what is loſt. There are many ſuperſtitions for theft, that ſtand by Natural reaſons, and Cheaters aſcribe them to the vertue of Words. There is the Eagle ſtone, ſo called, it is as one great with childe; for ſhake the ſtone, and it rings in the belly: If then any one powder this, and put it into good bread baked upon the Embers, and give it to a Thief, the Thief cannot ſwallow it, when he hath chewed it, but he muſt either be choked, or diſcovered for a Thief; for he cannot ſwallow it being baked with that, as *Dioſcorides* ſaith. The Natural cauſe for this is, becauſe the powder that is mingled with the bread is ſo dry, that it makes the bread extream dry, and like a pumiſh, that it cannot be ſwallowed, when it comes into the throat. Adde to this, that he who ſeeks to finde a Thief, muſt ſay to the ſtanders by, whom he ſuſpects that he will work wonders; whereupon he that is the Thief, hath his throat very dry, by reaſon of the fear and terrour he is in; ſo that he cannot ſwallow this bread with the powder in it, for it will ſtick to his throat; for if he were void of fear he could ſcarce ſwallow it. There is another cunning invention: they write the names of thoſe that are ſuſpected upon Schroles of Paper, and make them faſt in clay bullets, and put them under the water, the pellets being well wet, open, and the light ſchroles of Paper riſe above the water. And this cauſeth the ſpectators to admire, and to ſuppoſe it is ſome diabolical art. The clay pellets are made as many as the ſtanders by are, and the names writ in the ſchroles, are wrapt up in the pellets: for the ſchroles that are not very faſt wrapt in the pellets, are not very faſt bound in; but if you will have them never to open, you ſhall work it well with the ſchrole, and ſo it will never come forth. If you will have

Flowers to fall from a Tree:

When I ſaw this firſt I was amazed, but I asked the reaſon, and he ſhewed me it. It is a property of Mullens, that when in the morning it opens the Flowers, if the Plant be ſhaken gently, the Flowers drying by degrees will fall all to the ground; and one that ſees it will think it comes from Magical Art, if he that ſhakes them off ſhall mumble ſome idle words. Alſo,

Women are made to caſt off their clothes and go naked:

To let nothing paſs that Jugglers and Impoſtors counterfeit, They ſet a Lamp with Characters graved upon it, and filled with Hares fat; then they mumble forth ſome words, and light it; when it burns in the middle of womens company, it conſtrains them all to caſt off their clothes, and voluntarily to ſhew themſelves naked unto men; they behold all their privities, that otherwiſe would be covered, and the women will never leave dancing ſo long as the Lamp burns: and this was related to me by men of credit. I believe this effect can come from nothing but the Hares fat, the force whereof perhaps is venemous, and penetrating the brain, moves them to this madneſs. *Homer* ſaith, The Meſſageræ did the like, and that there are Trees whoſe fruit caſt into the fire, will make all that are neer to be drunk and fooliſh; for they will preſently riſe from their ſeats, and fall to leaping and dancing. There are Thieves alſo

Who bore through the head of a Pullet with an Awle, and yet maintain that ſhe is alive.

And they ſay it is done by conjuration, and they promiſe to make a man hard by this, that he cannot be wounded; for with ſome Characters fraudulently invented and bound under the wings, they thruſt through the head of the Cock with a Bodkin, and ſtaying awhile, they pull it forth again, and the Pullet flies away without any wound, or loſs of blood. When I conſidered of this, and opened the Pullets head, I found it to be parted in the middle, and the Knife or Bodkin paſſing through that place, hurts not the brain, and I have often tried it, and found it true. There is alſo

A remedy for the Sciatica,

Great *Cato*, the chief man for all commodity, and the Maſter of all good Arts, as *Pliny* ſaith, In his Books of Husbandry he uſed ſome charms againſt the pains of the Sciatica, ſaying, that if any thing be diſlocated, you may charm it whole again by this means. Take a green Reed four or five foot long, cut it in the middle, and let two men hold them to the huclebones. Begin to play with another, S. F. *motas vetas daries dardaries aſtataries diſſunapiter*, until ſuch time as they joyn together, and ſhake about your ſword, when they come together, and one toucheth the other, take that

that in your right hand, and cut it aſunder with your left; bind it to the place diſlocated or broken, and it will be whole. See how ſo worthy a learned man brake forth into ſuch madneſs; nor did he know by his great learning, that without the force of Words, green Reeds cut long-ways, will turn round of themſelves and meer, if they be pendulous, as the wands of Willows, and brambles will do. *Theophraſtus* gives the reaſon why they turn round, in his Books *De Cauſis Plantarum*. Moreover we reade in *Dioſcorides*, that a Reed with Vinegar applied to the hucklebones will cure the Luxation of the loins, without words or ſuperſtition.

CHAP. IX.

Of ſome Experiments of a Lamp.

I Much rejoyced when I found amongſt the Ancients, that *Anaxilaus* the Philoſopher, was wont to make ſport with the Snuff of a Candle and the Wick, and by ſuch deluſions would make mens heads ſhew like Monſters, if we may believe *Pliny*: By taking the venomous matter comes from Mares newly having taken Horſe, and burning in new Lamps, for it will make mens heads ſeem like Horſheads, and ſuch like: but becauſe I gave no credit to theſe things, I never cared to try them. But take theſe for truth.

To make men ſeem like to Blackmores,

Take Ink, but the beſt comes from Cutles: mingle this with your Lamps, and the flame will be black. *Anaxilaus* is reported to have done this, for oft-times by mingling Cutles Ink, he made the ſtanders by as black as Ethiopians. *Simeon Sethi* ſaith, That if any man ſhall dip a Wick in Cutles Ink, and Verdigreaſe, thoſe that ſtand by will ſeem partly Braſs-colour, partly Black, by reaſon of the mixture. And we may imitate this in all colours; for ſetting aſide all other lights that might hinder it, for elſe the other lights will ſpoil the ſport, and if you do it by day, ſhut the windows leſt the light come in there and deſtroy the deluſion. If the Lamp be green Glaſs and tranſparent, that the rays coming through may be dyed by the colour of the medium (which is of great conſequence in this) and green Coppras be mingled with the Oyl, or what moyſture it burns with, and they be well ground together, that the liquor may be green; make your Cotten of ſome linnen of the ſame colour, or bombaſt; this being ſmeered with it, muſt burn in that Lamp: the light that is oppoſite againſt you, will ſhew all faces of the beholders and other things to be green.

To make the face ſeem extream pale and lean,

This is eaſie; pour into a large Glaſs very old Wine, or Greek Wine, and caſt a handful of Salt into it: ſet the Glaſs upon burning coles without flame, leſt the Glaſs ſhould break, it will preſently boil; put a Candle to it, and light it; then put out all other lights, and it will make the faces of the ſtanders by to be ſuch, that they will be one afraid of another. The ſame falls out in ſhops, where Bells and Metals are melted, for they ſeem ſo ſtrangely coloured in the dark, that you would wonder at it, their lips look pale, wan, and black, and blew: Alſo let Brimſtone, when it burns, be ſet in the middle of the company, and it will do the ſame more powerfully. *Anaxilaus* the Philoſopher was wont to work by ſuch deluſions. For Brimſtone put into a new cup, and ſet on fire, and carried about, by the repercuſſion of it when it burns, makes the company look pale and terrible. That oft-times happened to me when at Naples I walked in the night in the Leucogean Mountains; for the Brimſtone burning of it ſelf, made me look ſo.

CHAP.

CHAP. X.

Of ſome mechanical Experiments.

THere are ſome Experiments that are witty and not to be deſpiſed, and are done by Simples without mixture, which I thought not unfit to communicate to ingenuous Men, and Artificers. There is an Art, called

The flying Dragon,

or the Comet: It is made thus; Make a quadrangle of the ſmall pieces of Reeds, that the length may be to the breadth, one and half in proportion; put in two Diameters on the oppoſite parts, or Angles, where they cut one the other, bind it with a ſmall cord, and of the ſame bigneſs, let it be joyned with two others that proceed from the heads of the Engine. Then cover it with paper or thin linnen, that there be no burden to weigh upon it: then from the top of a Tower, or ſome high place, ſend it out where the wind is equal and uniform, not in to great winds, leſt they break the workmanſhip, nor yet to ſmall, for if the wind be ſtill, it will not carry it up, and the weak wind makes it leſs labour. Let it not flye right forth, but obliquely, which is effected by a cord that comes from one end to the other, and by the long tale which you ſhall make of cords of equal diſtance, and papers tied unto them: ſo being gently let forth, it is to be guided by the Artificers hand, who muſt not move it idly or ſluggiſhly, but forcibly; ſo this flying Sayle flies into the air. When it is raiſed a little (for here the wind is broken by the windings of the houſes) you can hardly guide it, or hold it with your hands. Some place a Lanthorn upon it, that it may ſhew like a Comet: others put a Cracker of paper, wherein Gun-power is roled, and when it is in the air, by the cord there is ſent in a light match, by a ring or ſome thing that will abide; this preſently flies to the Sayle, and gives fire to the mouth of it, and the Engine with a thundring noiſe, flies into many parts, and falls to the ground. Others bind a Cat or Whelp, and ſo they hear cries in the air. Hence may an ingenuous Man take occaſion, to conſider how to make a man flye, by huge wings bound to his elbows and breaſt; but he muſt from his childhood, by degrees, uſe to move them, always in a higher place. If any man think this a wonder, let him conſider what is reported, that *Archytas* the Pythagorean did. For many of the Noble Greeks, and *Favorinus* the Philoſopher, the greateſt ſearcher out of Antiquities, have Written affirmatively, that the frame of a Pigeon made in wood, was formed by *Archytas*, by ſome art, and made to flie; it was ſo balanced in the air by weights, and moved by an aireal Spirit ſhut within it.

Soli Deo Gloria.

FINIS.

A TABLE containing the General Heads of NATURAL MAGICK.

The first Book;

Treating of wonderful things.

The second Book;

Of the generation of Animals.

The third Book;

Of the production of new Plants.

The fourth Book;

The increasing of Houshold Stuffe.

The fifth Book;

Of changing Metals.

The sixth Book;

Of counterfeiting precious Stones.

The

The seventh Book;

Of the Wonders of the Load-stone.

The

The Table.

The eighth Book;

Of Physical Experiments.

The ninth Book;

Of Beautifying Women.

The tenth Book;

Of Distillation.

The eleventh Book;

Of Perfuming

The twelfth Book;

Of Artificial Fires.

The thirteenth Book;

Of tempering Steel.

The fourteenth Book;

Of Cookery.

The fifteenth Book;

Of Fishing, Fowling, Hunting, &c.

Tee sixteenth Book;

Of invisible Writing.

The

The Table

The ſeventeenth Book;

Of Burning-glaſſes, and the wonderful ſights by them.

The eighteenth Book;

Of Things heavy and light.

The ninteenth Book;

Of Wind-Inſtruments.

The twentieth Book;

Of the Chaos.

FINIS.