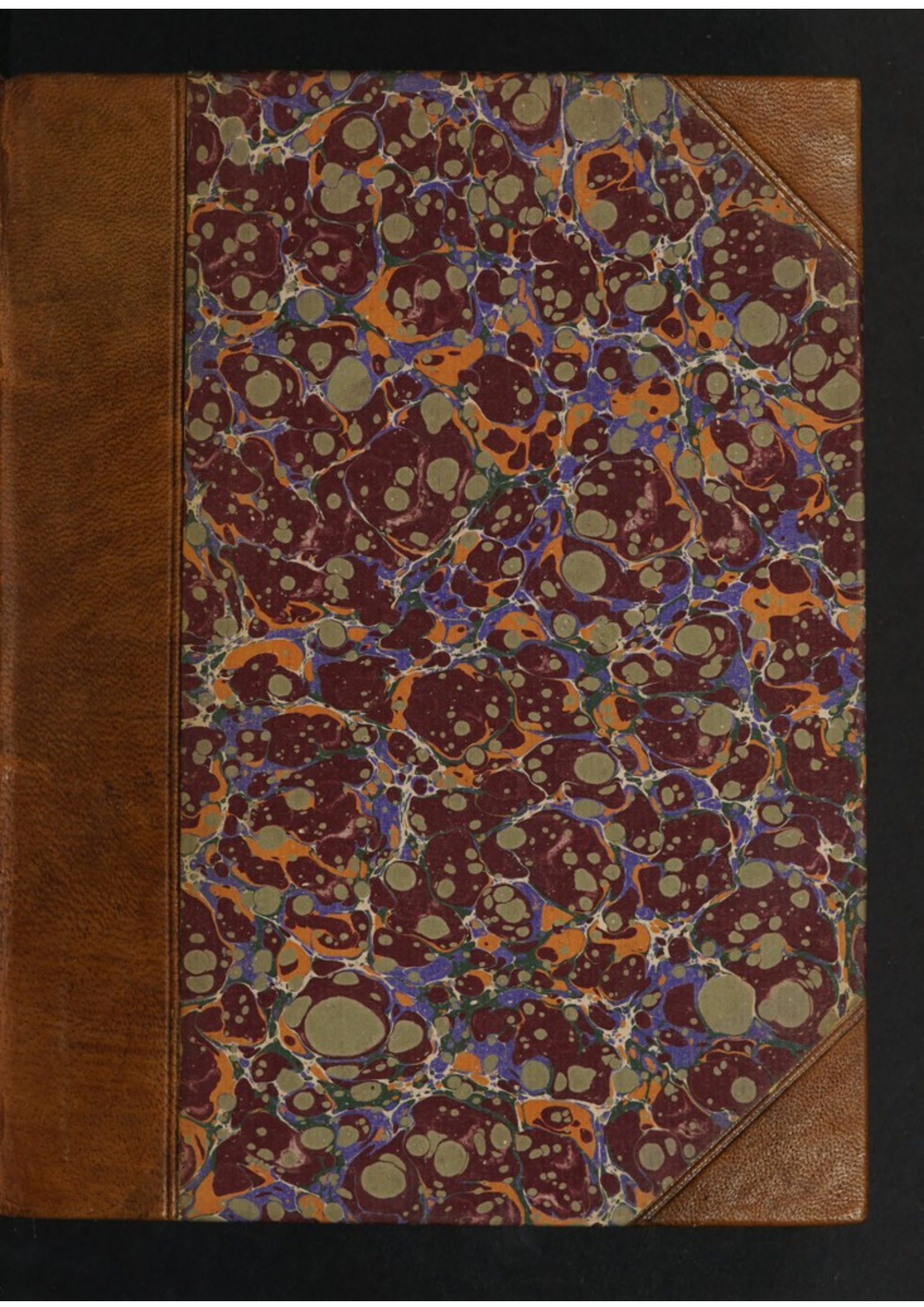
The mysteries of nature and art in four severall parts. The first of water-works. The second of fier-works. The third of drawing, colouring, limming, paynting, graving, and etching. The fourth of experiments / [John Bate].

Wellcome Collection
183 Euston Road
London NW1 2BE UK
T +44 (0)20 7611 8722
E library@wellcomecollection.org
https://wellcomecollection.org

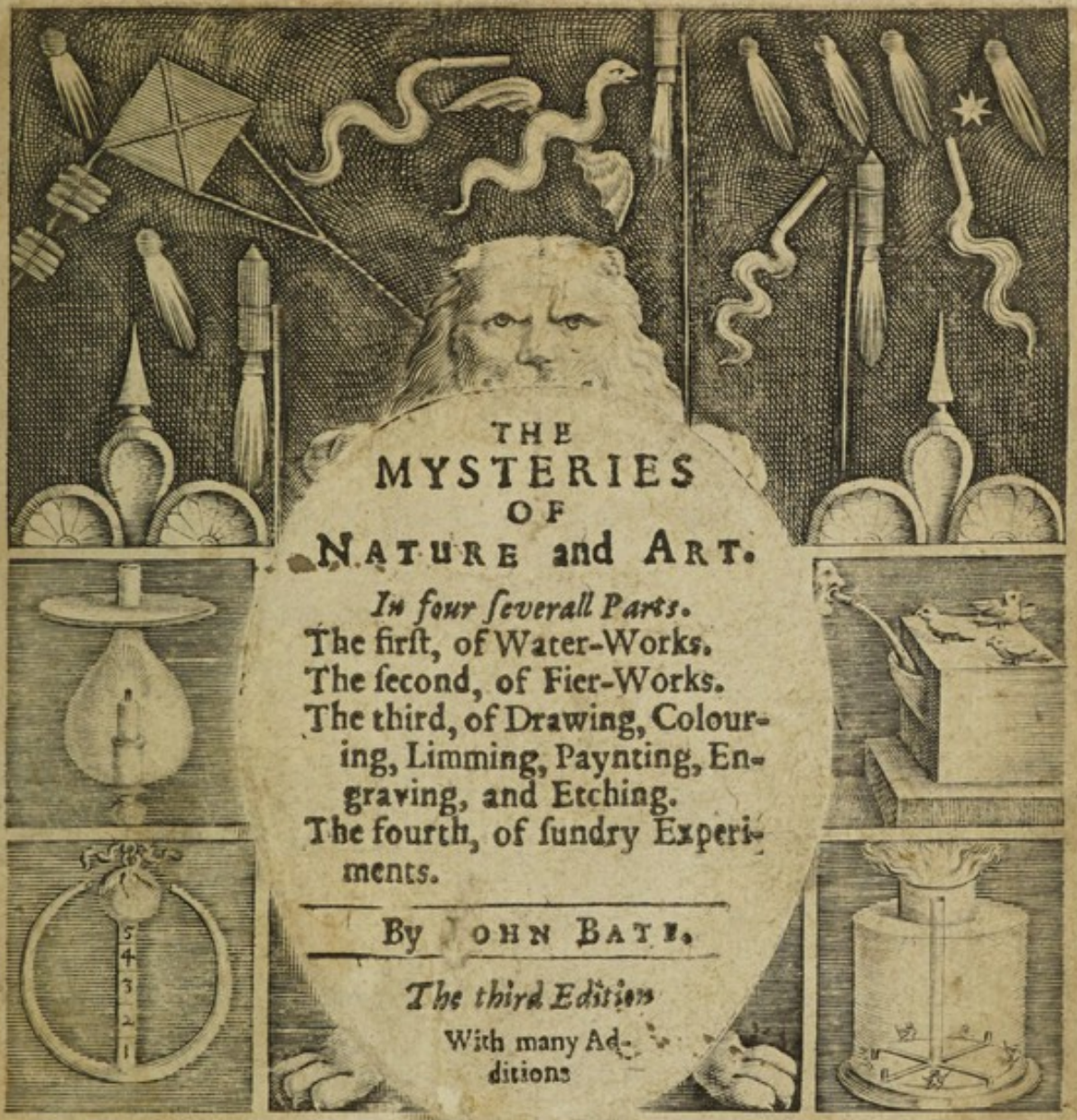


MYSTERIES
OF
NATURE
& ART

BATE

1654

12



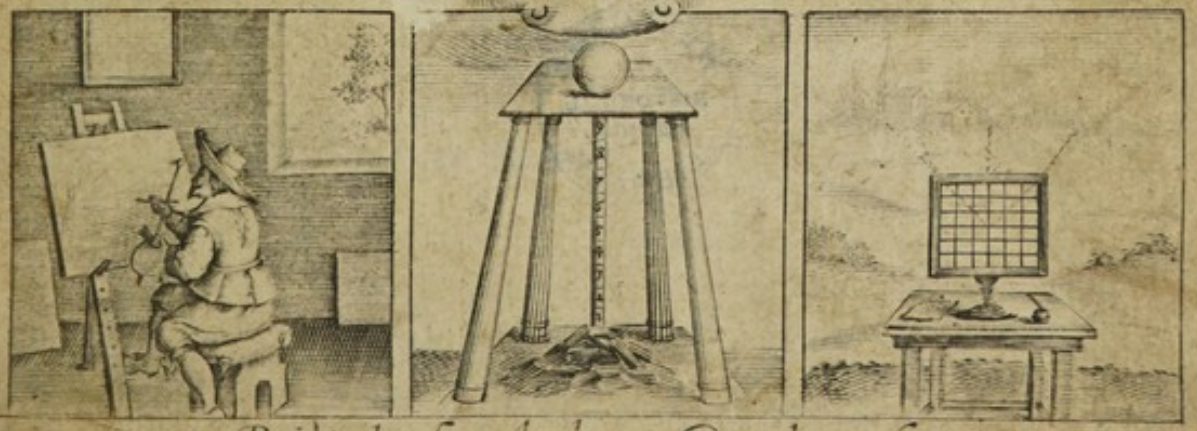
THE MYSTERIES OF NATURE and ART.

In four ſeverall Parts.

The firſt, of Water-Works.
The ſecond, of Fier-Works.
The third, of Drawing, Colouring, Limming, Paynting, Engraving, and Etching.
The fourth, of ſundry Experiments.

By JOHN BATE.

The third Edition
With many Additions



Printed for Andrew Crooke 1654

THE MYSTERIES OF NATVRE and ART.

In four ſeverall Parts.

The firſt of
VVater-VVorks.

The ſecond of
Fier-VVorks.

The third of
Drawing, Colouring, Limming, Paynting, Graving, and Etching.

The fourth of
Experiments.

By JOHN BATE.

LONDON.
Printed by *R: Biſhop* for *Andrew Crook*, at the Green Dragon in Pauls Churchyard. 1654

THE

MYSTERIES

OF

NATURE and ART

In four Several Parts.

The first of

Water-Works.

The second of

Fire-Works.

The third of

Drawing, Colouring, Limning, Painting, Graving, and Etching.

The fourth of

Experiments.

By John Bate.

LONDON

Printed by J. Milbourn for Andrew Crook, at the Green Dragon in Paul's Church-yard. 1654

To the Reader.

Courteous Reader,

THis ensuing Treatise hath layn by me a long time penned, but in a confused and undigested manner, as either my Practise, Reading, or Conference suggested the Experiments. It was not in my minde to have exposed it so soon to publique censure, but the importunity of many and my friends, have wrested it from my hands, and made it common. Expect no elegancy of phrase, for I endeavoured as much as I could to Write in playn Tearms, that it might suit with the meanest capacity. The Subjects admit no curious Method, neither could my Ocasions afford me time to bethink my selfe of any whereunto I might mould it, nor indeed to be my own Transcriber.

The whole Book consisteth of Foure Parts: the first whereof treateth of *Water-works*, the second of *Fire-works*, the third of *Drawing*, *Washing*, *Limming*, *Paynting*, and *Engraving*; the fourth and last of sundry Experiments both serviceable and delightfull, which because they are confusedly intermixed, I have entituled them *Extravagants*.

Now the former impression venting faster than I did expect it would, I was called upon for a second, my Condicion being no other than at first: to speak

plain, I was ſtill a Prentice, yet according unto the ſmall meaſure of Time that my Ocaſions would afford I have amended what was formerly amiſſe, plentifully enlarged it in every part, and collected a Table at the end for every Part. Of the ingenious and well diſpoſed, I deſire a favourable conſtruction of theſe my Endeavours, and then if they meet with any light faults, to put them by as things incident to Works of this nature that pertayn to the Preſſe, eſpecially when the Authors have no time to bee at hand to peruſe them over. As for others, what I have ſaid formerly, I ſay again; it is bootleſſe for me to deſire of them what the beſt deſerving could never obtain. Farewell.

Your well-wiſhing Friend,

JOHN BATE.

To the ingenious Author, *I. B.*

KInde freind, thy worth and fame I maſt admire,
In whom both Art and nature ſo conſpire
An happy Progenie. And ſith the time is come,
A ſecond burthen delivered by thy womb,
To ſolemnize the birth, and to expreſſe
My Ioy, my Love, and eke my thankfulneſſe:
I'le be its witneſſe tis no baſe born brat,
Or father'd onely, not legitimat:
Thy unknown painfull travaile ſhewe's twas thine}
By birth, thy care from faults it to refine.
Twas naturall, tis youthfull all may ſee,
Tis active and ingenious like to thee.
Free-born, though forc'd to ſerve a prentiſhip
Of Sev'n years toyle, in which thy wrong did nip
Its taller growth, and marrd it's fayrer feature,
Blaſting the buds of thy rath-ripe Nature.
But, time 'll befreind thee, and ſpur on a pace
To do thy vertues right, and publique grace:
And thrice welcome to all may that day be,
Which ſhall thee bleſſe with joy of beeing free.
Though ſure ſuch ſkill in ſecrets myſticall,
Proclaim thee not to be illiberall
Thy work doth ſpeak it ſelf, and needs no praiſe
Of hired Poetry in ſome begging phraiſe
To catch thy Readers. No, thy well-pen'd ſtile
Of things, not words, do better grace this pile.
Peace then my prating Muſe, forbear to ſpread
Riddles not underſtood till they be read.
And rather pray heaven bleſſe them with ſucceſſe,
Theſe Elements may ſafely paſſe the Preſſe,

And

And being come abroad, as welcom be
Again to all the world, as now to me.
And so (dear Friend) I wish thy Book may sell,
All may have it, that all may so farewell.

Thine unfainedly affectionate,

JOS: BERNARD.

To his friend *I. B.* upon his Treatise of Art and Nature.

O That Apelles *lived now! then he*
Might draw thee to the life, but alas we
Must not attempt that which the Painters Art
Can onely doe: but what, the Painters Art
Said I? that can't; no colours but thine own
Can thee expresse, nor yet can Art be shown
In any but thy selfe: for thou art he
Whom Nature joyn'd with Art, doth dignifie,
Therefore when I through ev'ry leaf descry
Thy Engines, and in each his property,
I can't deny but that there's both in one:
There's Art, there's Nature, whom thou knew'st alone
To joyn; or else in Art hath any been,
Or Natures Treatise better then thee seen?
whom thine own book here showes, and in which you
Lie open to each censure, and each view,
Yea to each curious eye. But what of that?
wee'll thee (in spight of them) perpetuat,
And carp at carpers, and yet still comprize
Thy vertues, in our annual memories.

T. T.

Of Water-works.

IT hath been an old Saying amongſt Philoſophers, and Experience doth prove it to be true, *Non datur vacuum*, that is to ſay, *Nature will not admit of any vacuity or emptineſſe:* For ſome or other of the Elements, but eſpecially Ayer, and Water do inſert themſelves into all manner of concavities or hollowneſſes, in or upon the Earth, whether they are ſuch as are formed either by Art or Nature. For the one it is ſo obvious and manifeſt, as that it needs not any proofe at all. As for the other, I ſhall make it manifeſt unto you by eaſy Demonſtracions: Let there be gotten a large veſſell of glaſſe, or other, having beſides the mouth another hole (though but a little one) at the top: pour water into the veſſell by a Tunnell thruſt into the mouth of it, and you ſhall finde that as the water runneth into the veſſell, a winde will come forth of the little hole, ſufficient to blow out a Kandle being held over it. This proveth, that before the water was poured into the veſſell (though to our ſight it appeared to be empty) it was full of Ayer, which was forced out of the veſſell as the Water ran in; and the reaſon hereof is, becauſe the Water is by nature of a maſſie, ſubtill, ſubſtance; and the Ayer of a windy, light, evaporative nature: The knowledge of this, with the rarifaction of incloſed Ayer, is the ground and foundacion of divers excellent Experiments, not unworthy the knowledge of any ingenious Artiſt whatſoever.

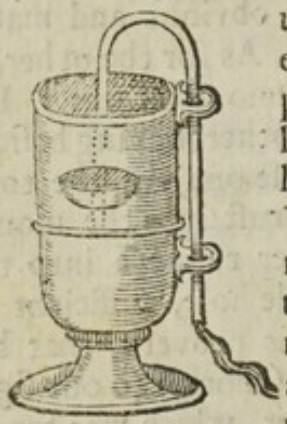
How to draw Water by a Crane.

TAke any veſſell, of what bigneſſe you pleaſe, fill it with Water, then take a Crane (that is, a crooked hollow Kane)

let one End thereof bee ſomwhat longer than the other; put the ſhorter end of it into the veſſell of Water, and let the longer end hang out of the veſſell, unto which longer end put your mouth, and draw in your breath, and the Water will follow; then withdraw your mouth, and you ſhall ſee the Water run ſo long, till it come equall with that end of the Kane which is within the veſſell.

Another.

TAke a deep Veſſell having two loops on one of the ſides, fill it nigh full with Water; then take a hollow Kane like unto the aforeſayd, but let there be faſtened unto the ſhorter end a wooden diſh; put the longer end thereof thorow the loops on the ſide, and that end which hath the Diſh faſtened unto it into the Veſſell of Water; and then with your mouth (as you did in the former) draw out the Ayer, and you ſhall ſee that as the Water runeth out, the Crane will ſink lower and lower, and ſo will continue runing untill the Veſſell be drawn empty.



How to make a conceited pot, which being filled with water, will of it ſelfe run all out; but being not filled quite, will not run out.

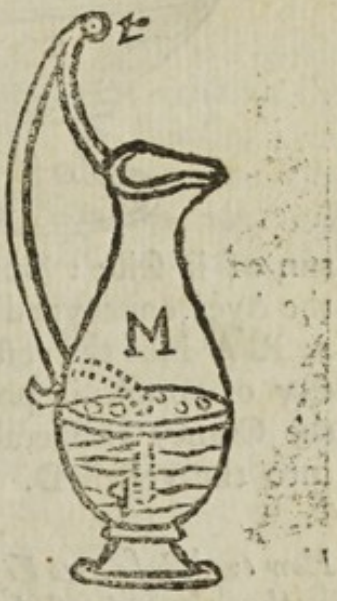
MAke or cauſe a pot to be made, of what faſhion you like beſt, and make a large hollow Kane to ſtand up in the midſt thereof, having at the bottom two or three ſmall holes; let the top of this Kane be cloſe: then make a hole in the bottom of the Veſſell, and put up a little Kane hollow at both ends, into the other Kane, ſo that the one end thereof may almoſt touch the top of the great Kane, and it is done. Note, that if you put into this Veſſell ſo much liquor, that it may

ſwim

ſwim above the top of the Kane, it will of its own accord run, and never ceaſe ſo long as there is any liquor in the Veſſell; but if you fill it below the Kane, it will not run at all of it ſelfe: the reaſon whereof is this; the Ayer being the lighter Element, doth aſcend into the higher place, but being drawn as in the two firſt Demonſtracions, out of the Crane, or forced, as in this, by the waight of the Water in the Veſſell, the Water then tendeth downwards unto its proper place.

Another conceited Pot, out of which (being firſt filled with Wine and Water) you may drink pure Wine apart, or fair Water apart, or elce both together.

LEt M ſignify a pot having a particion in the middle, as you may ſee in the Figure; which muſt have divers little holes bored thorow: the handle of this pot muſt be hollow quite thorow; and the lower end thereof muſt paſſe thorow the ſide of the Pot, and alſo thorow the particion that is within the Pot: It is noted with the letters *q* and *r*. If you fill the lower part of this Pot with Water, and then with your finger ſtop the hole *r* at the top of the Handle, and then fill the upper part with Wine, neither of both will mix together: But if you withdraw your finger from the hole *r* at the top of the Handle, you may drink out of the ſayd Pot both Wine and Water mixed together. With this Pot you may welcom unbidden Gueſts, having the lower part ready filled with Water, call to your ſervant to fill your Pot with Wine, then you may drink unto your Gueſt, drinking up all the Wine, who when he takes the pot thinking to pledge you in the ſame and finding the contrary, will happily ſtay away untill he be invited, fearing that his next preſumption might more ſharply be rewarded.



How

How to dispose of two Vessels upon one foot, that so much Wine may run out of the one, as you shall put water into the other.

LEt A B C D be the foot, at each end whereof place a Vessell equall in bigneſſe the one to the other, as D E; alſo let there paſſe a hollow Kane from the one to the other, as A R A, the ends whereof muſt almoſt touch the tops of the ſayd Veſſels: in the Veſſell D there muſt bee a hollow pipe, as F, whereby you may by help of a Tunnel pour water into the veſſell; alſo in the veſſell E there muſt be a Crane as G. The mouth of the veſſell D muſt bee cloſe ſtopped, and the pipe F muſt paſſe thorow the ſtoppell: Now if you fill the veſſell E with Wine almoſt unto the top of the Crane and afterwards ſtop the mouth of the Veſſell, that the Ayer may not breath forth, it will not run of it ſelfe: but if you put Water into the veſſell D, the Ayer contayned in it, will paſſe thorow the hollow pipe A R A into the veſſell E, where ſtriving for a greater quantity of room, it preſſeth the wine out of the veſſell E (by the Crane) anſwerable in quantity unto the Water poured into the veſſell D.

How to diſpoſe two Veſſels upon one foot, the one being empty, and the other almoſt full of Wine, and yet ſhall not run out of the veſſell, unleſſe you fill the empty veſſell with Water, and then the one ſhall run pure wine, and the other fair water.

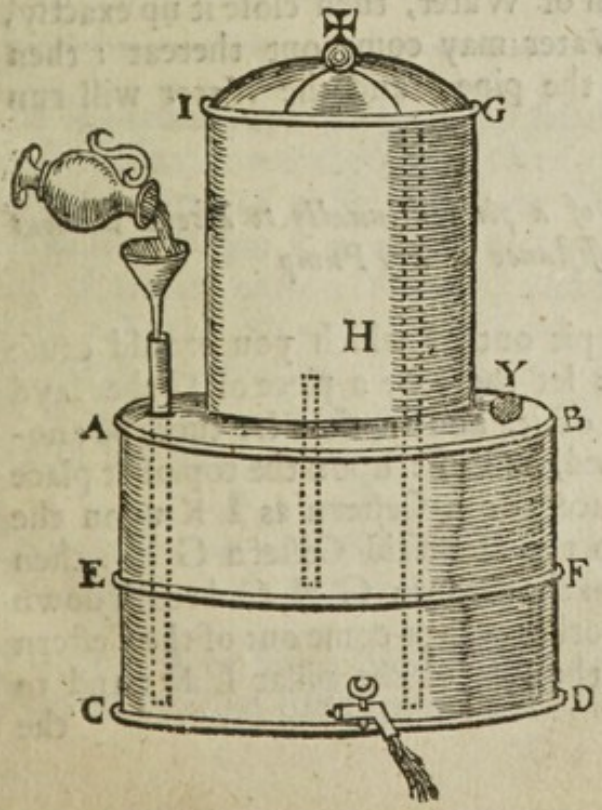
LEt there be two Veſſels placed upon one foot, having a hollow Kane paſſing from one to the other (as I taught

in the precedent Problem) but let there bee two Cranes, as F G, one in each veſſell ; then fill one of the veſſels with Wine, but not above the Crane, ſo it will not run of it

ſelfe : but if you pour water into the other veſſelluntill it be full, it will cauſe that Wine ſhall run out of the one, and clear Water out of the other.

To make that the water contayned in one veſſell, ſhall aſcend into another veſſell placed above it.

LEt A B C D ſignify a veſſell having a particion in the middle, as E F, let there be placed upon this veſſell a Cylinder of Glaſſe, clear & very tranſparant, that will contain the ſame quantity of water, that the one of the particions will, as I G H; and in the lowermoſt particion towards the bottom, let there bee a Cock ; and out of the ſame veſſell let two pipes be made to paſſe, the one whereof reaching almoſt to the top of the Cylinder, the other muſt come out by the ſide of the Cylinder: alſo out of the up-



per particion there muſt come another pipe : Moreover, there muſt be a hole thorow the top of the uppermoſt particion as Y ; which (ſo ſoon as the upper particion is filled with Water) muſt be cloſely ſtopped. Fill the lower particion at the pipe, alſo the upper particion by the hole Y : Note then that if you turn the Cock, as the water runneth out of the lower particion, the water contayned in the upper particion will aſcend thorow the pipe into the glaſs cylinder. When all the water in the lower particion is run out at the Cock, then the water which before did aſcend into the cylinder, will fall back again into the upper particion. After this manner you may compoſe an artificiall Water-clock, if you mark the houres upon the cylinder, and make the Cock after ſuch manner as that the water may iſſue out but by drops.

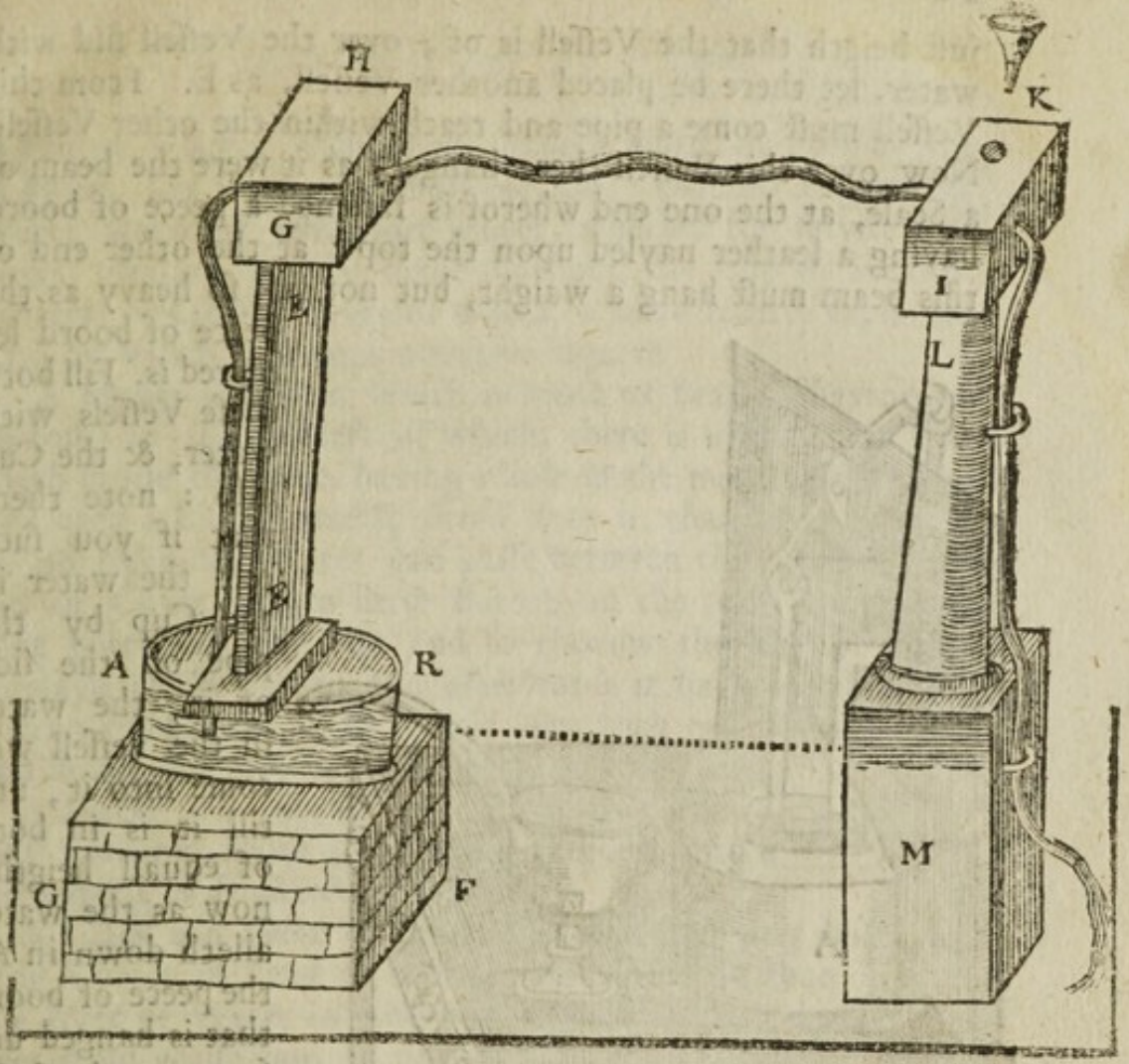
How to convey Water over a Mountain

THis Experiment is as eaſie to be performed as any of the former, and indeed after the ſame manner, for you moſt lay a pipe of lead over the Mountain with one end in the Spring or water that you deſire to convey, and the other end muſt lie ſomwhat lower then it : then open the pipe at the top of the Mountain ; ſtop both the ends of the pipe, and with a Tunnell fill the pipe full of Water, then cloſe it up exactly, that neither Ayer nor Water may come out thereat : then unſtop both the ends of the pipe, and the Water will run continually.

How to make the Water of a pit continually to aſcend without ſtrength or aſſiſtance of any Pump

LEt A B C D be the pit out of which you would cauſe the Water to aſcend : let there be a piece of Timber layd overthwart over the top of it, and in that let there be another piece of Timber faſtened, as E F : upon the top of it place a Ceſtern, as G H ; place alſo a Ceſtern as I K upon the piller L M, anſwerable to the aforeſaid Ceſtern G H : then make a pipe to come out of the Ceſtern G H, and reach down into the pit : alſo make another pipe to come out of the Ceſtern I K, and to deſcend by the ſide of the pillar L M : and to

the



the lowermoſt end let there be faſtened a Cock, and this end muſt deſcend lower then the end of the other pipe: then make another pipe to paſſe from one Ceſtern to the other, and its done. When you would occupy it, fill the Ceſtern I K, full of water with a Tunnel, and ſtop it afterwards cloſe with a Kork; then turn the Cock, and as the Ceſtern I K emptieth, it will bee ſupplied by the water in the Ceſtern G H; and as G H emptieth, it will be ſupplied by the water in the Well or Pit

To make a Cup or Veſſell that ſo oft as you take the liquor out of it, ſo oft it ſhall fill it ſelfe, but never run over.

SUppoſe A to bee a Veſſell full of water, having a pipe commi ng from the bottom, and riſing up into a Cup of the

juſt heigth that the Veſſell is of; over the Veſſell filld with water, let there be placed another Veſſell, as E. From this Veſſell muſt come a pipe and reach within the other Veſſell. Now over this Veſſell there hangeth as it were the beam of a Scale, at the one end wherof is faſtened a peece of boord having a leather nayled upon the top: at the other end of this beam muſt hang a waight, but not full ſo heavy as the peece of boord lethered is. Fill both theſe Veſſels with water, & the Cup alſo: note then, that if you ſuck out the water in the Cup by the pipe on the ſide of it, the water in the veſſell will come into it, untill it is in both of equall heigth: now as the water alleth down in A, the peece of boord that is hanged unfo one end of the beam falleth after it (becauſe it is heavier than the waight) and ſo giveth way unto the water in E, which runneth into it: and when the Veſſell is filled again with water, it beareth up the ſayd peece of boord againſt the pipe of the Veſſell E, ſo that the water can run out thereat no longer, except the water bee again drawn out of the Cup.

Of drawing Water by Engins.

BEfore I begin with theſe, take a word or two by the way. Let it be a generall Nocion, that no Engine for Water works of what ſort ſoever, whether for ſervice, or meere pleaſure, can be made without the help of Suckers, Forcers, or Clacks; every of which, I have orderly explained both by words and demonſtrative figures

A Sucker is a Box, which is made of Braſſe (having no bottom) in the middeſt of which, there is a ſmall Bar that goeth croſſe the ſame, having a hole in the middle of it; this Box hath a Lid ſo exactly fitted unto it, that being put into it, no Ayer nor Water can paſſe between the creviſe: this Lid or Cover hath a little button on the top, and a ſtem that goeth into the Box and ſo thorow the hole of the aforeſayd croſſe barre, and afterwards it hath a little button riveted on it, ſo that it may with eaſe ſlip up and down, but not be taken or ſlipt quite out.

A Forcer is a plug of wood exactly turned and leathered about; the end that goeth into the barrell, is ſemicircularly concave.

A Clack is a peece of Leather nayled over any hole, having a peece of Lead to make it lie cloſe, ſo that the Ayer or Water in any Veſſell may thereby be kept from going out.

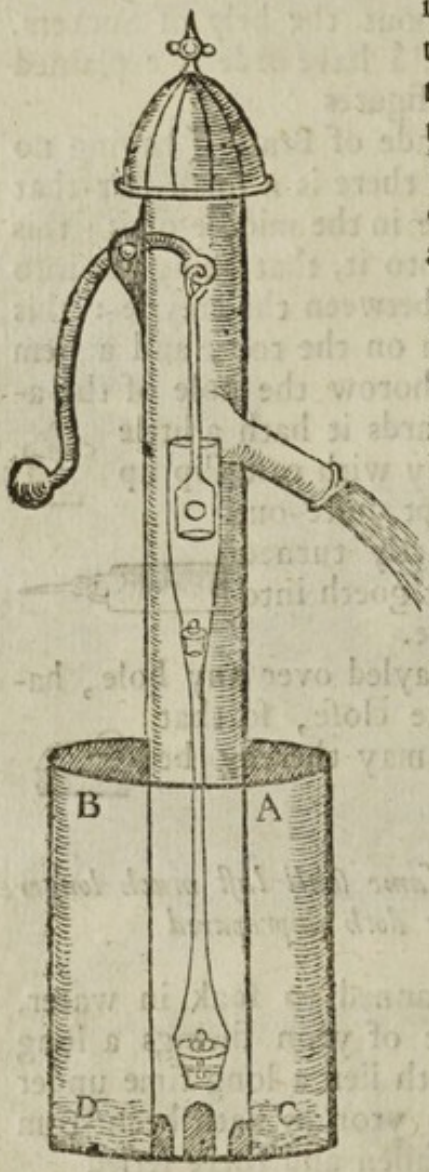
How to harden Leather, ſo as the ſame ſhall laſt much longer in Suckers of Pumps, then it doth unprepared

LAy ſuch Leather as is well tanned to ſoak in water, wherein there hath been ſtore of yron fileings a long time, or elſe in the water that hath lien a long time under a grindſtone, into the which ſuch yron as hath been from time to time ground away, hath fallen and there ſetled

The making of a pump to draw Water

SUppoſe A B C were a deep Well, whercin you would make a Pump to draw water to the ſurface or ſuperfi-

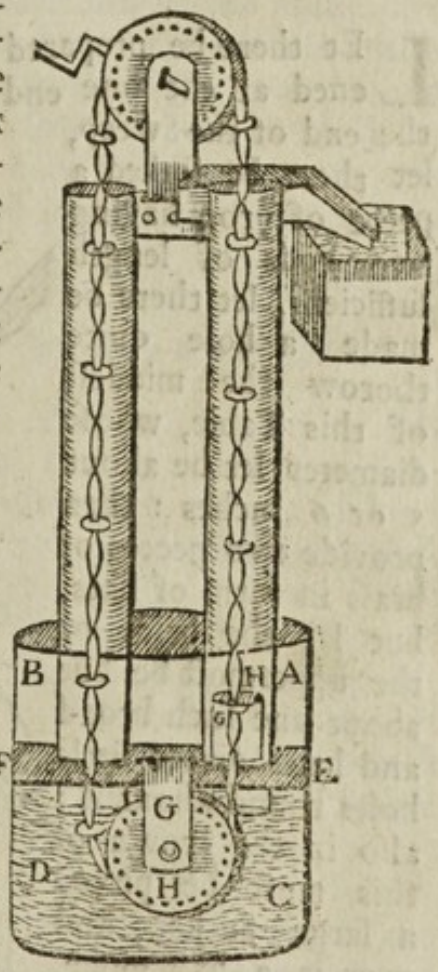
cies of the Earth. First therefore you must provide a pipe of Lead, or a piece of Timber bored thorow, so long as will reach unto the bottom of the Well: that part that standeth in the water must bee cut with two or three arches, as it were, if it be wood; if Lead, it must have somwhat to bear it a little from the bottom, that the water may thereby be let into the pipe. Towards the bottom of the pipe in the water there must be fastened a Sucker: also another of these Suckers must bee fastened about two foot above the top of the ground: then have a Bucket fitted unto the hole of the wooden or leaden Pipe, let it bee well leathered about, and have a Clack at the bottom of it, and let it be hanged with a Sweep as the figure shewes: Note, that after you have filled the distance between the lower Sucker and the Bucket with water, that if you lift up the Sweep, it will thrust down the Bucket upon the water, and presse it, the water being pressed upon by the Bucket, beareth up the Clack that is fastened in the bottom of the Bucket, and so comes into the Bucket: then if you pull down the Sweep, the Clack shutteth, and so the water remayns in the Bucket, which being drawn upward, there being nothing to follow but water, both the Suckers open, and there commeth into the Pump so much water as the Bucket drew up: so soon then as you lift up the sweep again, the water beareth up the Clack again, and there being no place for the water formerly contayned in the Bucket to fall back into, it must of necessity rise above the Bucket, and so seek for a passage some other where.



The

The making of an Engin, whereby you may draw Water out of a deep Well, or mount any River water, to be conveyed to any place within three or four miles off the ſame. Alſo it is uſed in great Ships which I have ſeen.

SUppoſe A B C D to be a deep Well, and E F to be a ſtrong peece of Timber faſtened athwart the ſame, a good way in the water. In this Plank let there be faſtened a peece of Timber with a ſtrong wheel in it, as G H, having ſtrong yron Spikes drove athwart the wheel within the creviſe, and ſtrongly riveted on each ſide; let them be three or foure inches diſtant from each other. Let there be likewiſe made in the ſayd Plank two holes, in which ſet two hollow Poſts, that may reach to the top of the Well, or ſo much higher as you deſire to mount the water; ſet them bee made faſt that they ſtir not. In the bottom of one of theſe Poſts there muſt be faſtened a Barrell of Braſſe, as G H, made very ſmooth within; and betwixt thoſe two Poſts at the top, let there bee faſtened unto them both, another peece of ſtrong Timber to hold them faſt, leſt they ſtart aſunder: and in the middeſt of that make a Mortice, and in it faſten a ſtrong peece of Timber with a wheel like to the former mencioned, the pin whereof ought to be made faſt unto the wheel, and have a crooked Handle to turn about, that by turning of it you may turn the wheel alſo. Then provide a ſtrong yron Chayn of length ſufficient, having on every third or fourth link a peece of horn that will eaſily go thorow the Braſſe Barrell, and a leather on each ſide of it, but ſomwhat broader then the horn: put this Chayn under the

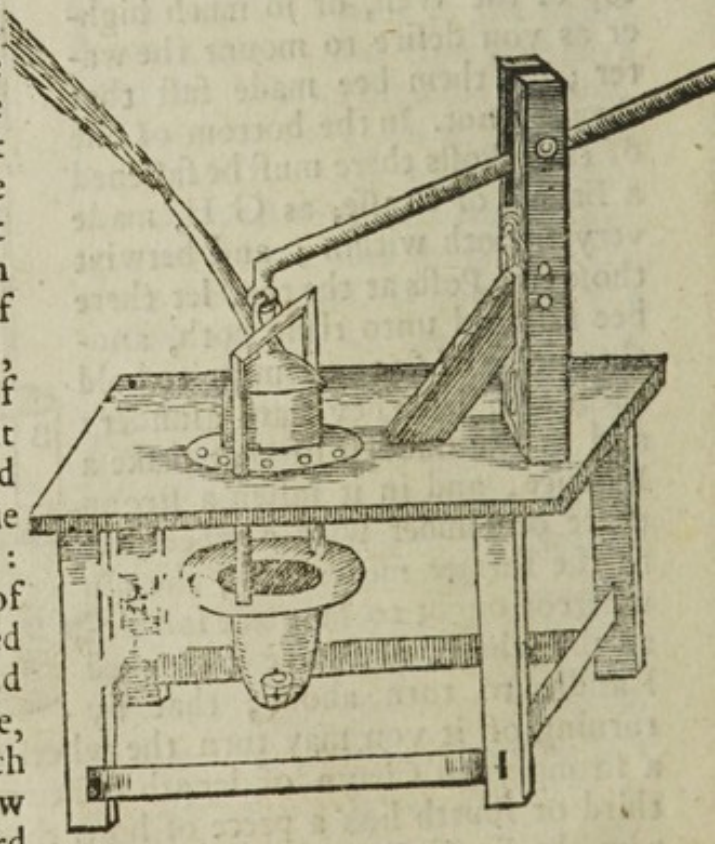


lower

lower wheele in the Well upon both the hollow posts, draw it over the upper wheele, and linke it fast and straight, turn then the Handle round, and it will turn the chaine round, whose Leathers comming up the brasse barrell, will beare the water before them ; this goeth very strongly, and therefore had need be made with wheeles & wrought upon by horses, for so the water is wrought up at Broken Wharfe in London.

To make an Engine, which beeing placed in water will cast the same with Violence on high

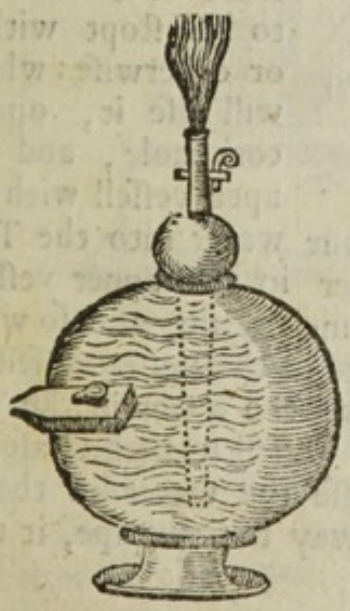
LEt there be prepared a strong Table, with a sweep fastened at the one end thereof, to lift up & doun: unto the end of the Sweep, let there be linked a peece of yron having two rods of length sufficient, let there be made a hole quite thorow the middest of this Table, whose diameter let be about 5 or 6 inches : then provide two peeces of brass in form of hats, but let the brim of the uppermost be but about one Inch broad and have divers little holes round about it : also in the crown of this must be placed a large Sucker, and over it a half globe, from the top of which must proceed a hollow trunk about a yard long and of a good



wide bore, then take good liquoured leather, 2 or 3 times double, and put between the boord and the brims of this, and with divers little ſcrews put thorow the holes of the brim, ſcrew it faſt unto the top of the Table. Note that the Table muſt be leathered alſo underneath the compaſſe of the brim of the lower Braſſe. Now the lowermoſt Braſſe muſt be equall diameter (in hollowneſſe) unto the other, but it muſt be more ſpirall towards the bottom, and muſt have either a large Clack or Sucker faſtened in it: alſo the brim of this muſt bee larger then that of the uppermoſt, and have two holes made about the midſt, on each ſide one: bore then two holes in the Table, on each ſide of the braſſe one, anſwerable unto the holes of the brim of the lower braſſe, thorow which holes put the two rods of the yron hanged unto the Sweep, and rivet them ſtrongly into the holes of the lower braſſe, place this in water, and by moving the Sweep up and down, it will with greater violence caſt the water on high.

Experiments of forcing Water by Ayer compreſſed.

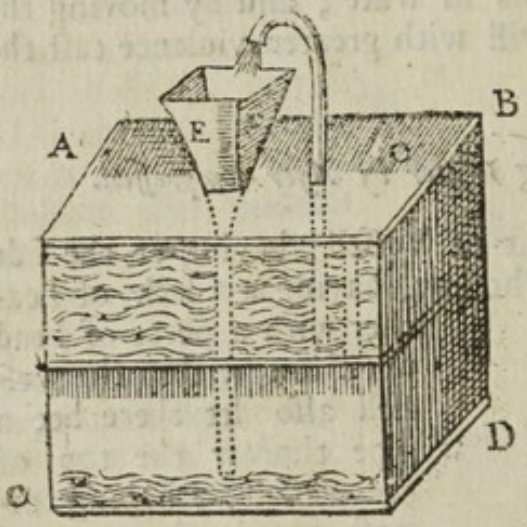
LEt there bee a large Pot or Veſſell, having at the ſide a peece of wood made hollow, having a Clack of Leather with a peece of Lead upon it: within the veſſell alſo let there bee a pipe thorow the top of the veſſell, reaching almoſt to the bottom of it: at the top of which let there bee a round hollow Ball, and on it a ſmall cock of Braſſe. Note that if you fill the ſayd veſſell halfe full of water, and blow into the hole of the pipe, at the ſide, your breath will lift up the Clack, & enter



the veſſell, but when it is in, it will preſſe down the Clack: blow into it oftentimes, ſo ſhall there be a great deale of Ayer in the veſſell, which will preſſe ſo hard upon the water, that if you turn the cock at the top, the water in the veſſell will ſpinne out a good while.

Another.

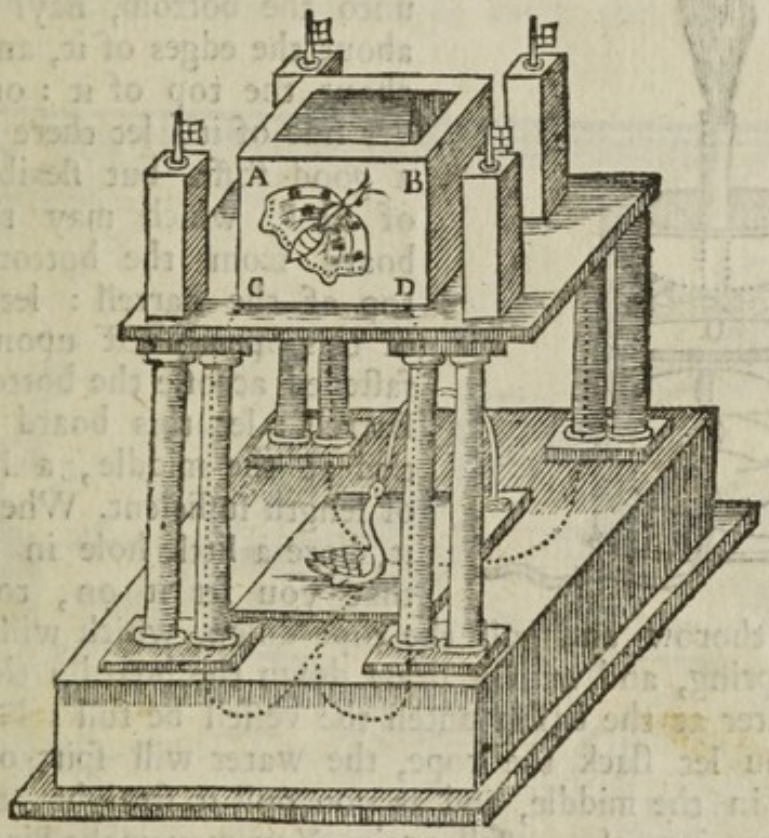
LEt A B C D be a great Veſſell, having a particion in the middle: let there bee a large Tunnell at the top of it, as E F, whoſe neck muſt go into the bottom almoſt of the lower Veſſell: let there be a hollow pipe alſo comming out of the particion, and almoſt touch the top of the upper Veſſell. In the top of the upper Veſſell let there bee another pipe reaching from the bottom of the upper veſſell, and extending it ſelfe out of the veſſell a good way: let the top of it hang over the Tunnell. In the top of the upper veſſell let there be a hole beſides, to bee ſtopt with cork or otherwiſe: when you will uſe it, open the cork hole, and fill the uper veſſell with water, then ſtop it cloſe again, and pour water into the Tunnell, and you ſhall ſee that the water in the upper veſſell will run out of the pipe into the Tunnell again, and ſo will continue running untill all the water in the upper veſſell be run out. The reaſon thereof is this; the water in the Tunnell preſſing the ayer in the lower veſſell maketh it aſcend the pipe in the particion, and preſſe the water in the upper veſſell, which having no other way but the pipe, it runneth out thereat



The

The forcing of Water by preſſure, which is the naturall courſe of Water in regard of its heavineſſe and thinneſſe, artificially contrived to break out of what Image you pleaſe.

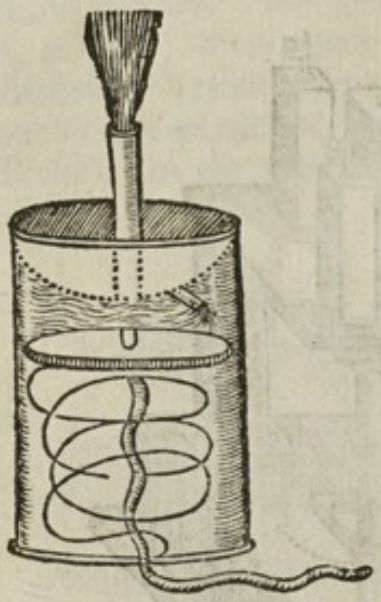
LEt A B C D be a Ceſtern placed upon a curious Frame for the purpoſe, and let the bottom of this Frame bee made likewiſe in the form of a Ceſtern : thorow the pillers of this Frame let there paſſe hollow pipes from the bottom of the upper Ceſtern, and deſcend to the bottom of the lower Ceſtern, and then run all to the middle thereof, and



joyn in one, and turn up into the hollow body of a Beaſt, Bird, Fiſh, or what your fancy moſt affecteth : let the hole of the Image whereat the water muſt break out, bee very ſmall, for ſo it will run the longer. Fill the upper Ceſtern with water, and by reaſon of the waight thereof it will paſſe thorow the pipes, and ſpin out of the hole of the Image.

Experiments of forcing water by Engins.

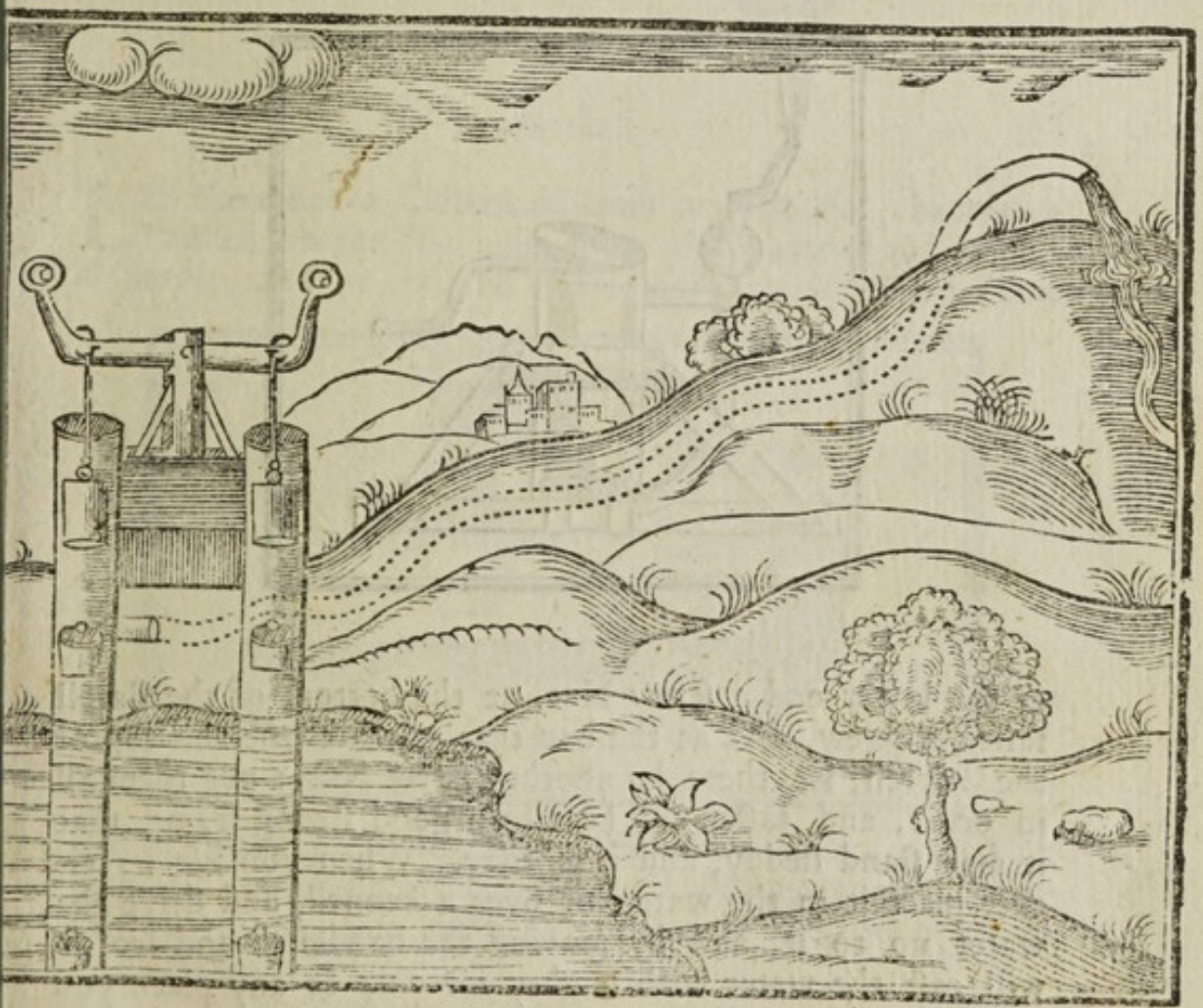
LEt there be an yeven ſtraight Barrell of braſſe of what length and bigneſſe you pleaſe : let the bottom of it be open, and let the top be cloſed, but ſo that it be hollow on the out ſide like a baſon : in the midſt whereof let there be a ſtraight pipe erected, open at both ends ; alſo let there be another ſhort pipe at the ſide of it, which let be yeven with the top of the baſon on the outſide, but ſtand a little from it on the ſide. Having thus prepared the Barrell, fit a good thick board unto it, ſo that it may ſlip eaſily up & down from the top of the Barrell, unto the bottom, nayl a leather about the edges of it, and another about the top of it : on the under ſide of it, let there be faſtned a good ſtiffe, but flexible Spring of ſteel, which may thruſt the board from the bottom to the top of the Barrell : let the foot of this Spring reſt upon a barre faſtened acroſſe the bottom of the Barrell : let this board alſo have tied at the middle, a little rope of length ſufficient. When you uſe it, bore a little hole in the Table that you ſet it on, to put the rope thorow and pull the rope down, which will contract the Spring, and with it draw down the board : then poure in water at the baſon untell the veſſell be full : Note then, as you let ſlack the rope, the water will ſpirt out of the pipe, in the middle, and as you pull it ſtraight, the water will run into the veſſell again. You may make Birds, or divers Images at the top of the pipe, out of which water may break.



Another manner of forcing water, whereby the water of any Spring may be forced unto the top of a Hill.

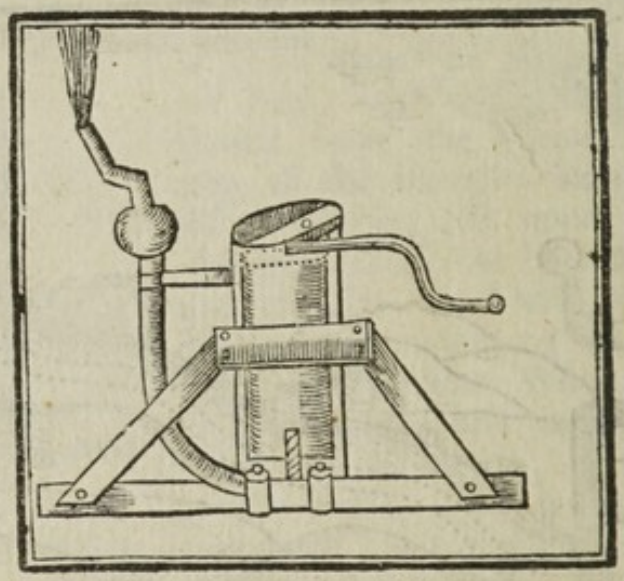
LEt there be two hollow poſts, with a Sucker at the bottom of each, alſo a Sucker nigh the top of each : let there

there be faſtned unto both theſe poſts a ſtrong peice of Timber, having, as it were, a Beam or Scale pinned in it, and having two handles, at each end, one. In the tops of both theſe hollow poſts faſten two braſſe Barrels, made very even and ſmooth within ; unto theſe two Barrels let there be fitted two Forcers, leathered according to Art, at the tops of theſe Forcers, muſt be faſtened two yrons, which muſt be linked unto the afore ſaid Beame ; from each poſt below towards the end of the Barrells, let there bee two leaden pipes, which afterward meet in one, to conduct the water up to the place deſired, which if it bee very high, there will bee need of ſome Suckers to catch the water as it commeth.



The description of an Engine to force water up to a high place: very usefull for to quench fire amongst buildings.

LEt there be a brasse Barrell provided, having two Suckers in the bottom of it : let it also have a good large pipe going up one side of it, with a Sucker nigh unto the top of it, and above the Sucker a hollow round Ball, having a pipe at the top of it made to screw another pipe upon it, to direct the water to any place. Then fit a Forcer unto the Barrell with a handle fastened unto the top; at the upper end of this Forcer drive a strong screw, and

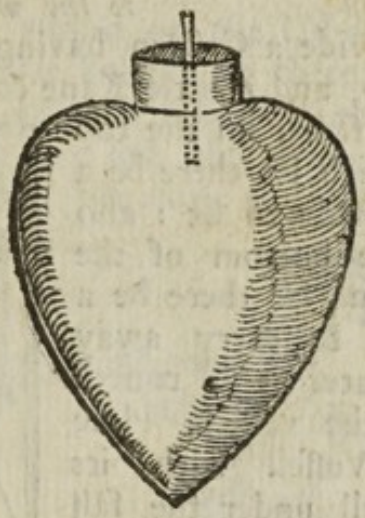


at the lower end a screw Nut, at the bottom of the Barell fasten a screw, and at the bar that goeth crosse the top of the Barrell, let there be another screw Nut : put them all in order, and fasten the hole to a good strong frame, that it may stand steddy, and it is done. When you use it, either place it in the water, or over a kennell, and drive the water up to it, and by moving the handle to and fro, it will cast the water with mighty force up to any place you direct it.

Experi-

Experiments of producing Sounds by Ayer and Water.

LEt there be had in a readineſſe, a pot made after the form of a Heart having a little hole at the top, in the which faſten a Reed or Pipe, alſo another little hole at the bottom : preſſe this Pot into a Bucket of water, and it will make a loud noyſe.



Another

LEt there bee a Ceſtern of Lead or ſuch like, having a Tunnell on the top : let it be placed under the fall of a Cundit, and at the one end of the top let there come

out of the veſſell a ſmall pipe, whch let be bent into a Cup of water, and there will be heard a ſtrange voyce. Over this pipe you may make an artificiall Tree with divers Birds made to ſit therein.

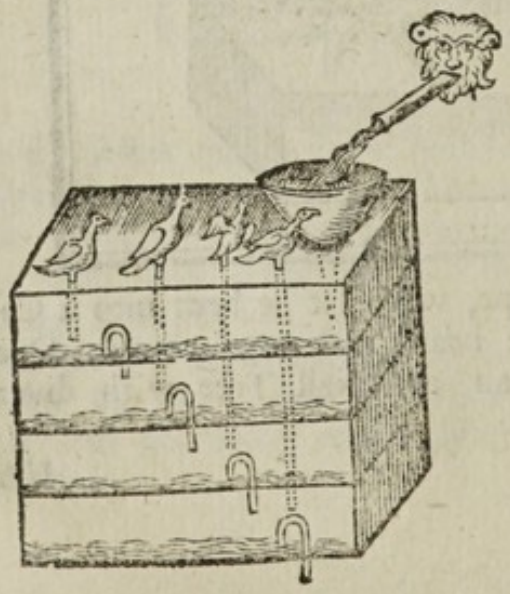
How

How to make that a Bird ſitting on a Baſis, ſhall make a noyſe, and drink out of a Cup of water, being held to the mouth of it.

PRovide a Ceſtern having a Tunnell at one end of the top, and a little Kane comming out of the other end of the veſſell ; on the top of which let there be a Bird made to ſit : alſo at the bottom of the Ceſtern, let there be a Crane to carry away the water as it runeth into the veſſell. Place this Veſſell with its Tunnell under the fall of a Cundit of water, and the Bird will ſing; and if you hold a cup of Water under his Bill, he will drink and make a noyſe.

A Device whereby ſeverall voyces of Birds chirping may bee heard.

PRepare a Ceſtern haviug divers particions, one above another ; let them all have Cranes in the bottoms to carry the water form one to another ; alſo let each Ceſtern have his ſeverall pipe, all of them comming out at the top of the Ceſtern, on whoſe tops let Birds bee artificially made, with Reeds in them : alſo in the top of the upper Ceſtern let there be a Tunnell. Place it under the fall of a Cundit of water, and you ſhall heare ſo many ſeverall voyces as there are Birds,



A Device whereby the figure of a man ſtanding upon a Baſis, ſhall bee made to ſound a Trumpet.

PRepare a Ceſtern having within on the Lid a concave hemiſphere faſtened, in whoſe bottom let there be made one or two holes: let there alſo be a hole in the top of the ſayd Ceſtern, whereby it may bee filled with water a ocaſion ſerveth: alſo let there bee made to ſtand on the top of this Ceſtern the immage of a man holding unto his mouth a Trumpet: this immage muſt likewiſe have a ſlender pipe comming out of the Ceſtern unto the Trumpet, and in this Pipe or Kane there muſt bee a cock nigh unto the Ceſtern. Alſo there muſt come out of the concave hemiſphere at the ſide of the Ceſtern, a little ſhort pipe having a Clack on it within the Veſſell. Fill the Ceſtern about two thirds full of water, and then cork it up faſt; blow then into the veſſell at the pipe on the ſide divers times, and the Ayer will force the water out of the hemiſphere, and make it riſe up on the ſides of it: turn then the cock, and the waight of the water will force the Ayer out of the pipe, and ſo cauſe the Trumpet to ſound.

Hercules ſhooting at a Dragon, who as ſoon as hee hath ſhot, hiſſeth at him.

LEt there be a Ceſtern having a particion in the middeſt, in the particion let there bee a deep Sucker, having a

ſmall Rope faſtened unto the top of it : let one end of the Rope come out of the upper Lid of the Ceſtern, & be faſten ed unto a Ball, the other part thereof let it be put under a Pulley (faſtned in the particion) and let it be carried alſo out of the upper Ceſtern, and be faſtened unto the Arm of the Image, which muſt be made to ſlip two and againe, and to take hold of the ſtring of a ſteele Bow that is held in the other hand. At the other end of the Ceſtern let there bee made an artificiall Image of a Dragon, thorow whoſe body muſt come a ſmoll pipe with a reed artificially faſtned in the upper part thereof. Note then, that when you put up the Ball, the Image will draw his Bow, and when you let it fall, the Dragon will hiſſe

Experiments of producing ſounds by evaporacion of water by Ayer

PRepare a round Veſſell of Braſs or Latten, having a crooked pipe or neck, where-to faſten a pipe : put this Veſſell upon a Trevet over the fire, and it will make a ſhrill whiſtleing noyſe.

To make two Images ſacrificing, and a Dragon hiſſing.

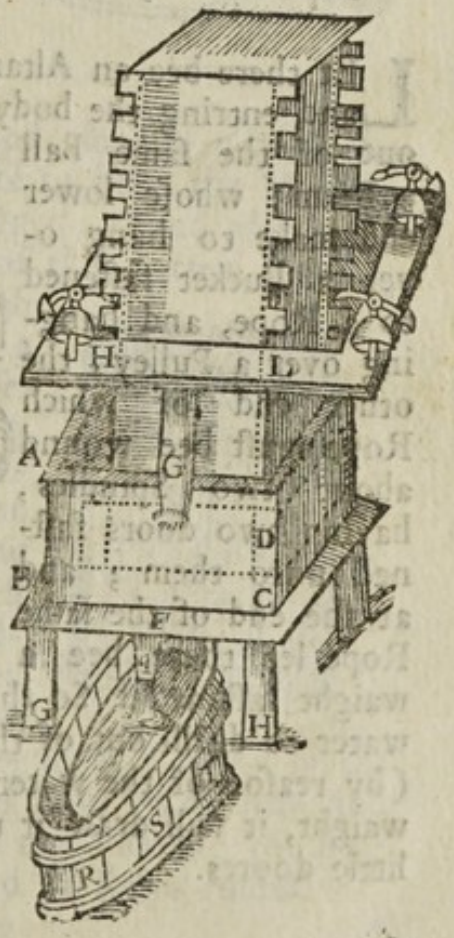
PRepare a Ceſtern having an Altar of Braſs or Tin upon it, and let there be in the Ceſtern a hollow pipe turning up out of the Ceſtern at each end, alſo in the middle with-

in

in the Altar, alſo on the ſide of the Altar into the body of a Dragon artificially made, with a Reed in the mouth of it. Let there be two Boxes at the tops of the pipes, on the ends of the Ceſtern, having two crooked pipes or Cranes comming out of them. Fill the Boxes with water when you occupy it, alſo put fire upon the Altar, and the Dragon will hiſſe, and the water in the two Boxes being wrought upon by the heat of the fire comming thorow the pipes, will drop into the fier. Theſe two Boxes ought to bee incloſed in the bodies of two images, and the two ſhort Cranes comming out of them, in her armes & hands.

Experiments of producing Sounds by Engins.

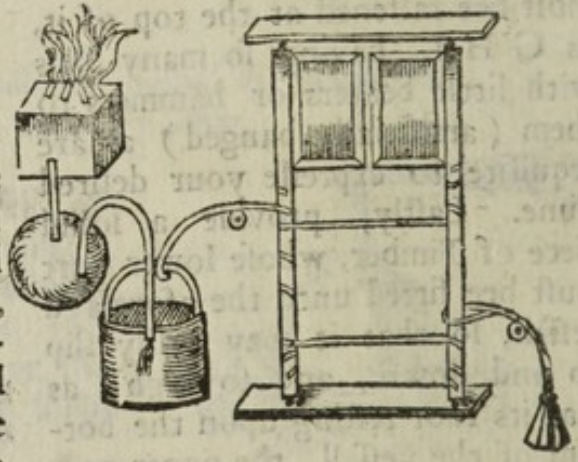
PRepare a Veſſell after the form of the Figure marked with the letters A B C D: place it upon a Frame as F G H: this veſſell muſt have a hole in the bottom, with a pipe faſtened in it, as *q*, to convey the water contained in it into a veſſell or Tub ſet under it, marked with the letters R S T: alſo a Frame muſt bee faſtened at the top of it, as G H L, having ſo many Bels with little beaters or hammers to them (artificially hanged) as are requiſite to expreſſe your deſired Tune. Laſtly, provide a ſollid piece of Timber, whoſe lower part muſt bee fitted unto the aforeſayd veſſell, ſo that it may eaſily ſlip up and down, and ſo high, as that its foot reſting upon the bottom of the veſſell, the upper part thereof may ſtand ſomwhat above all the Bels. Note likewiſe, that that part of this wood above its bottom or foot, muſt be cut away about three quarters of an inch. Upon this wood (thus fitted) muſt



be fastened severall pins equall unto each Bell, from the top unto the foot thereof, so disposed that they may orderly presse down the inward end of the hammers of each Bell, according as the Tune goeth : when you use it, fill the Cestern almost with water, and put the fitted piece of Timber into it, and as the water runneth out at the bottom, it will play upon the Bels : note, that it were very requisite to have a cock fastened to the pipe on the bottom of the vessell, that therewith you might at your pleasure stay the water. The like Engines might be made to play upon wyer strings disposed upon a concavous matter to make the muzyk resound: but because this Description giveth light enough for the framing of divers other, I did think good here to omit them.

Experiments of Mocions by rarifying Water with Fier.

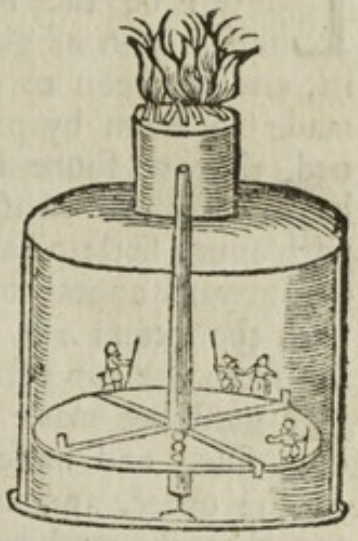
LEt there bee an Altar having a pipe comming out of it and entring the body of a hollow Ball, let there come out of the same Ball a Beam, whose lower end make to hang over a Bucket fastened to a Rope, and hanging over a Pulley, the other end of which Rope must bee wound about two Spindles, having two doors fastned unto them ; and at the end of the same Rope let there bee a waight fastened : So the fier on the Altar will cause the water to distill out of the Ball into the Bucket, which when (by reason of the water) it is become heavier than the waight, it will draw it up, and so open the sayd gates or little doores.



Experiments

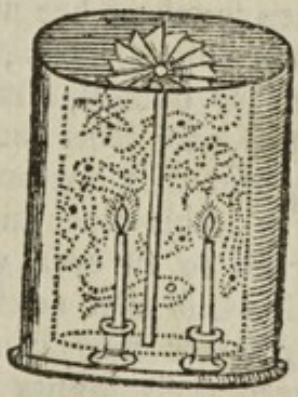
Experiments of Mocions by rarifying Ayer by Fier.

LEt there be a round veſſell of Glaſſe, or Horn, and on the top of it a veſſell of Braſſe, and in the middeſt a hollow pipe ſpreading it ſelfe into foure ſeverall branches at the bottom : the ends of two of the branches muſt turn up, and the ends of two muſt turn down : upon theſe foure branches faſten a light Card, with ſeverall images ſet upon it. Then rarify the Ayer by laying a red-hot yron upon the top of the Braſſe or Tyn veſſell, and it will turn the wheel about, ſo that you would think the immages to bee living creatures by their mocion.



Another Way.

FIrſt prepare a round piece of wood, having a braſs Box in the middeſt, ſuch as they make to hang the Mariners Compaſs with, but a good deal bigger ; round about this peece of wood faſten divers ſhreds of thin Latten, ſtanding obliquely or aſkew, as the figure doth repreſent : round about theſe faſten a coffin of thin paſtboord, cut into ſeverall formes of Fiſhes, Birds, Beaſts, or what you pleaſe. Prepare a Lantern with oyled parchment, ſufficient to contayn it, in the middle of whoſe bottom muſt be erected a Spindle with a narrow point, to hang the paſtboord (cut into forms) upon : and let there bee upon each ſide a Socket for to ſet a Kandle in ; alſo let there bee made a doore in the bottom to put the Kandles in at, and after to be ſhut, and tis done. If you ſet two Kandles in the Sockets, the heat of them will turn the whol paſtboord of forms round.



A conceited Lamp having the Image of a Cock ſitting on the Top, out of whoſe mouth by the heat of the Lamp either Water or Ayer may be ſent.

LEt *e r* be the foot of the Lamp, which muſt have a hollow pan of glaſſe or white Tin, to contain the oyl in, and whereon to put foure cotton lights, which may be made to ſwim by paſſing the wyer wherein they are faſtned, thorow foure ſmall pieces of cork. Now there muſt be a veſſell of Braſſe or Tin to be born over the lights with foure little pillars: you may make this veſſell to ſeem to outward appearance, like a Crown: this veſſell is noted with the letters *a b*, having a pipe marked with *c y*, reaching from the top of the veſſell almoſt unto the bottom: this pipe muſt bee made flat on one ſide, and halfe round on the other, and unto the top thereof, muſt be ſodered a round fillet of Braſſe, as M, the bottom of this fillet muſt cover the top of the pipe noted with *c*: alſo it mnſt hang over as much on the flat ſide of the pipe. Then let there bee made the image of a Cock, which muſt be hollow, and under whoſe belly there muſt come a pipe with a bottom ſodred on it: this pipe muſt bee turned to ſit even with the fillit M, ſo that neither Ayer nor water may come beetween their joynts: make then a ſmall hole in the bottom of the fillet, that is ſodered on the pipe directly over the hole of the ſaid pipe, *y*, alſo make ſuch another hole in the bottom of the pipe that comes from the belley of the Cock, ſo that it may anſwer unto the aforeſaid hole in the bottom of the fillet M, then turn the Cock to the other ſide,

ſide, and with a double Bit make a hole both thorow the ſide of M, and alſo thorow one ſide of the pipe that comes from the Cocks belley. Laſtly, you may make ſome hole whereat you may put water into the veſſell, and to bee ſtopped up, and it is done. But obſerve this, that the pipe muſt firſt bee fitted, and afterwards ſodered into the veſſel, ſo as the veſſell may give no vent but at the above mencioned holes in the ſaid pipes

The larger you make this veſſell towards *a b*, the more ſtrange it will appear in its effects, ſo the Lights bee proporcionable. Fill the veſſell halfe full of water, and ſet the Lights on fire underneath it, and after a ſhort time, if you turn the holes that are on the ſides of the pipes, that they may anſwer one another, the water being by little & little converted into Ayer, by the heat of the Lights that are underneath, will breath forth at the mouth of the Cock; but if you turn the mouth of the Cock the other way, that the holes at the bottom of the pipes may anſwer each to other, then there being no vent for the Ayer to breath out at, it will preſſe the water, and force it to aſcend the pipe *y*, and iſſue out where the Ayer breathed forth before. This is a thing may move great admiracion in the unskilfull, and ſuch as underſtand it not. Other Devices, and thoſe more ſtrange in their effects, may be contrived from hence.

Amongſt all the Experiments pneumaticall, there is none more excellent than that of the Weather-Glaſſe: wherfore I have laboured to deſcribe the making thereof as plainly as it poſſibly might be.

What the Weather-Glaſſe is.

A Weather-Glaſſe is a ſtructure of at the leaſt two Glaſſes, ſomtimes of three, foure, or more, as ocaſion ſerveth, incloſing a quantity of water, and a porcion of Ayer proporcionable; by whoſe condenſacion or rarifaction the included water is ſubject unto a continuall mocion, either upward or downward; by which mocion of the water is commonly foreſhown the ſtate, change, and alteracion of

the

the Weather. For, I ſpeak no more than what my own experience hath made me bold to affirm ; you may (the time of the year, and the following Obſervacions underſtandingly conſidered) bee able certainly to foretell the alteracion or uncertainty of the weather a good many houres before it come to paſſe.

Of the ſeverall ſorts and faſhions of Weather-Glaſſes.

THere are divers ſeverall faſhions of Weather-Glaſſes, but principally two.

1 The Circular Glaſſe.

2 The Perpendicular Glaſſe.

The Perpendiculars are either ſingle, double, or treble.

The ſingle Perpendiculars are of two ſorts, either fixt or moveable:

The fixt are of contrary qualities; either ſuch whoſe included water doth move upward with cold, and downward with heat, or elſe upward with heat, and downward with cold.

In the double and treble Perpendiculars, as the water aſcendeth in one, it deſcendeth as much or more in the other.

In the moveable Perpendicular the Glaſs being artificially hanged, it moveth up and down with the water.

How to make the Water.

I muſt confeſs, that any water which is not ſubject unto putrifaction, or freezing, would ſerve the turn, but Art hath taught to make ſuch a water as may be both an Ornament to the work, and delectable to the eye.

Take two ounces of Verdigreaſe in powder, and infuſe it ſo long in a pynt of white Wine vineger, untill it hath a very green colour, and then pour out the vineger gently from the Vardigreaſe : take alſo a pynt and a halfe of purified May-deu, and put therein 6 ounces of Roman Vitreoll in groz pouder, let it ſtand till the Vitreoll be throughly diſſolved,

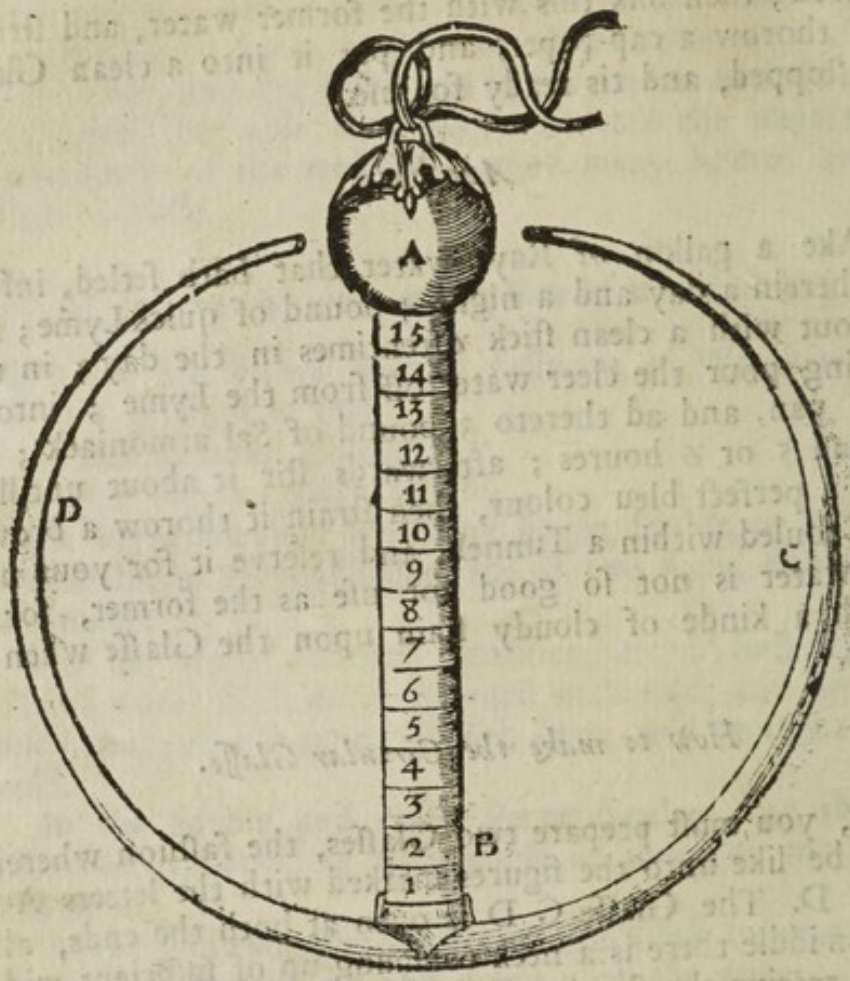
dissolved; then mix this with the former water, and strayn them thorow a cap-paper, and put it into a clean Glasse well stopped, and tis ready for use.

Another

TAke a gallon of Rayn-water that hath setled, infuse therein a day and a nighr 4 pound of quick Lyme; stir it about with a clean stick oftentimes in the day; in the morning pour the cleer water off from the Lyme; into a brasse pan, and ad thereto 3 pound of Sal armoniack; let it stand 5 or 6 houres; afterwards stir it about untill it be of a perfect bleu colour, then strain it thorow a brown paper rouled within a Tunnell, and reserve it for your use. This water is not so good for use as the former, for it leaveth a kinde of cloudy stain upon the Glasse when it falleth.

How to make the Circular Glasse.

FIrst, you must prepare two Glasses, the fashion whereof let be like unto the figures marked with the letters A B and C D. The Glasse C D is open at both the ends, also in the middle there is a neck comming up of sufficient wideness to receive the shank end of the Glasse marked with the letters A B. Then fill the Glasse C D a third part, with either of the waters, and divide the Glasse into so many equall parts as you would have degrees; rarifie the Ayer in the head of the Glasse A B by holding it to the fier, which being yet warm, reverse the shank of it into the neck of the Glasse C D. Note that if the water doe not ascend high enough, you must take the Glasse A B out again, and heat it hotter: if it ascend too high, heat it not so hot. If it bee in the Dog dayes, and extream heat of Summer, 1 and 2 are good Degrees; if the weather be most temperat, then 3 and 4 are best; if a frost, 9 or 10. When you have hit an indifferent Degree, lute the joynts very close, and fasten a Ribben unto the top of the Glasse to hang it by.

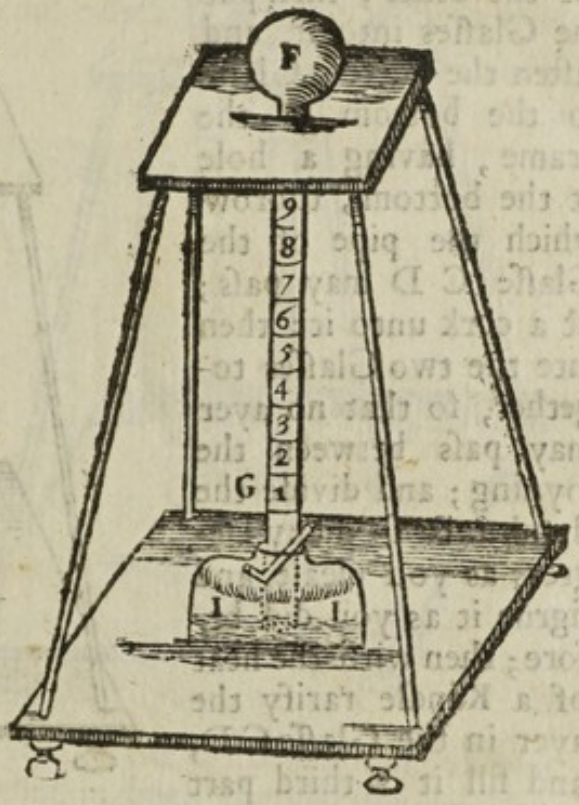


In this Glaſſe the water will with cold aſcend the Glaſſe A B, but with heat it will deſcend the Glaſſe A B, and aſcend the hornes of the Glaſſe C D.

How to make the ſingle perpendicular Glaſſe, whoſe water aſcendeth with cold, and deſcendeth with heat.

PRepare two Glaſſes after the faſhion of the figures F G I I. Alwayes chuſe thoſe upper Glaſſes that have the leaſt heads, elce they will draw the water too faſt, and preſs it too low ; alſo let not the ſhank of the Glaſſe bee too wide : it is no matter to bee curious in chuſing the lower Glaſſe. Having provided both theſe Glaſſes, make a Frame for

for them about one inch longer than the ſhank of the Glaſſe F G having a hole at the top to put the ſame thorow. There ought to be a great deal of care had in making the Frame ſo, that the foot thereof may be of a greater compaſſe than the top, to the end that it may ſtand firm, and not be ſubject to bee turned down, which will diſtemper the whole work. After you have provided the Frame, proceed to the making of it after this manner : Put both the Glaſſes into the Frame, and then divide the ſhank of the Glaſſe F G into ſo many equall parts as you would have Degrees ; write figures upon paper, and paſte them on, with gumme tragagant diſſolved in fayr water ; then fill the bottom Glaſſe two thirds with the water, and rarify the ayer in the Glaſſe F G ſo oft untill you have hit ſuch a Degree as is moſt fitting for the temper of the weather : put in a little crooked hollow kane for the ayer to paſſe in and out at, but let it not touch the water : then ſtop it about the joynts of the Glaſſe with good cement, that nothing may come out. Make an artificiall Rock about it, with pieces of cork dipt in gleu, and rouled in this following pouder, and it is done.

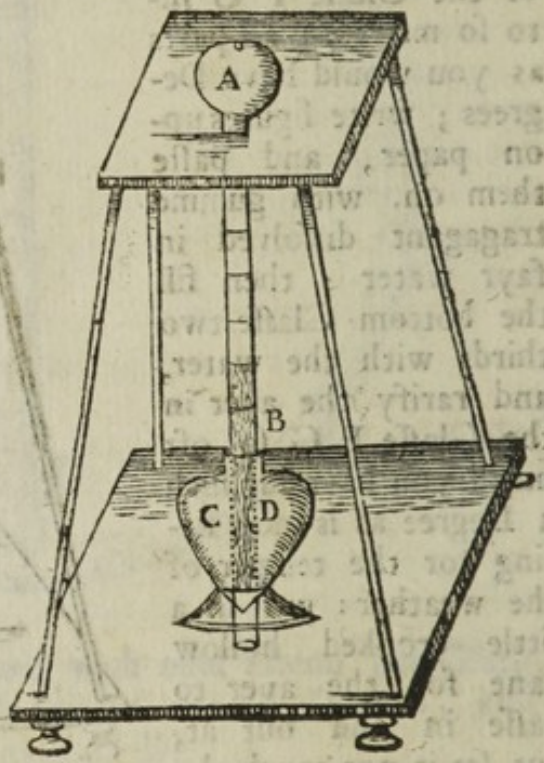


The pouder for the Rock.

Take mother of Pearl 2 Pound, ſmall red Corall halfe a pound, Antimony crude 4 ounces, and make a groſſe pouder of them.

To make the ſingle perpendicular Glaſſe, aſcending with heat, and deſcending witg clod.

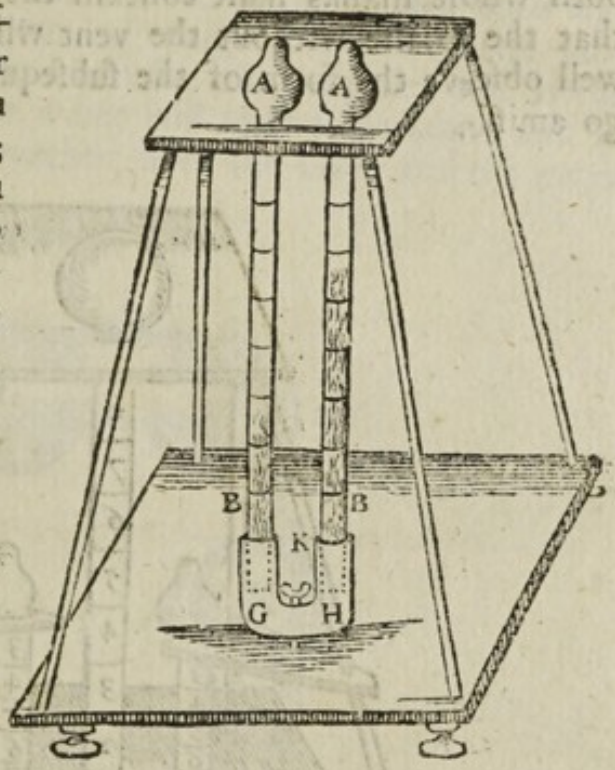
PRepare two Glaſſes after the faſhion of the figures A B, and C D: let the Glaſſe A B have a ſmall pinhole in or about the top of it, and let the Glaſſe C D have beſides the hole at the top, another hole at the bottom, with a ſhort pipe. Provide ſuch a Frame for this as you did before for for the other; then put the Glaſſes into it, and faſten the bottom Glaſſe to the bottom of the Frame, having a hole at the bottom, thorow which the pipe of the Glaſſe C D may paſs; fit a cork unto it: then lute the two Glaſſes together, ſo that no ayer may paſs between the joyning; and divide the ſhank into ſo many Degrees as you pleaſe, and figrue it as you did before; then with the heat of a Kandle rarify the ayer in the Glaſſe C D, and fill it a third part full with water, and then put the cork faſt in: Note that if the firſt heating of the Glaſſe rayſe not the water unto your content, you muſt repeat it over and over, untill it do: when it is ſufficient, then ſtop the cork in very firm, that no water may come out, and tis made.



How to make the double perpendicular Glaſſe.

PRepare two Glaſſes like unto the figure marked with the letters A B, the one of them muſt have a ſmall hole in or

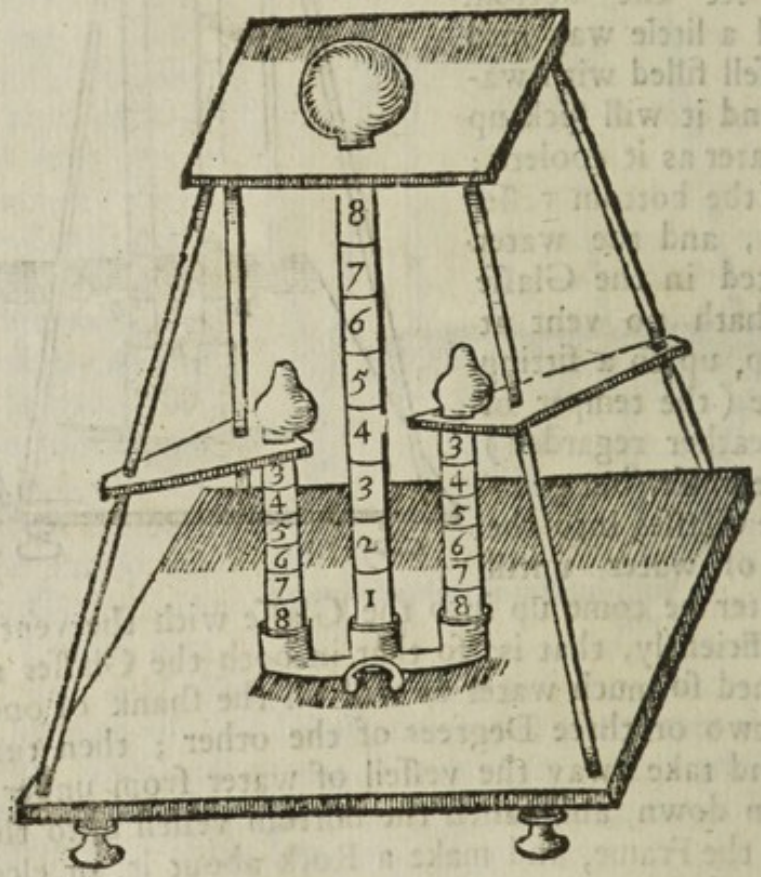
or about the head thereof. Prepare likewiſe for the bottom a Veſſell of the faſhion of the figure G H, having two mouths, at each end one; alſo a cock in the middle, as K: then divide the ſhank of the Glaſſe without the hole in the top, into equall parts, and ſet numbers upon it; and then lute them both faſt into the necks of the bottom veſſell: But firſt remember to put them in a Frame. When the cement is dry, turn the cock of the bottom veſſel, and rarify the ayer in the Glaſs that hath no hole at the top; then ſet the bottom veſſell a little way into a veſſell filled with water, and it will ſuck up the water as it cooleth; when the bottom veſſel is full, and the water mounted in the Glaſſe that hath no vent at the top, up to a fitting Degree (the temper of the weather regarded) then depreſſe (but gently) the Glaſſes into the veſſell of water untill the water be come up into the Glaſſe with the vent at the top ſufficiently, that is, ſo that in both the Glaſſes may be contained ſo much water as will fill the ſhank of one, and about two or three Degrees of the other; then turn the cock, and take away the veſſell of water from under them, let them down, and faſten the bottom veſſell unto the bottom of the Frame, and make a Rock about it, or elce what other works you pleaſe, that the Art may not be diſcerned: laſtly, ſet figures upon both, but firſt upon that without the vent, beginning from the bottom, and proceeding upwards, then lay your hand upon the head of it, which will depreſſe the water, which when it commeth equall to the



Degrees, paſte the ſame Degree on the place of the water in the other Glaſſe with the vent, and tis done.

How to make the treble Perpendicular Glaſſe.

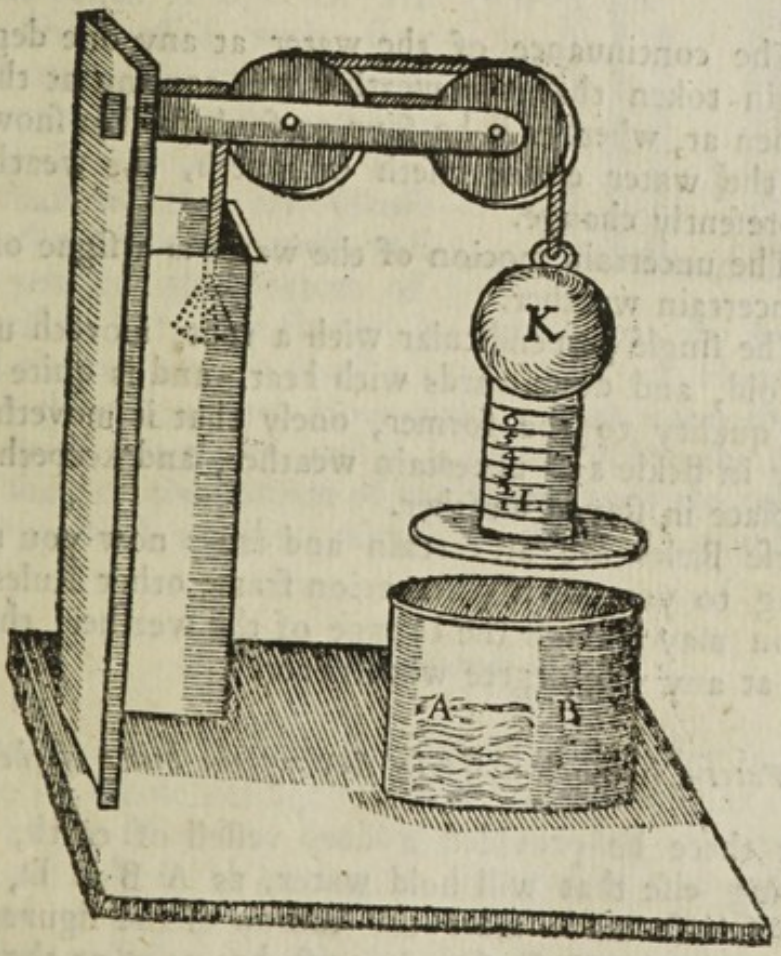
AFter the ſame manner is the treble Penpendicular Glaſs made: but whereas in the double Glaſſe there was but one Glaſſe that had a vent at the top, there is two in this, both whoſe ſhanks muſt contain the juſt quantity of water that the Glaſſe without the vent will contain. If you doe well obſerve the form of the ſubſequent figure, you cannot go amiſſe.



How to make the moveable Perpendicular Glaſſe.

FIrſt prepare the Glaſs A B, fill it almoſt top full of water, provide alſo the Glaſs K L, having a loop at the top

top of it: divide it into ſo many equall parts as you would have Degrees, and on the mouth thereof faſten a thin boord that will eaſily ſlip in and out of the bottom Glaſs: make then a waight of Lead or Braſs ſomwhat heavier than both the Glaſs and boord faſtened thereto, and then tie a little Rope to the loop of the Glaſſe A B, and the waight at the other end thereof. Rarify the Ayet contained in the Glaſs L, and reverſe it into the Glaſs A B filled with water, and hang the plummet or waight over two little pulleys faſtened in a Frame made for the purpoſe, and as the Glaſs K L kooleth, the water will aſcend the ſame, and ſo by the change of the weather, both the Glaſs and the water will move accordingly.



Of the use of all the severall sorts of weather Glasses.

ALbeit the forms of weather Glasses are divers, according to the fancy of the Artist, yet the use of all is one and the same: to wit, to demonstrate the state, and temper of the season, whether hot or cold; as also to foreshew the change and alteracion thereof.

1 Note therefore, that the nature and property of the water in all the Glasses that have no vent holes at the top, is, to ascend with cold, and descend with heat. But in them that have vents, it descendeth as much as it ascendeth in these.

2 The sudden falling of the water is an evident token of Rayn.

3 The continuance of the water at any one degree, is a certain token that the weather will continu at that stay it is then at, whether it be fayr or foul, frost or snow. But when the water either riseth or falleth, the weather will then presently change.

4 The uncertain mocion of the water is a signe of fickle, and uncertain weather.

5 The single perpendicular with a vent, moveth upwards with cold, and downwards with heat, and is quite contrary in quality to the former, onely that it moveth uncertainely in fickle and uncertain weather, and keepeth a constant place in stayed weather.

These Rules are all certain and tru: now you may according to your own observacion frame other Rules, whereby you may foretell the change of the weether, the water being at any one degree whatsoever.

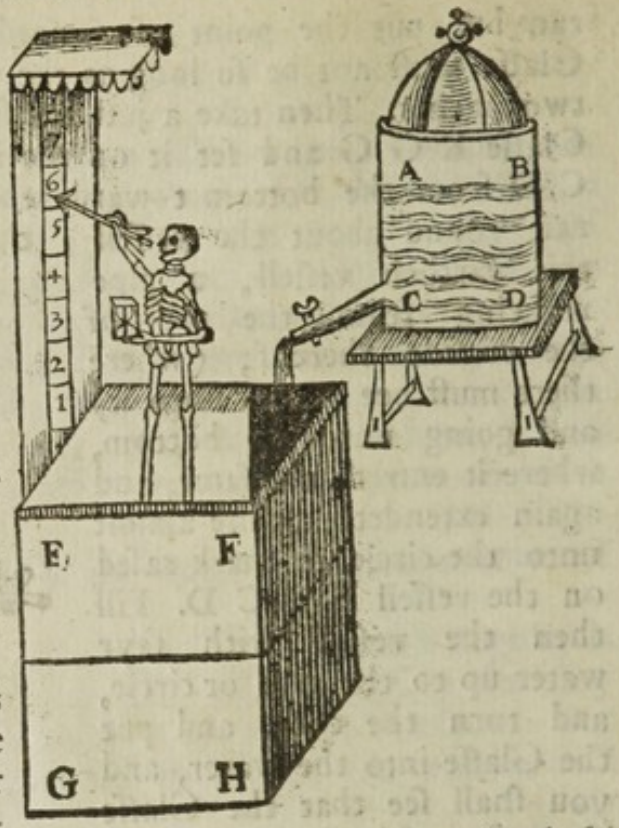
A Water-Clock, or a Glasse shewing the houre of the Day.

LEt there be provided a deep vessell of earth, or any thing else that will hold water, as A B C D, provide also a Glasse made after the fashon of the figure marked with the letters K G G. It must bee open at the bottom, and have also a small hole at the top, thorow which if you can

can but put the point of a needle, it is sufficient: this Glasse must not be so long as the vessell is deep, by about two inches. Then take a just measure of the length of the Glasse K G G and set it on the inside of the vessell A B C D from the bottom towards the top, and then make a rase round about the vessell; there must be fitted unto this earthen vessell, a pipe reahcing from the top of the outside thereof, (where there must bee a cock unto it) and going unto the bottom, where it entreth the same, and again extendeth it selfe almost unto the circle or mark rased on the vessell A B C D. Fill then the vessell with fayr water up to the rase or circle, and turn the cock, and put the Glasse into the water, and you shall see that the Glasse by reason of its heavines, will tend toward the bottom of the vessell, but very slowly, by reason that the Ayer contained therein hath so small a vent: turn an Hour Glasse, and at the end of each Hour make a mark upon the Glasse equal with the water, and it is done. When the Glasse is quite sunk to the bottom of the water, turn the cock, and with one blast of your mouth at the pipe, it will ascend again.

Another fashioned one

PRepare a vessell, as A B C D having a very small coc k unto it, whose passage ought to be so small, as that the water might issue out but by drops. Prepare likewise a vessell, as E F G H having at one end of it a pillar of a foot and a halfe, or two foot high: let there be fitted unto this vessell a boord, so that it may freely without stay, slip up and down: towards one side of this boord,

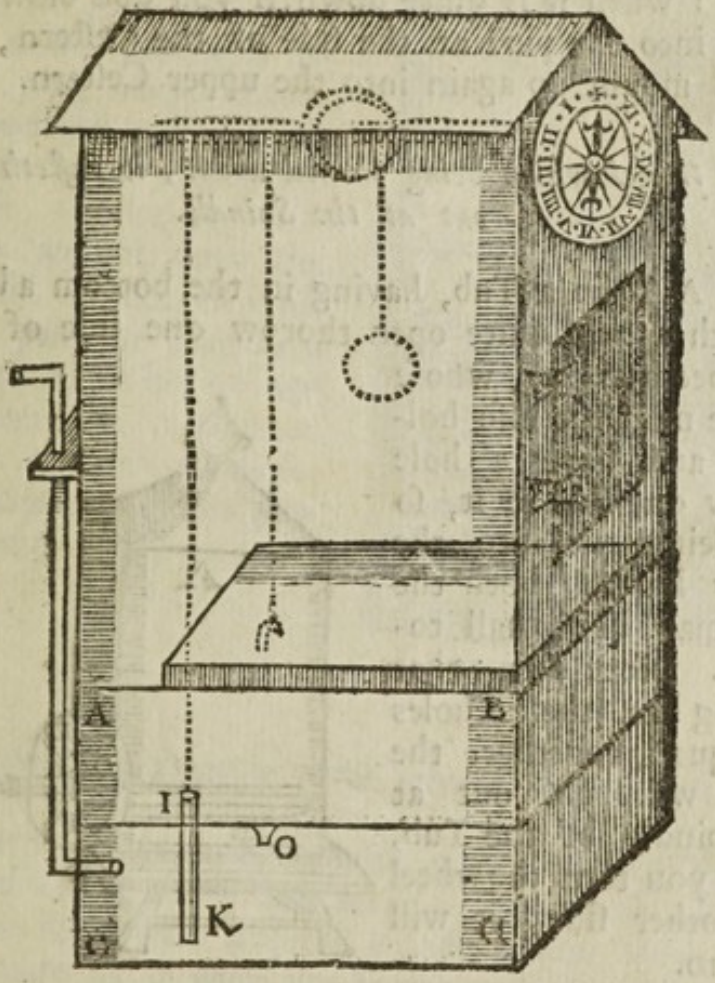


there must be a good big hole, which must bee placed under the cock of the other vessell. Then fatten unto the top of this boord, the Image of *Time* or *Death*, and pointing with a Dart upon the piller aforesaid : turn then an Houre-Glasse, and at the end of every Houre, make a figure on the place of the piller that the Image with his Dart pointeth at, and it is made. For note, the dropping of the water out of the cock thorow the hole of the boord whereon the Image standeth causeth the same to ascend by little and little. Mark the figures.

Another artificiall Water-Clock, which may be set conveniently in a double Weather Glasse.

FIrst prepare a Cestern, as A B C D having a particion in the middle, let there be made two pipes, the one whereof must reach out of the upper Cestern and descend almost to the bottom of the lowest Cestern, as I K ; the other must be a short one, and have a very small hole, that the water may thereby issue out of the upper Cestern but by drops ; also at the side nigh the bottom of the upper Cestern, let a small pipe enter. To the upper Cestern fit a boord, (with a peece of lead nailed upon it to make it somewhat heavie) so that it may easily slip up and down in it ; this boord must have a loop to fasten a rope unto, and you must so poyse the sayd boord, that it being hung

hung up by a line, may hang yeven and levell. Then prepare a Box to put over the Ceſtern, which ought to ſtand about 6 inches above the Ceſtern : in the top of this Box let there be faſtened a long Pulley with a crevice to put a ſmall rope over : in this crevice it were fitting to faſten ſmal pins, to the end that the rope may turn the ſaid wheel as

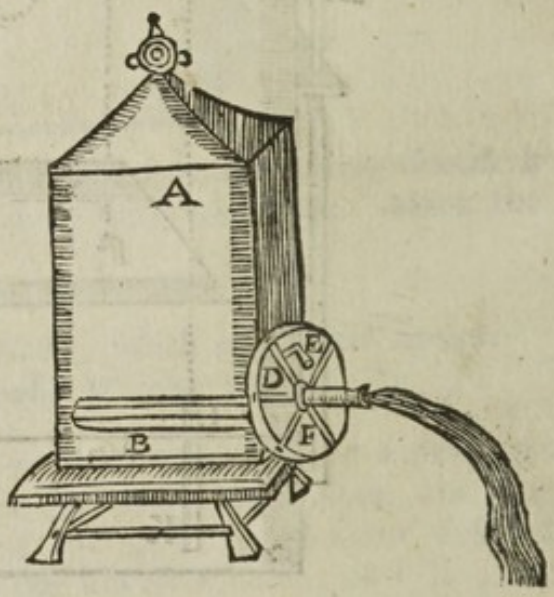


the water falleth from under the boord : let the Spindle of this pulley come out at one ſide of the Box whereon there is a Dyal drawn, containing ſo many houres as you would have it go for : unto this end of the Spindle let there bee fitted a Needle or Directer for to ſhew the hour ; then put a ſmall cord over the pulley in the Box, and faſten one end thereof unto the loop of the boord,

and at the other end let there bee tyed a waight not quite ſo heavy as the boord; then fill the upper Ceſtern with water, and the boord will preſſe it out into the lower veſſell, at the pipe O, drop by drop; and as the boord ſinketh lower, it will by means of the rope upon the pulley, turn the Index or Directer faſtened unto the Spindle of the pulley about the Dyall; you may ſet it by an Hour-glaſſe or Watch: when it is quite down, if you doe blow with your mouth into the pipe at the ſide of the Ceſtern, the water will all mount up again into the upper Ceſtern.

A Wheel which being turned about, it caſteth water out at the Spindle.

LEt A B be a Tub, having in the bottom a braſs Barrel with a hole quite open thorow one ſide of it: let D E F, bee a wheel, whoſe Spindle muſt bee alſo hollow, and have a hole thorow one ſide of it, ſo that being put into the hollow Barrell, both the holes may be equall together. Note then, that ſo long as theſe holes are equall, together, the water will run out at the Spindle of the Tub, but if you turn the wheel to another ſide, it will not run.

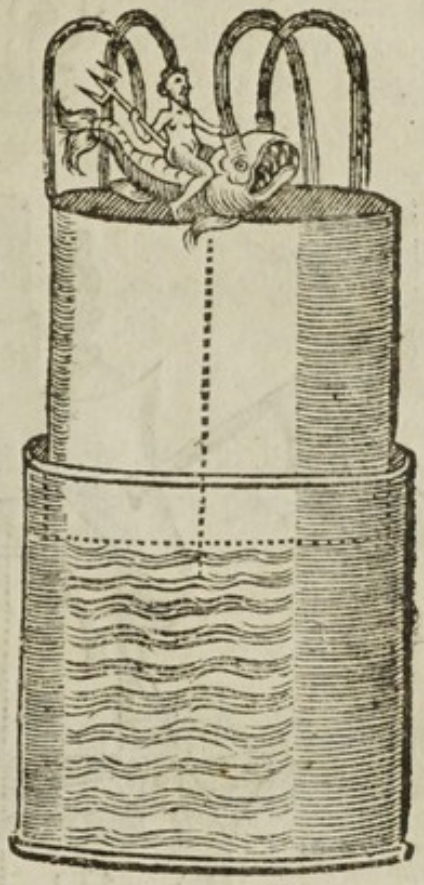


A Water-Preſſer, or the mounting of water by compreſſion.

LET there be provided a Barrell of braſs, of what length and wideneſſe you pleaſe, let it be exactly ſmooth within, and very tight at bottom: unto this Barrell fit a plug of wood leathered about, and let there bee made divers

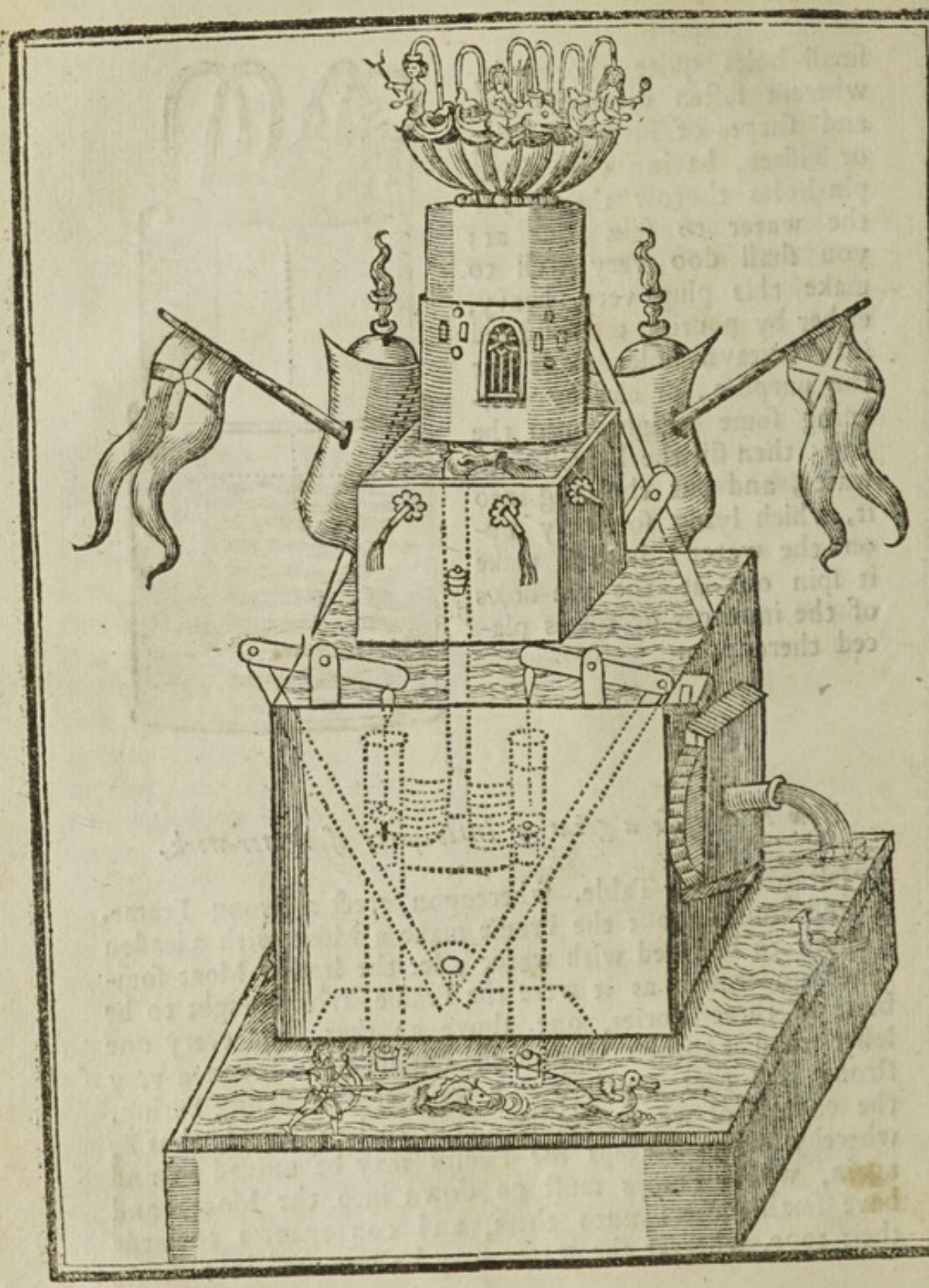
ſmal

ſmall holes quite thorow it, wherein faſten divers formes and ſhapes of Birds, Beaſts, or Fiſhes, having very ſmall pin-holes thorow them, for the water to ſpin out at: you ſhall doo very well to make this plug very heavy, either by pouring melted Lead into certayn holes made for the purpoſe, or elce by faſtening ſome waight unto the top: then fill the Barrell with water, and put the plug into it, which lying ſo heavy upon the water, it will make it ſpin out at the pin-holes of the immages or forms placed thereupon.



How to compoſe a great or little peece of Water-work.

FIrſt prepare a Table, whereupon erect a ſtrong Frame, and round about the Frame make a Moat with a leaden Ceſtern to be filled with water; let the leaden Moat ſomwhat undermine as it were the Frame, which ought to be built in three ſtories, one above another, and every one leſſer thau another. Within the middle ſtory faſten a very ſtrong jack that goeth with a waight, or a ſtrong Spring, the ending of whoſe ſpindles ought to be crooked, thus Z, whereby divers Sweeps for Pumps may be moved to and again, whoſe Pumps muſt go down into the Moat, and have ſmall ſuckers unto them, and conveyances towards their tops, whereat the water may be mounted into divers



Cesterns, out of some wherof there may bee made conveyances in their bottoms, by small pipes running down into the River or Moat again, and there breaking out in the fashions and forms of Dragons, Swans, Whales, Flowers, and such like pretty Conceits: out of others the water may fall upon wheels, out of whose Spindles the water turning round, may be made to run. In the uppermost story of all let there bee made the Forcer by Ayer, as I taught before or else a Presser, having at the top, *Neptune* riding on a Whale, out of whose nostrils, as also out of *Neptune's* Trident, the water may bee made to spin thorow small pinholes: you may also make divers Mocions about this work, but for that the multitude of Figures would rather confound than instruct the Reader, I have of purpose omitted them.

An Appendix unto the WATER-WORKS.

CHAP. I.

YOu may remember I have tould you formerly, that water (one of the foure Elements) is a massie subtile substance; now every heavy thing wee know tendeth naturally downward, so that if it had a passage unto the middle or center of the Earth, thither it would run, there it would abide. I tould you likewise, the use of the Crane pipe, which is called by some

some, the Philosophers Engine, whereby water may bee convayed from a Fountain, notwithstanding the interposicion of Hills and Mountaines: this considered, that the place unto which you would convey the water, lie some what lower than the Fountain, which may easily be essayed by divers instruments, principally the Geometricall Square: so the place may be viewed from the Fountain, or both the place and the Fountain may be viewed from any Tower, Church, or Hill, that is betwixt both. The descripcion and use of which instrument, since it is both easie and common, it will be needlesse for me to describe.

This is the naturall course of water, but there is a second kinde of conveyance of water, which we call artificiall, whereby by Engins artificially contrived we either draw or force up water, to some higher place or places to be thence conveyed unto any place desired. These Engines receive their mocion divers wayes. First, by the stream of the same River, wherein they are placed. Secondly, by the Winde. Thirdly, by Horses. Fourthly, by a Crane-mill: and lastly, by divers Pumps, Forces, and such like Invencions. You may remember likewise, that I have formerly tould you, that no water work can bee composed without Suckers, Forcers, Clacks, either or every of them. And now I will not insist upon what I have formerly spoken, but referre you for that unto the former part, *pa.* 13, and proceed to the descripcion of some things of more service & difficult composure First, I will describe other Clacks, and Suckers, teach their divers applicacion; and then I will describe certain Mills and Engines. First, for mounting of water to be conveyed to remote places, for divers uses: secondly for dreyning of Medowes: thirdly, for quenchiug of fier in Buildings: and lastly, for Recreacion and Delight.

CHAP. 2.

BY the letter A is signifyed a Sucker, made after the usuall manner, saving that it hath an edge round about the bottom of it: which edge or brim hath divers little holes in it, wherby to nayl it upon any part, where need requireth.

B signifieth a peece of Timber made square, and perforated to nayl the Sucker upon.

C signifieth a Grate to be nayled upon the bottom of the said peece of Timber, noted with the letter B. The use of this Crate is to keep gravell, strawes, and durt from ascending with the water.

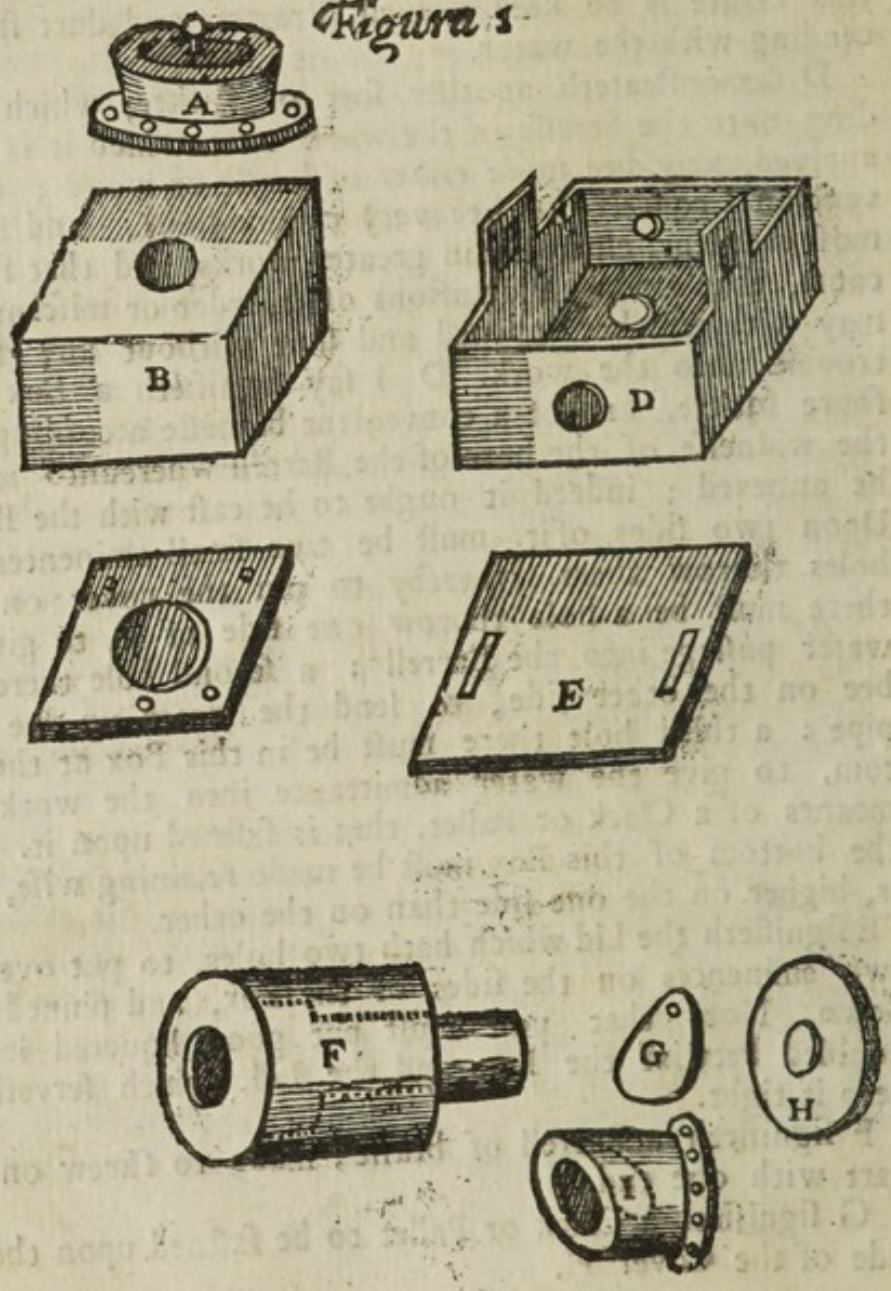
D demonstrateth another sort of Sucker, which according unto the Stresse of the work unto which it is to bee applyed, may bee made either of brasse or wood; the Invencion I conceive to bee very commodious, and for use most excellent, especially in greater works, and that for this cause, that upon all occasions of disorder or mischance, it may with ease bee opened and shut without any farther trouble unto the work. D I say signifieth a Box made foure square, and of a convenient bigneſse according unto the widneſse of the bore of the Barrell whereunto it is to be annexed; indeed it ought to be cast with the Barrell. Upon two sides of it, must be two small eminences with holes thorow them, whereby to pin the cover on fast; there must be a hole thorow one side of it, to give the water passage into the Barrell: a second hole there must bee on the other side, to send the water up the main pipe: a third hole there must be in this Box at the bottom, to give the water admittance into the work, by meanes of a Clack or Pallet, that is fastned upon it. Now the bottom of this Box must be made reclining wise, that is, higher on the one side than on the other.

E signifieth the Lid which hath two holes, to put over the two eminences on the sides of the Box, and pinned close down. Note that you must put good liquered leather doubled betwixt the Box and the Lid, which serveth to keep it tight.

F signifieth a Barrell of brasse, made to skrew on any part with one end.

G signifieth a Clack or Pallet to be fastned upon the inside of the Cover H.

Figura 1



H signifieth a Cover that is to be sodered upon the other end; this Cover must have a hole bored in it, to give the water ingresse into the work.

I signifieth another Sucker or rather Fallet, and it is a Box made of brasse, having a bottom with a hole in it, and over it must be riveted a pallet or Clack; the bottom of this Box must bee made higher on the one side then on the other, so that beeing nayled to any perpendicular or erect standing Barrell, it may encline somwhat as may appeare by the figure.

The applicacion of these Clacks and Suckers, is so to bee contrived as they may suit with the convenience for the work; somtimes at the sides of the Barrells, somtimes at the bottoms: in like manner Forcers may be made to move either horizontally or perpendicularly, according unto the convenience of the work, or the invencion of the Artist and Engineer.

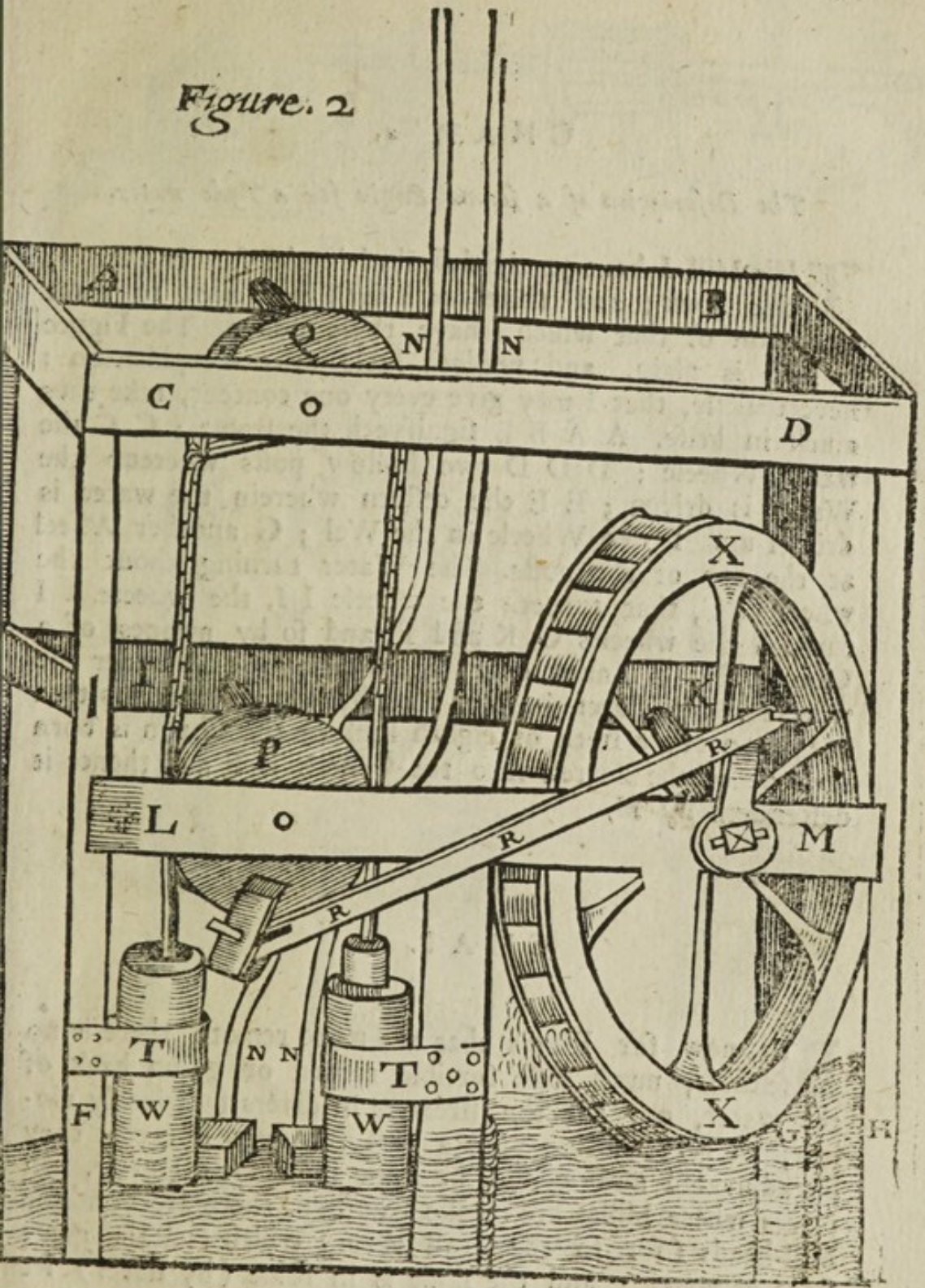
CHAP. 3.

The Descripcion of the Engin near the North end of London Bridge.

DIvers Rivers there are, which according unto their propinquity or remoteneſse from their mother Sea, run and return (I mean ebbe and flow) more or leſse; whoſe force and stream in some is of its own accord, sufficient to mount its proper water, as may be seen at the Water-Mill or Engin near the North end of Lundon Bride; which Engin by the Ebbing and Flouing of the Thames, doth mount the sayd water unto the top of a Turret, and by that means it is conveyed above two miles in compaſs, for the uſe and service of that City. Which Engin I circumspectly vieued as I accidentally passed by, immediatly after the late Fire that was upon the Bridge *Anno* 1633. and the Device seeming very good, when I came home I drew a Modell thereof, and have here presented it unto thy veiu.

A B C D E F G H I K L M, doe signify a Frame, strongly made of Timber, X X signifie the water wheele, the Gudgins of this wheele must be set to turn in strong brasse Sockets, firmly set in the two middle-beames of the Frame I K L M. The ends of the said Gudgins, must bee made to reach a good way over the Beames, and they must be made square towards their ends, and have each a handle pinned fast on. Then in the middle Beames I K L M, must likewise be fastened another strong wheele, as P, which must have as it were a spoak, reaching out from it, upon the lowet side. There must also be another halfe or 3 quarter wheele, as Q placed directly above it, whose diameters must be of one size or proporcion: directly under the utmost edges of these wheeles must be firmly set two strong Barrells of brasse or yron, which is of more durance as W W, having each of them a Sucker cast with the Barrels: These Barrels must be bound fast unto two posts of the Frame, with two strong yron bands, as T T, to the end they may not stirr: unto each of these must be fitted a Force well leathered, and in the tops of the Forces must be set two peices of wood, two foot long, and about two inches thick, and to the tops of them must be linked two chains of yron: which must be linked straight up to the two ends of an yron band, that must compasse the circumference of the uppermost wheele noted Q: a long and strong wooden bar must come over the handle of the mayn wheele, and upon the spoak of the wheele P, this barre is noted with R R R. N N N N signifie the Pipes wherinto the water is forced. These Pipes carry the water to the top of a Turret near adjoyning unto the Engin, and there being strayned, thorow a close wyer grate, it descendeth into the mayn wooden pipe, which is laid along the streets, and into it are grafted divers smaller pipes of Lead, serving each of them to the use and service of particular persons.

Figure. 2



CHAP. 4.

The Deſcripcion of a ſecond Engin for a Tyde water.

THis Mill I have partly deſcribed in the former Part of this Book; and therefore I ſhall not need to make repeticion of that which I have there ſpoken. The Figure it ſelfe is plain, and needeth little or no explikacion: nevertheleſſe, that I may give every one content, take thus much in brife. A A B B ſignifyeth the frame; C C the water Wheele; D D D two hollow poſts whereup the Water is driven; E E the ceſtern wherein the water is driven up. F one Wheele in the Wel; G another Wheel at the top of the poſts. The Water turning about the wheel C C, that turneth the wheele I I, the wheele I I turneth the wheeles G K and F, and ſo by meanes of a Chayn that is linked over the wheele G and under the wheele F the water in the Well by certain Leathers that are upon every ſixth or eighth Link of the Chayn is born up one of the Barrels into the Ceſtern E F and thence it deſcendeth by M,

CHAP. 5.

BUt now for Rivers that are more remote, there is no ſenſible, much leſſe forcible return or going back of the water, nor are the ſtreames in divers ſufficiently violent, to give mocion unto a Mill or Engin; except they be adjuvated and aſſiſted by ſome ingenuous Deviee. In places where Milles are in the Country, there are Ponds or Mill-heads (for ſo they call them) which contain great ſtore of water; and the ſame is in ſome (by ſluces) let down

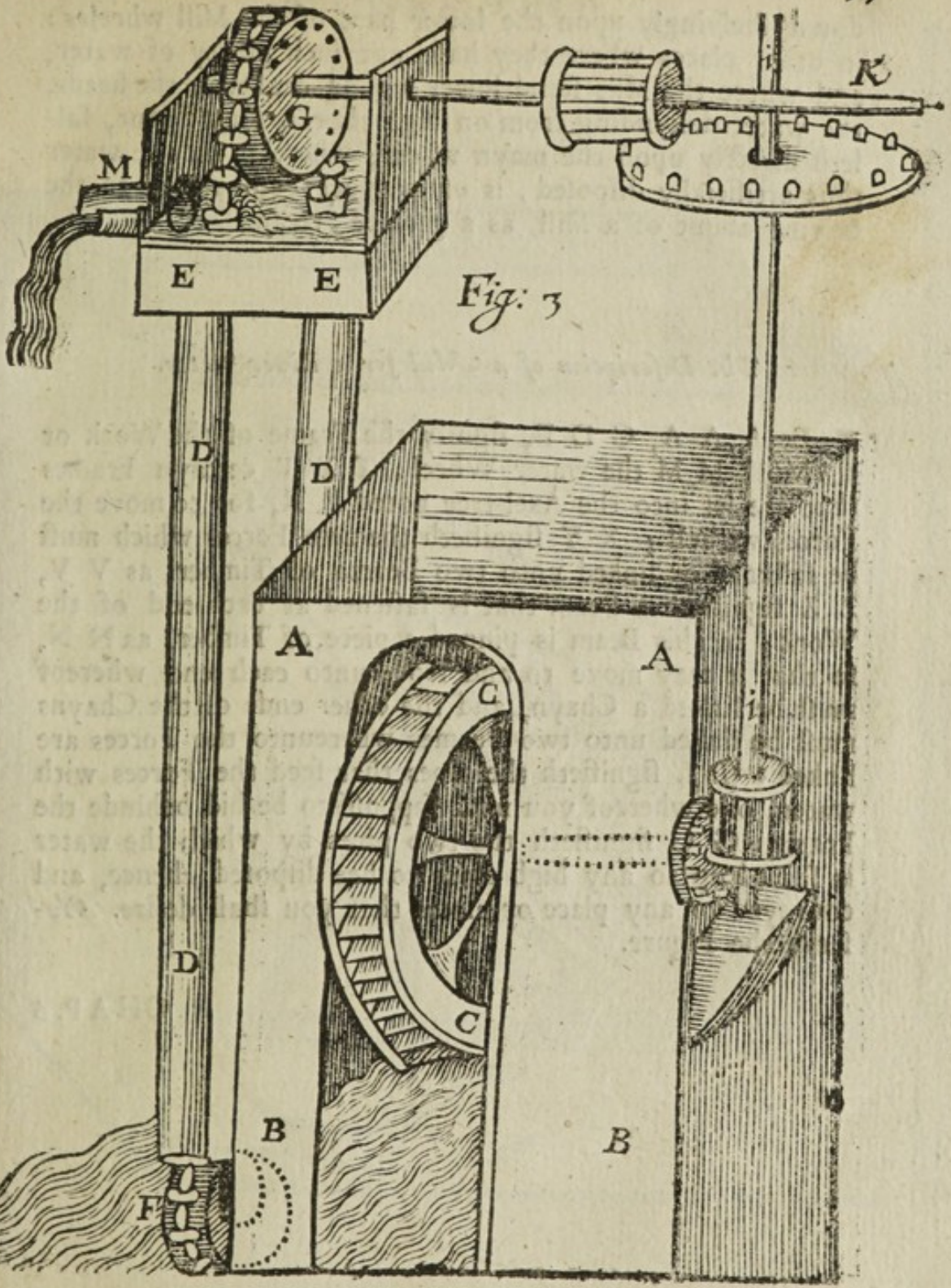


Fig: 3

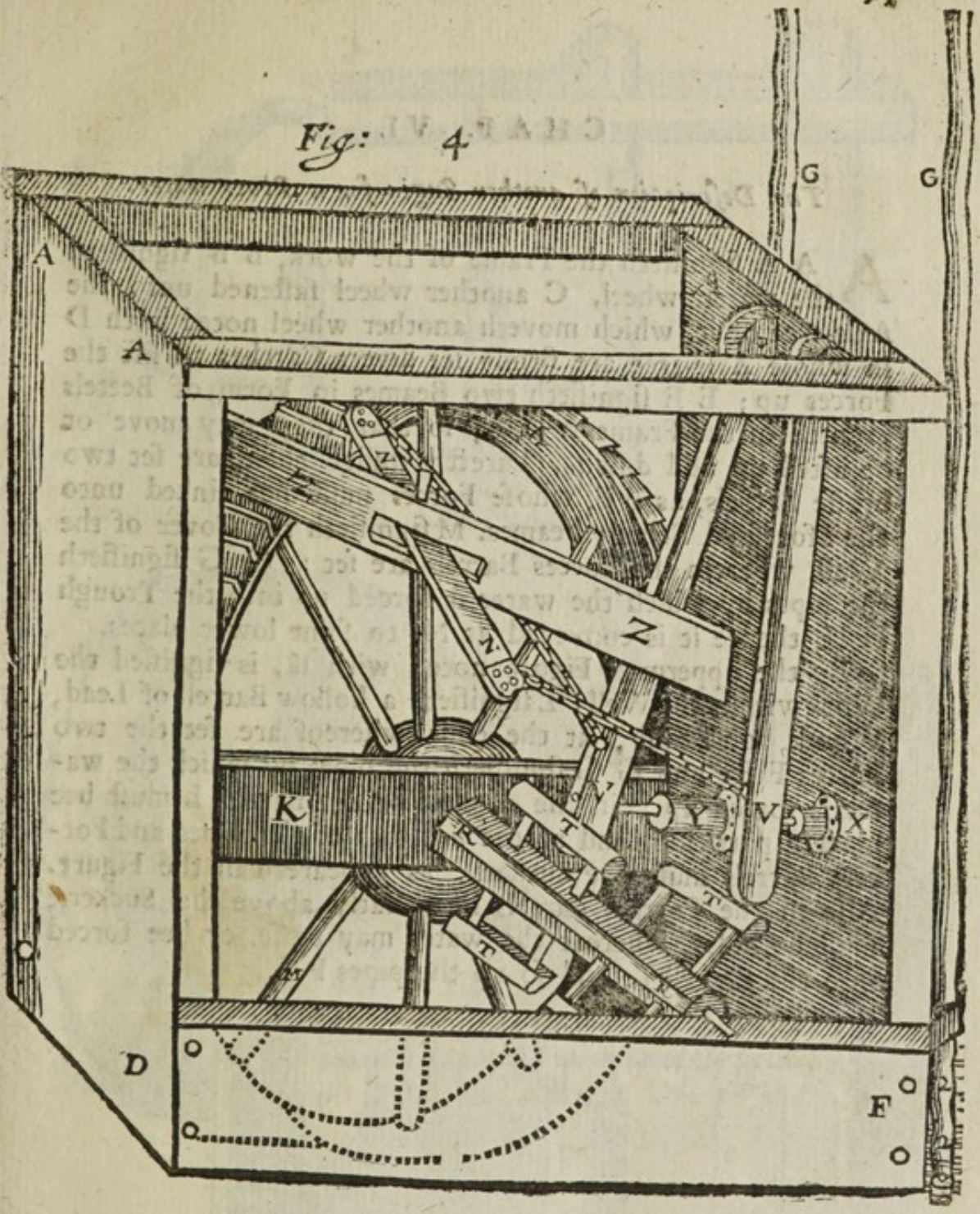
down shelvingly upon the lower part of the Mill wheeles: in other places where they have not such plenty of water, and where the Mils stand lower a good deal than the heads, the water descending from on high thorou some spout, falleth directly upon the mayn wheel; whereby a little water thus artificially disposed, is of as great equivalence to the driving about of a Mill, as a greater Stream.

The Descripcion of a Mill for a River water.

LEt A A A, C D E, signify the Frame of the Work or Mill; M M the water Wheel, T T T certayn Frames that are let into the Axel-tree noted R R, for to move the Forces withall; X Y signifieth the two Forces which must be fastened or linked unto two Beams of Timber, as V V, Z Z signifieth a Beam that is fastened at each end of the Work; in this Beam is pinned a piece of Timber, as N N, so that it may move to and fro; unto each end whereof must be linked a Chayn, and the other ends of the Chayns must be linked unto two Beames whereunto the Forces are linked: L L signifieth the pipes that feed the Forces with water, one whereof you must suppose to be hid behinde the Frame: G G signifieth the two pipes by which the water is forced up to any high place to bee disposed thence, and conveyed to any place or places that you shall desire. Observe the Figure.

CHAP. 6

Fig: 4

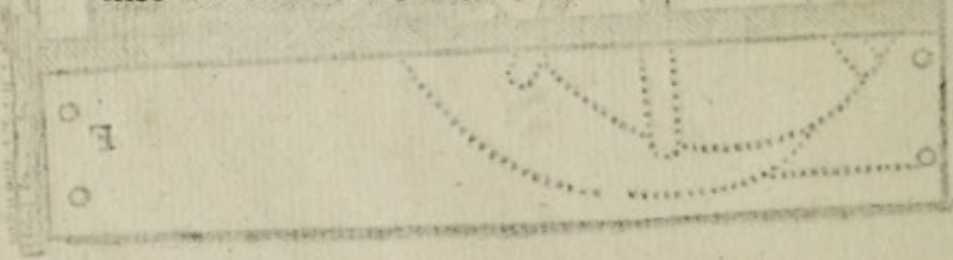


CHAP. VI.

The Deſcripcion of another Engin for a River water.

A A A ſignifieth the Frame of the work, B B ſignifieth the water wheel, C another wheel faſtened unto the Axle-tree of it, which moveth another wheel noted with D in whoſe Axle-tree are firmly ſet divers Catches to lift the Forces up; E E ſignifieth two Beames in Form of Beetels joynted in the Frame A A A, ſo that they may move or be lifted up and down. Directly under theſe, are ſet two braſſe Barrels, as F F, whoſe Forces muſt bee linked unto the aforeſayd Beetels beames. M ſignifieth the Cover of the Well, wherein the Forces Barrels are ſet: G G ſignifieth the Pipes by which the water is forced up into the Trough H H, thence it is conveyed at N, to ſome lower places.

By the uppermoſt Figure noted with K, is ſignified the Work within the Well: L ſignifieth a hollow Barrell of Lead, Wood, or Braſſe, at the ends whereof are ſet the two Forces F F: and G G ſignifieth the pipes by which the water is forced up: in the middeſt of the Barrell L muſt bee made a particion, and at the bottoms of the Pipes and Forcers Barrels muſt bee Suckers, as appeareth in the Figure. Alſo in the Forcers Barrels immediatly above the Suckers, muſt be holes, whereat the water may paſſe, or bee forced into the Barrell L, and ſo up the pipes F F.



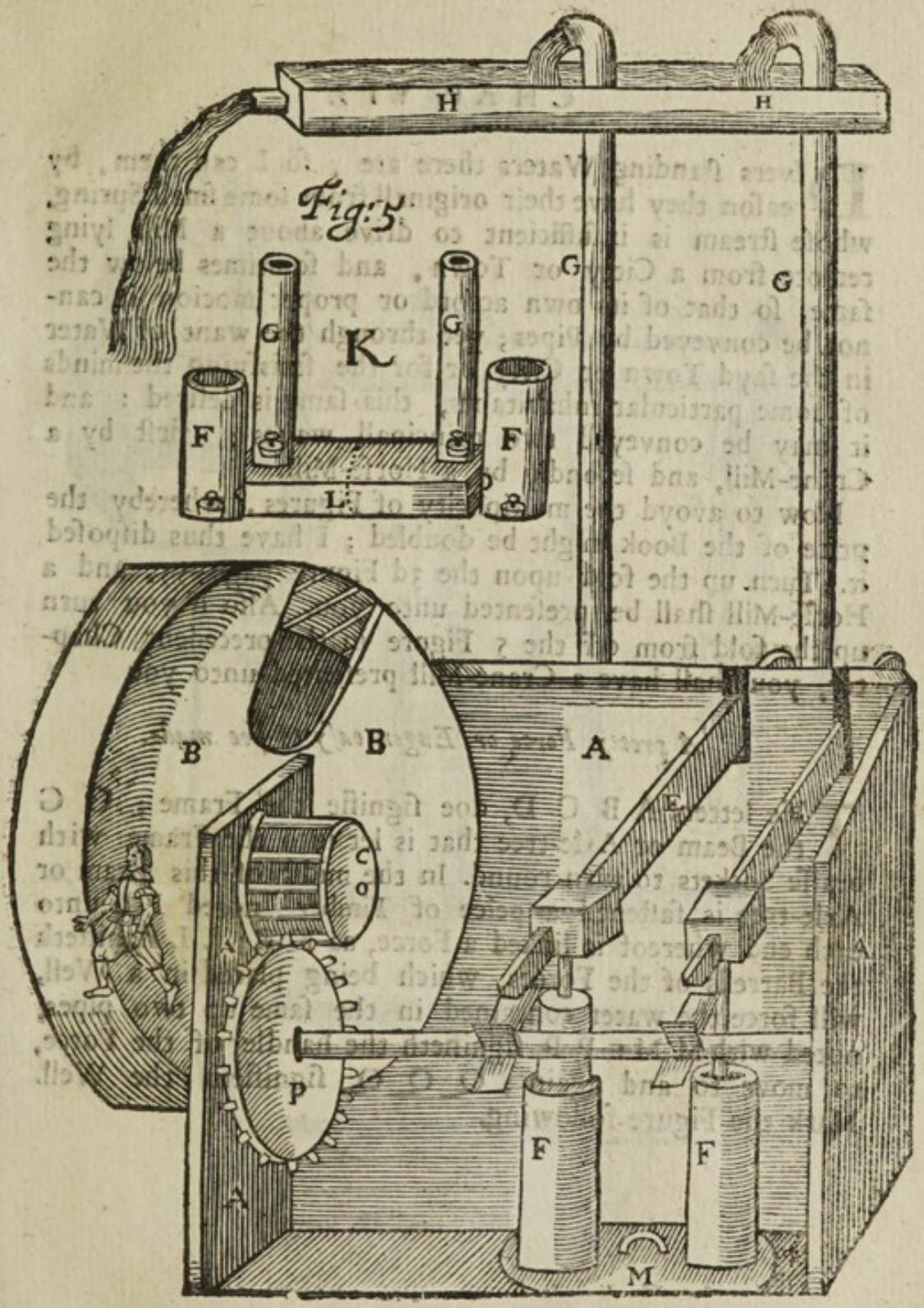


Fig: 5.

CHAP. VII.

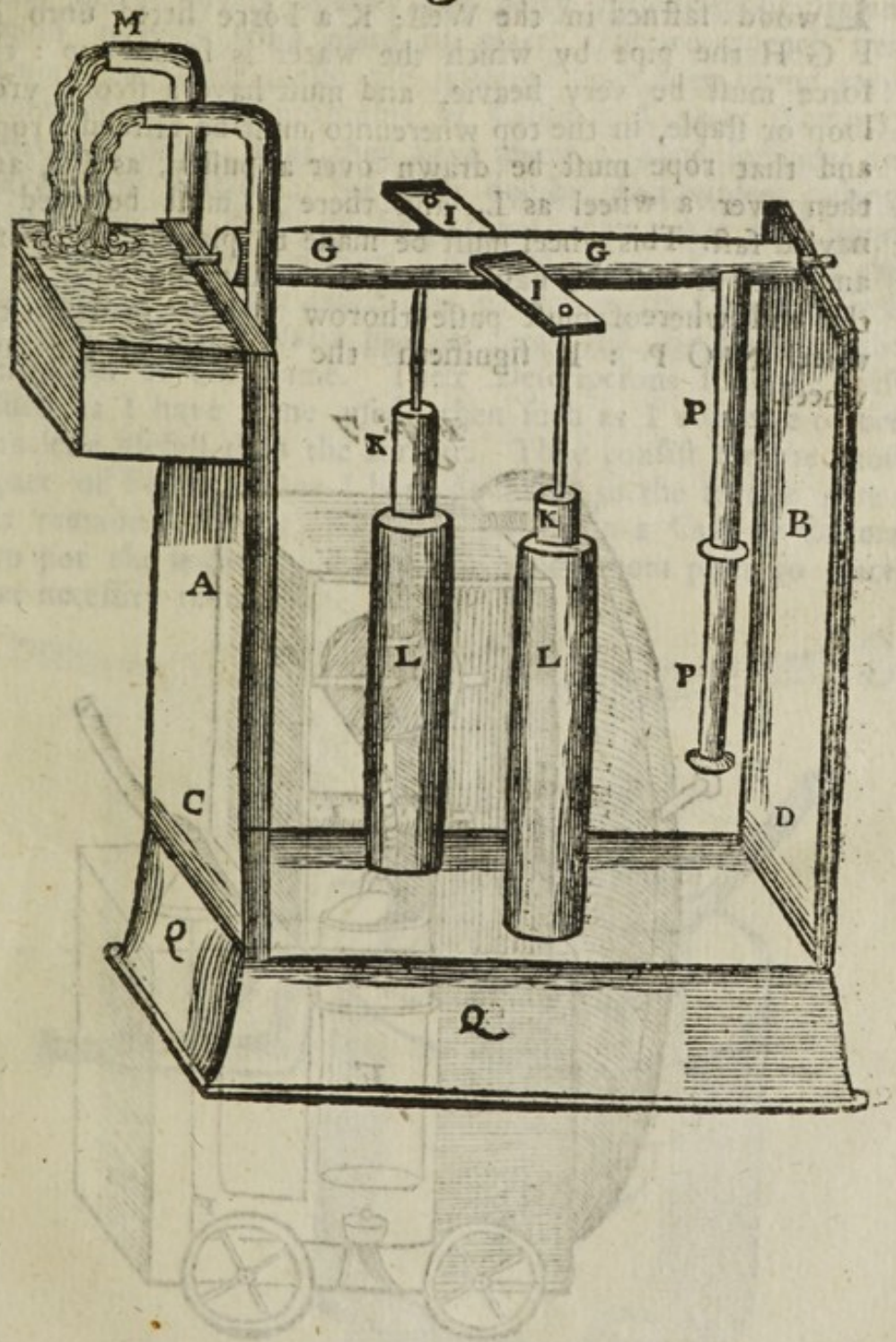
DIvers ſtanding Waters there are ; ſo I call them, by reaſon they have their originall from ſome ſmall Spring, whoſe ſtream is inſufficient to drive about a Mill lying remote from a Citty or Town, and ſomtimes below the ſame, ſo that of its own accord or proper mocion it cannot be conveyed by Pipes ; yet through the want of Water in the ſayd Town or Citty, or for the ſatisfying the minds of ſome particular inhabitants, this ſame is deſired : and it may be conveyed two principall wayes ; firſt by a Crane-Mill, and ſecondly by a Horſe-Mill.

Now to avoyd the multiplicity of Figures, whereby the price of the Book might be doubled ; I have thus diſpoſed it. Turn up the fold upon the 3d Figure page 55, and a Horſe-Mill ſhall be preſented unto you. Alſo if you turn up the fold from off the 5 Figure in the precedent Chapter, you ſhall have a Crane-Mill preſented unto you

A pretty Force or Engin eaſy to bee made.

THe letters A B C D, doe ſignifie the Frame ; G G the Beam or Axle-tree that is let into the Frame with braſſe Sockets to turn round. In the midſt of this Beam or Axle-tree is faſtened a peice of Timber noted I I, unto each end whereof is linked a Force, as K K : L L ſignifieth the Barrells of the Forces, which being placed in a Well, will force the water contained in the ſame up two pipes, noted with M M : P P ſignifieth the handle of the Force, to move to and again ; Q Q Q ſignifieth the Well. Mark the Figure following.

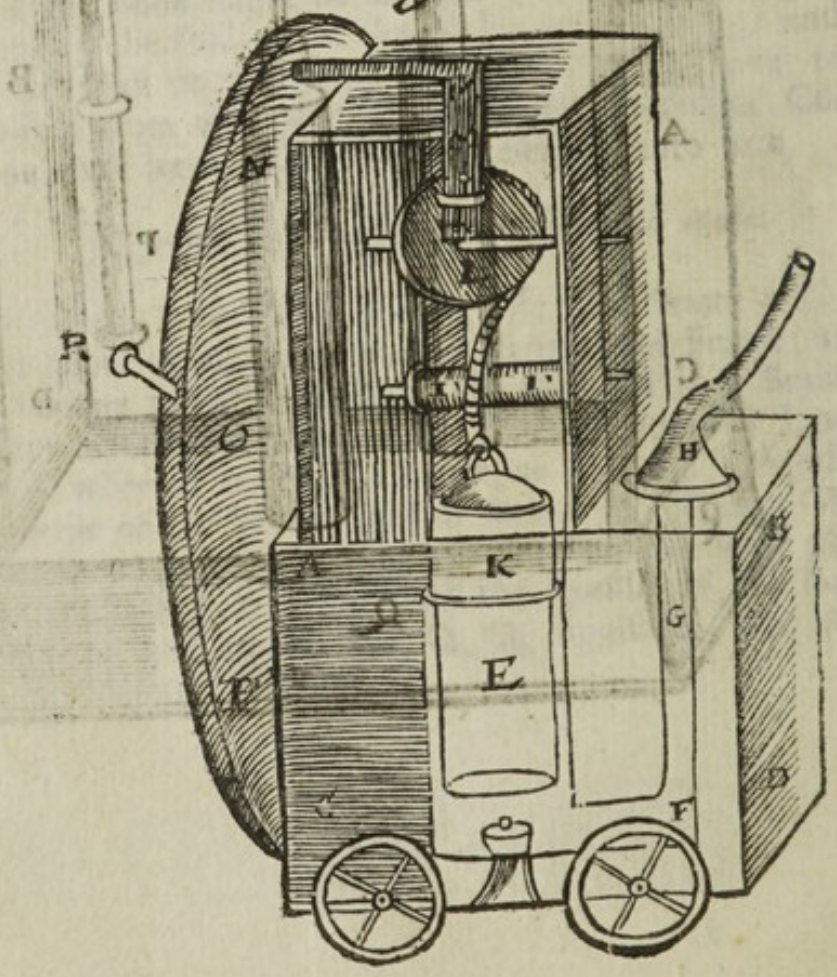
Fig: 6



Another pretty Force.

LEt A B C D signify a Well, E a barrell of braſſe or wood faſtned in the Well; K a Force fitted unto it; F G H the pipe by which the water is forced up: the force muſt be very heavie, and muſt have a ſtrong yron loop or ſtaple, in the top whereunto muſt be faſtned a rope, and that rope muſt be drawn over a pulley, as I I, and then over a wheel as L, and there it muſt be tyed or nayled faſt. This wheel muſt be made to play in the work, and unto it muſt be nayled an yron rod noted with M M the end whereof muſt paſſe thorow a hole made in the wheel N O P: R ſignifieth the handle of the ſayd wheel.

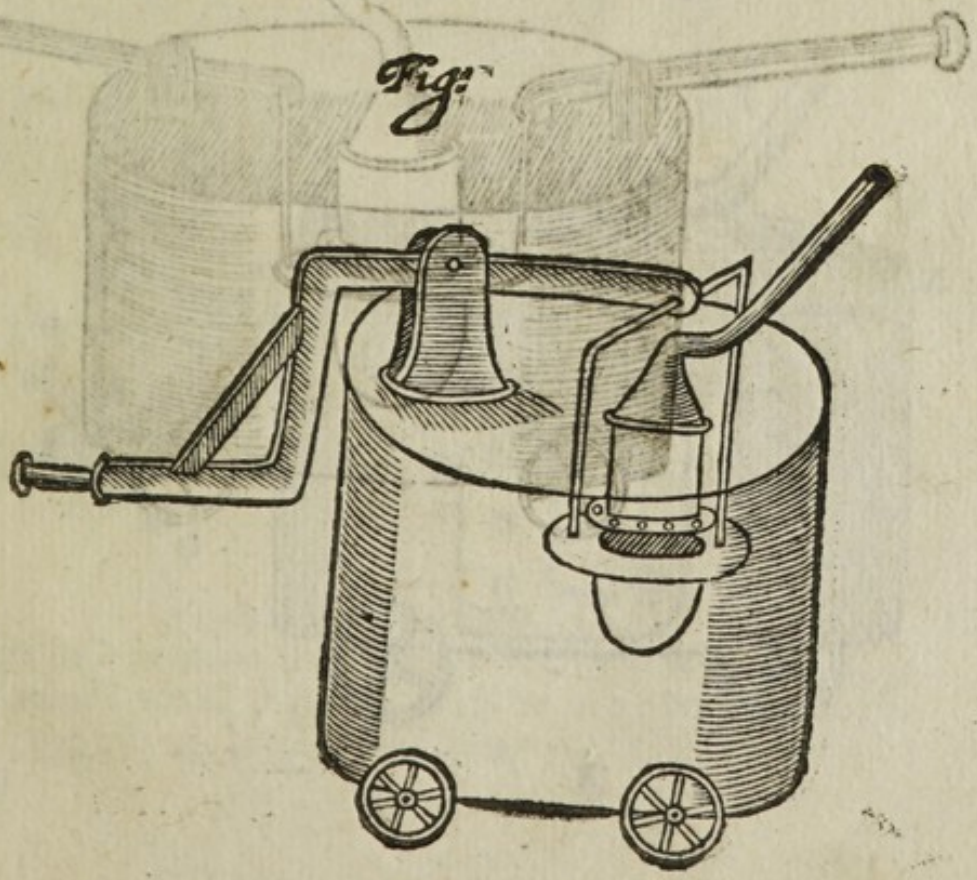
Fig. 17



CHAP. 8.

HAving sufficiently spoken concerning Mils and Engins for mounting water for meer conveyance, thence we may derive divers Squirts and petty Engins to be drawn upon wheeles from place to place, for to quench fier among buildings; the use whereof hath been found very commodious and profitable in Cities and great Townes, this considered, that they have water at hand sufficient to feed them withall: for they doe by their violent casting the water up dead the fier, having new taken hold upon any out side of building. Also, they doe the same if the convenience of the place doe permit so to place the sayd Engins, that the water squirted, may fall directly upon the erupcion of the flame. Their Descripcions follow; first such as I have seene used, then such as I conceive to bee no lesse usefull than the former. They consist for the most part of Forces. One I have described in the former part; it remaineth onely, that I include it in a Case or Cestern to put the water in, and to be drawn from place to place, as necessity requireth.

Fig:

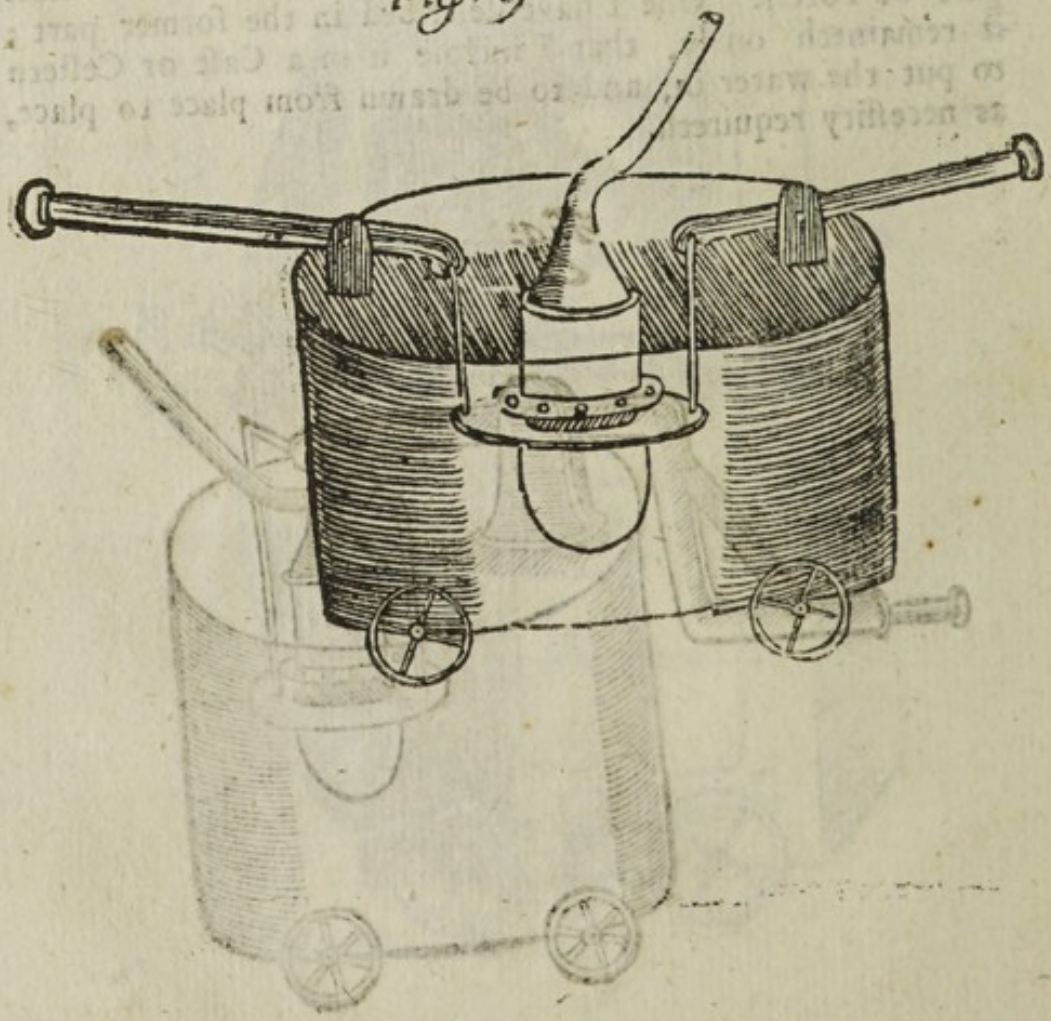


The Description of a second Engin.

A Second Engin I have seen in use, not much unlike the former. The difference betwixt both, is only this ; the lower brasse of this is poysed with two Sweeps, and the other but with one.

For use I account the other altogether as good as this, nay rather the better of the two ; because that this being wrought upon by two severall persons, they cannot alwayes keep a just time one with the other in fetching their stroakes, but they will strike sooner sometimes, and sometimes later, the one than the other.

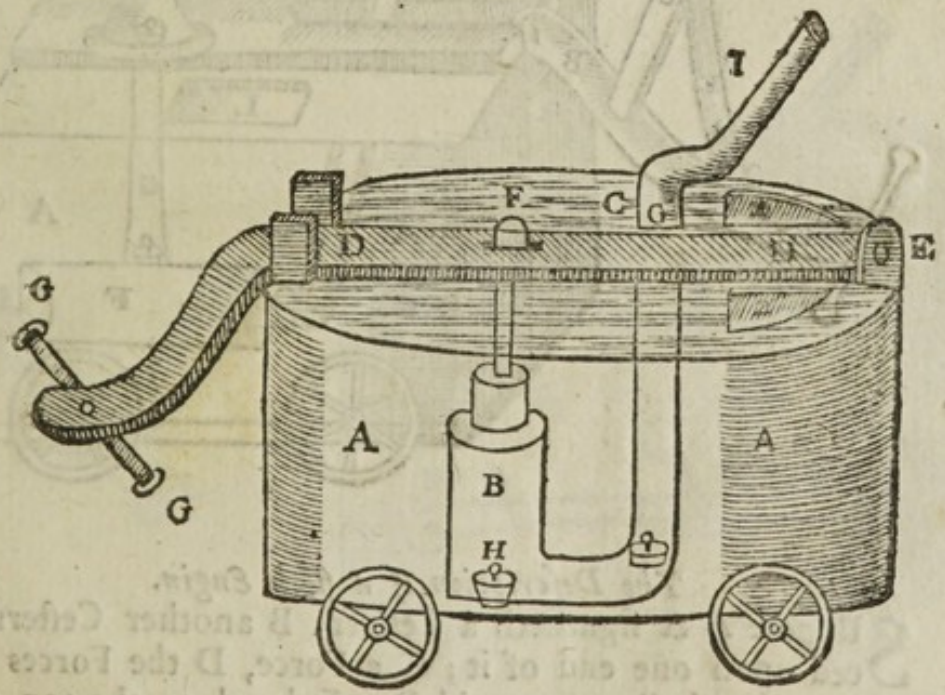
Fig. 9



The Deſcripcion of a third Engin.

LEt A A ſignify a Ceſtern, B a Barrell of yron or braſſe, faſtned in the midſt of the Ceſtern, with a force fitted unto it ; this Barrell muſt be made to turn up out of the Ceſtern, at C : and D D a Beam that lyeth a long the top of the Ceſtern, and it is made with a joynt at E, to lift up and down ; in the middle of this Beam there muſt be made a mortiſe hole, wherein the point muſt bee joynted, as may be ſeene at F : G G ſignifies two Handles whereby to lift up the Beam, which being lifted up, will with it draw the Force up alſo, and ſo the water in the Ceſtern, will come up into the Barrell, at the Sucker that is at the bottom of it noted H ; now the Beam falling down, preſſeth the water violently out at the pipe I, at the top of the Ceſtern : Z Z ſignifieth two holes whereat the Ceſtern muſt continually be ſupplyed with water.

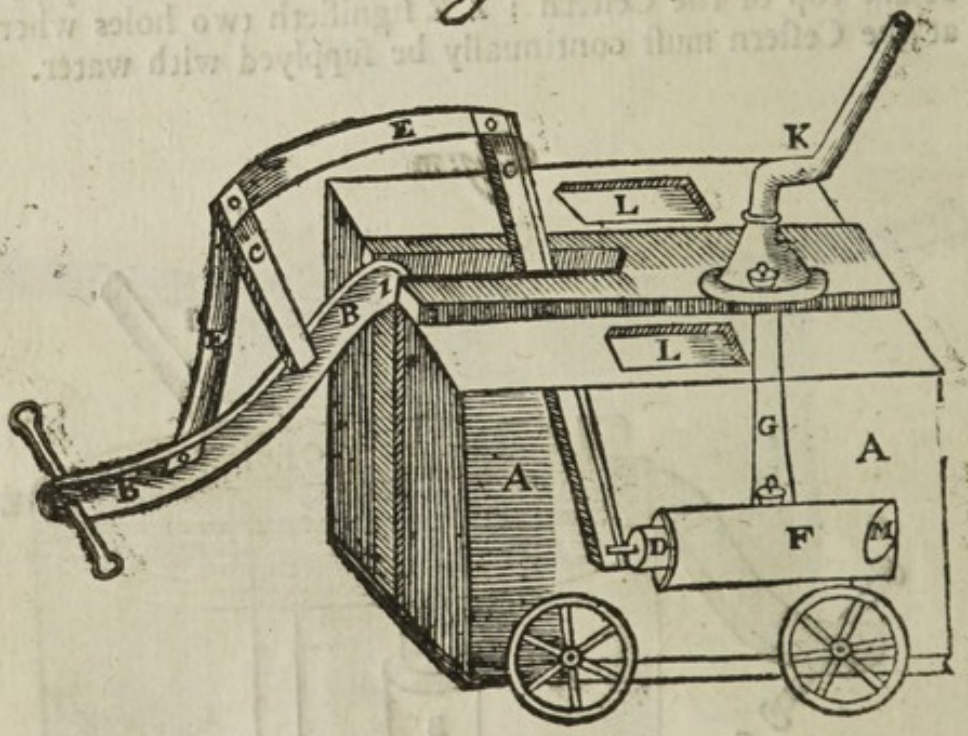
Fig. D



The Descripcion of a fourth Engin.

THe letters A A signifie a Cestern, B B a Beam that is joynted at I, C C two pieces of Timber fastned in the aforesaid Beam ; unto the lowermost end of one of the peeces noted C the Force is linked, and it is noted with the letter D within the Cestern ; E E signifieth a Bar of yron that holdeth C C and B together ; F the barrell of the Force, fastned within two or three inches of the bottom of the Cestern, at the end whereof must bee a Clack or pallet as M : and G a brasse Barrell that proceedeth from the Barrell of the force ; K the pipe out of which the water is forced ; L L two holes to supply the water at.

Fig. 11.

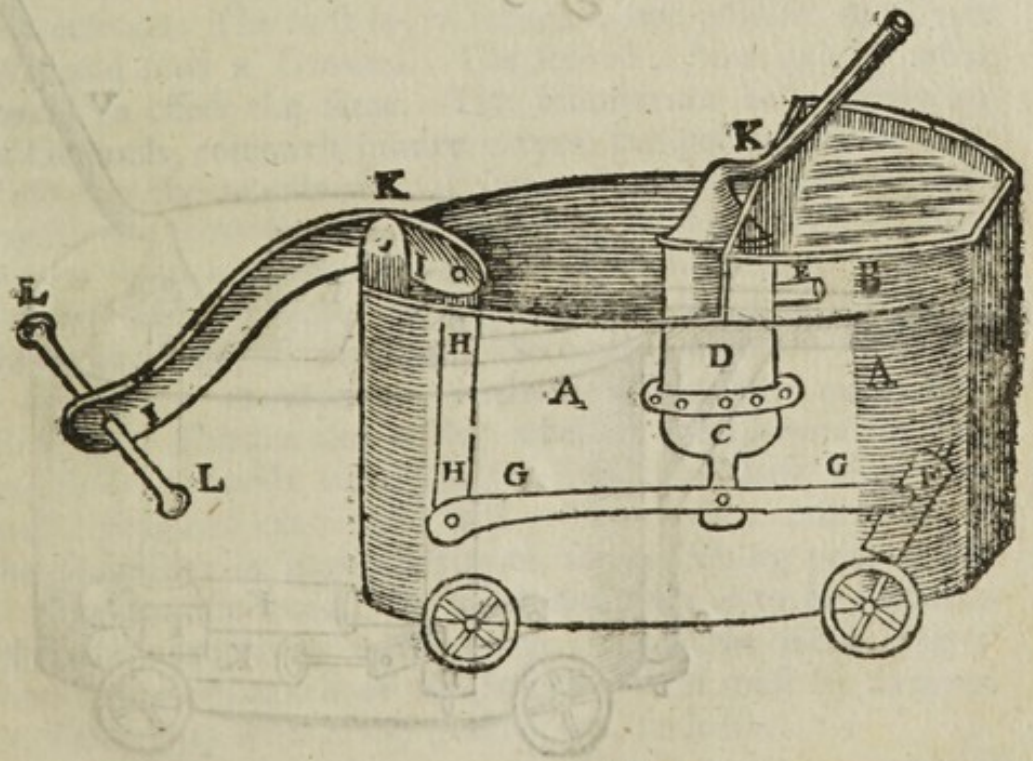


The Descripcion of a fifth Engin.

SUppose A A signifieth a Cestern, B another Cestern placed upon one end of it ; C a Force, D the Forces Barrell, with a hollow pyramid Box sodered to the top of it; K the

K the Pipe for the water to be forced out at. At the bottom of the Ceſtern B there muſt be a Pallet or Clack as E, which muſt paſſe thorow the ſide of the Ceſtern B, and enter the Barrell of the Force; F ſignifieth a peice of Timber placed athwart one end of the lower Ceſtern, & let in at both ends with Gudgins, that it may turn round. In the midſt of this, there muſt be a mortiſe, and in it muſt be faſt pinned another peece of Timber, noted with G G; in the middeſt wherof muſt be joynted an yron rod noted with H H, the uppermoſt end of this rod, muſt bee joynted unto a heavy peice of Timber as I I, which peice of Timber muſt be hanged alſo on the Ceſtern, by a joynt under K, ſo that it may be lifted up, and let fall down: L L ſignifieth two handles to lift the Timber Beam up by. Note that if you lift up the ſayd Beam I I, the Force draweth the water out of the Ceſtern B, into the Barrell D, and when you let ſlack the Beam, the waight thereof ſquirteth the water moſt violently out of the Barrell at the Pipe K.

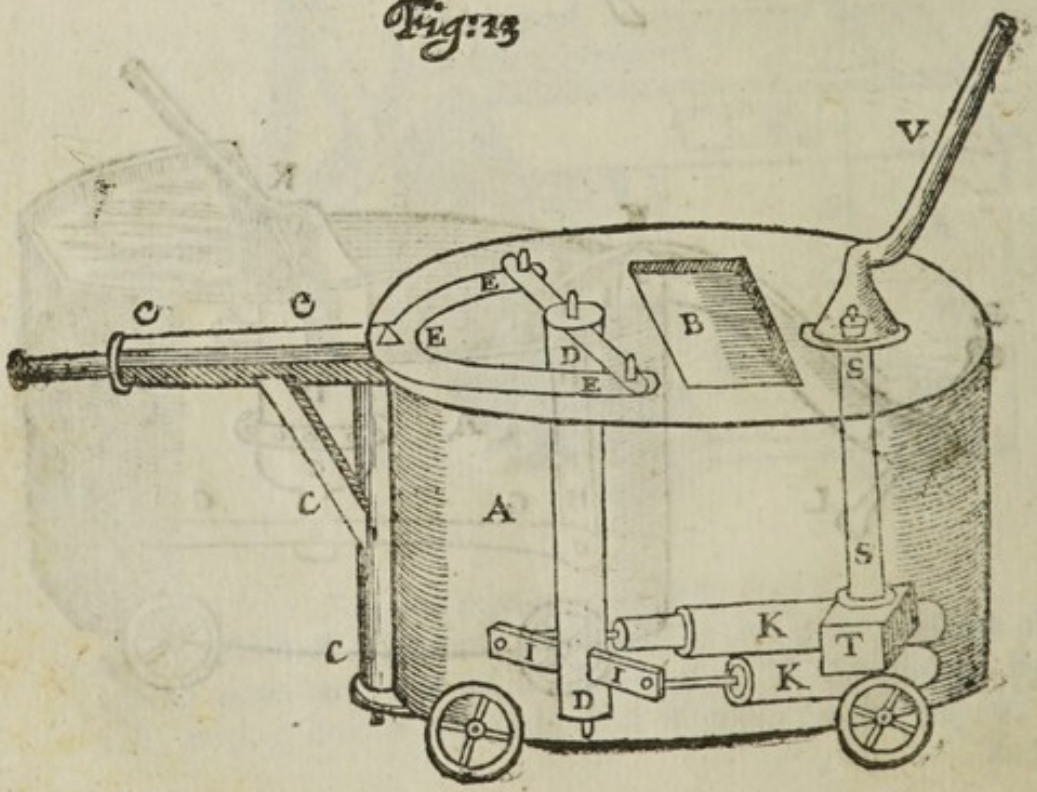
Fig: 12



The Deſcripcion of a ſixth Engin.

LEt A A ſignify a Ceſtern, B a hole to put the water in at, C C C C a Gate to move to and agen, D D a Spindle ſtanding upright in the Ceſtern towards the Gate's end, E E E a ſtrong ſemicircular yron, which being faſtned unto the Gate, the ends thereof muſt turn up, and be put thorow two holes of an yron Bar that muſt paſſe thorow the top of the Spindle: in the bottom of the Spindle muſt alſo be faſtened another ſtrong yron Bar as I I, unto each end whereof muſt be linked a Force. K K ſignifieth the two Barrels of the aforeſayd Forces, having inlet Pallets at their ends; T a Box at the top of the ends of the Forcers Barrels K K; this Box hath two Clacks at the bottom anſwering to two holes made in the ſayd Barrels; S S a pipe that proceedeth from the Box T, this pipe entreth a pyramid Box at the top of the Ceſtern, and in it is placed a Sucker: V ſignifieth a pipe proceeding from the top of the pyramid out of which the water is forced.

Fig: 13



CHAP. 9.

THere is nothing (as the Saying goes) bee it never so profitable, but that from the ſelfe ſame thing there may ariſe as great a diſcommodity, if it exceed the bounds and limits that Nature hath aſcribed unto it. What is more needfull and neceſſary to the fructifying of the Earth than Water, ſo it be moderate? And what is more hurtfull if it doe ſuperabound? There cannot be a ſafer Guard about a Houſe, Town, or Citty; nor is there a more domineering Lord or pernicious Enemy, if it be not kept within its circumſcribed bounds.

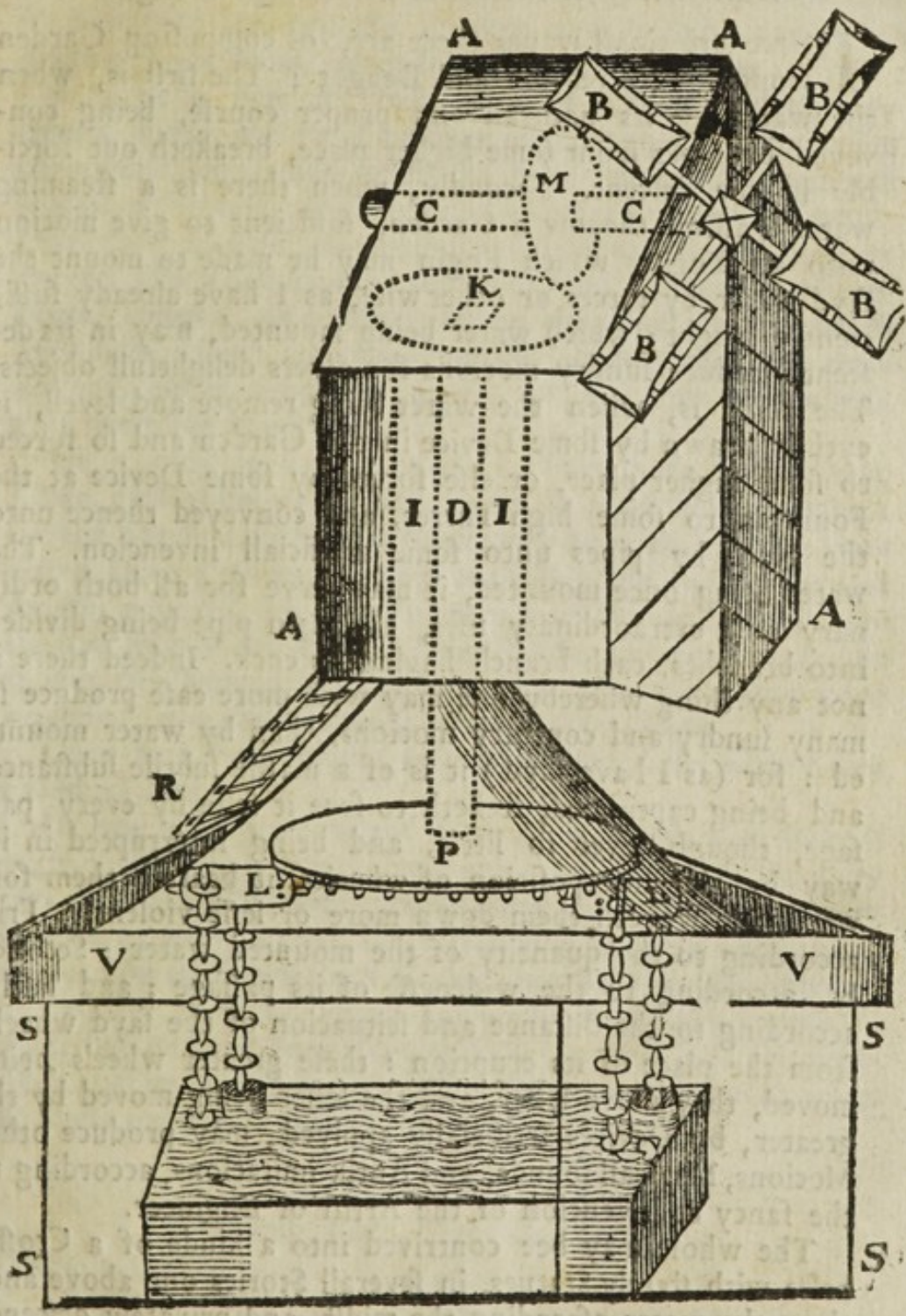
Divers Citties we read of, that it hath waſted and worn away; divers it hath ſwalloued up: and ſome there are yet that it would bring to ruine, were it not for the great coſt and paines that is continually uſed to reſiſt the violence of the ſame. Sundry Fields and Meddowes there are, that are uſually overfloated a long time together, which by timely prevencion might by intrenchments be avoyded, and many times otherwayes without much expences. Now there are two main and principall things to be conſidered in theſe our proceedings: The firſt is, whether it bee poſſible to drayn ſuch and ſuch a Ground. The ſecond, how and by what means to effect the ſame. The inundacion or overflowing of Grounds, commeth ſundry wayes, but principally by two: Firſt, by the overflouing of ſome adjacent or near adjoyning River: Secondly, by the drayning or deſcending of rayn waters from ſome high Grounds. For the firſt, conſider in the firſt place, whether the Ground you deſire to drayn, lie ſomewhat high, or very low. Secondly, whether there bee a convenient conveyance, without doing hurt unto other Grounds: Thirdly and laſtly, whether the Ground be firm and faſt, or mariſh and ſpongy. Every of theſe being duly conſidered and examined, will yeild ſufficient teſtimony of the poſſibility or impoſſibility of accompliſhing your deſire.

Now for the ſecond, by what meanes it is to be performed; which are divers: If it come through the overflouing of ſome River or Branch of the Sea, the ſame muſt be dammed or blocked up with piles, gravell, and ſuch like.

If there be any River near adjoyning to a floated ground, it happeneth oftentimes that the floated ground is so scituated, that the hurtfull water may by Trenches voyded into the same; but if by Channels only it cannot be effected, yet the applikacion of certain Mils and Engins may doo it: and here I cannot with silence overpasse the great industry, labor, and expences, of divers in forreyn parts, whereby they have converted divers in-lands, and parts of the Sea, into Fields of Corn, and habitable Townes. It happeneth many times that the ground from whence we would soak the water, lieth somwhat high, and then by petty Channels the water offending may be draynd into a Pond or great Cestern made or placed at the loweſt corner of the same ground, and so by a Spout passe the same upon a Mill wheel, which Mill may be employed for grinding of Corn, for fulling of Cloth, or for cutting of Timber, and afterwards by a Trench conveyed into some by-River. Where there is not such convenience, a Wind-Mill may be placed. And where you cannot gayn sufficient advantage from the Wind, Horse-Mils may be placed.

The Descripcion of a Wind-Mill, to convey Water.

LEt A A A A signifie the body of the Mill, B B B B the Sayles, C C the Spindle of the Sayles, M a wheele fastened upon the Spindle, D another Spindle having two wheeles fastened unto it, one at the top noted with K, and another at the bottom noted with P, this Spindle is made to turn in the main Piller, upon which the body of the Mill is made to turn; the sayd piller is noted with I I. The Wheel P moveth two other wheeles noted each of them with L: these two wheeles turn two Chaines that are put over them. R signifieth the Ladder for to goe up to the Mill. S S S S a Scaffold whereon the Mill is placed. V V a Battlement round about the top of the Scaffold, unto the inner side of this Scaffold, are fastned divers yron rings, unto which by meanes of a cord that is to be fastened unto the Ladder noted R, the Mill is to bee bound, which way soever the Wind sitteth. Marke the Figure following.


A
A
B
B
M
C
C
K
B
B
I D I
A
A
R
P
L
L
V
V
S
S
S
S

CHAP. 10.

Of Water-works for Recreacion and Delight: in generall.

THree principall wayes there are, of composing Garden Works for Recreacion and Delight; The first is, when the water by its naturall and proper course, being conveyed by Pipes from some higher place, breaketh out forcibly in the descent. Secondly, when there is a steaming water passing thorow a Garden, sufficient to give mocion unto an Engin, which Engin may be made to mount the sayd water by forces or other wise, as I have already sufficiently taught; which water being mounted, may in its descent produce sundry mocions for divers delightfull objects. The third is, when the water lying remote and levell, is eyther drawn by some Device in the Garden and so forced to some higher place, or else forced by some Device at the Fountain to some high Turret, and conveyed thence unto the Place by pipes unto some artificiall invencion. The water being once mounted, it may serve for all both ordinary and extraordinaty uses, the main pipe being divided into branches, each branch having its cock. Indeed there is not any thing whereby one may with more ease produce so many sundry and contrary mocions, than by water mounted: for (as I have sayd) it is of a massie subtile substance, and being captivated, seeketh to free it selfe by every passage, though never so little, and being interrupted in its way by the interposicion of wheeles, it beareth them forward, or swayeth them down more or lesse violently. Frist according to the quantity of the mounted water; Secondly, according to the wideness of its passage; and lastly, according to the distance and scituacion of the sayd wheels, from the place of its erupcion: these greater wheels being moved, they move lesser, and the lesser being moved by the greater, by Devices artificially applyed, may produce other Mocions, Muzicall sounds, and Antik imitacions, according to the fancy & invencion of the Artist or Engineer.

The whole may bee contrived into a kinde of a Crosse, beset with stately Statues, in severall Stories one above another, the water ascending the midst, and privately descending

ing upon certain wheels, which may turn other wheels, whereupon may be fixed divers Images ; and so there will be a circular Mocion. By turning certain lower cocks, or drawing back shuts, other Mocions may bee made.

Or else it may be contrived into a Rock, which may have a doore for the Gardiner to enter in at, who beeing throughly acquainted with the same, may by turning of Cocks or wheels, or drawing back shuts, passe the water from side to side, according as the Mocions are made to move. The Rock may be set forth with the shapes of Serpents, Beasts, and other, either dreadfull or delightfull Spectacles; some receiving mocion, others changing their posture, either from the water, or else from the wheels that force the water.

Or it may be contrived into a Rock bedect with Shels, Glass, and glistering Stones, rudely & confusedly compiled: on the out side within the Rock, may be made a pretty conceited Dining Room, hanged with Tapistry, or wildly and antikly paynted. Muzyk also may be privately disposed upon one side of the Room. This Room may be so made, as it may be changed in an instant, and that more than once or twice, and the Muzyk to change accordingly.

Or it may be contrived into a Fountain beset with divers naked Figures.

Or you may place divers immages in sundry and severall parts of the Garden, the more antik and ridiculous, the more pleasant and delightfull. These being made hollow, or perforated in divers parts, the water may bee sent unto them, by turning of divers stock Cocks, and so spin out thereat, so that the ignorant person can walk no where to gape about, but he shall be washed whensoever the Gardiner pleaseth, or if his own folly be such as to be medling with what he is unacquainted withall.

CHAP. 11.

Of Voyces, Cals, Cryes, and Sounds.

IT is necessary to speak somwhat here concerning Voyces, Cals, Cryes, and Sounds. They are known among some Shopkeepers, by the names of Cals; and there are long white

Boxes of them, which are transported hither from *France*: each Box contayning eleven in number, the names whereof follow: a Kooko, a Peacock, a Bittern, a Levret, a Stag, a Quayl, a small Bird, a Hare, a Drake, a Hedg-hog, a Fox.

They are seldom sold alone, and altogether at a very dear Rate. There is no difficulty in their making, nevertheless, for to satisfy the expectacion of some, I have not only set down their Forms, but also explicated the same so far as I thought needfull. Certain others there are, that I found out when I made the forenamed, and I doubt not but if another shall essay to make them again, he may ad some other unto their number.

Of the Kooko pipe.

FIrst you must turn a peece of wood hollow, like unto a Steel-stick, about three inches deep. Let the diameter of the hollowness towards the top, bee about one inch and a quarter or lesse; then make a stoppell unto it about a quarter of an inch thick, and cut a little slip from off one side of it: then put it into the mouth of the other turnd wood, and cut a little square hole in the sayd turnd peece, so that the lower side of the sayd hole may be equall with the bottom that you put in: then bore a small hole in the round end of the hollow turnd wood, about the bigness of the tag of a point; also bore such another in the middle of the bottom that you put in: then hold it between your thumb and middle finger, with the flat end towards your mouth, and blow into the pipe hole of the same, observing this; that your blast must be doubled according to the number of syllables that the Voyce doth contayn, as *Koo-ko*: and towards the end of the second syllable, you must stop the top of your fore-finger upon the hole of the round end of the pipe, which maketh the second syllable sound flat, and so it will give the tru & lively sound of *Kooko*: which when it is perfect and liketh you, you may gleu the bottom fast in. The same pipe giveth the right and lively sound or cry of an Oul, as Hoo ho ho ho hoo: but you must (as I have sayd) double your breath according to the number and pronunciacion of the syllables contayned in the sayd Voyce, the first whereof is long, the next three short, and the last long.

A.

A Cock.

I Have produced the Voyce of a Cock out of the former Pipe, only by boaring 4 holes round about the ſide towards the ſmall end, one oppoſit to the other, and ſtopping the two little holes at the ends.

The Drake, Bittern, Hare, Levret, Peacock, and Hedg-hog.

THe Pipes that ſound the Drake, Bittern, Hare, Levret, Peacock, and Hedg-hog, are almoſt made after one manner, and it is the ſize alone that alters the Voyce; the deſcripcion of which I have ſet down in generall, as followeth:

They conſiſt each of them of foure ſeverall parts, one to be skrewed or wrung upon another. The firſt part is like the mouth of a Cornet, and it is noted with the Letter A; the ſecond, is a peece of wood made hollow quite thorow, into one end whereof the peece A is to be wrung, and the other end is to be upon another peece, as C, but this part before ſuch time as you wring it on, muſt have the following braſſe faſtened in it.

Make or cauſe to bee made, a piece of braſſe like unto a Kane ſplit in the middle as A, fit a Cover unto it, of thin yellow Latten, ſuch as they tag points withall, that it may lie cloſe all over the top of the hollowneſſe of the aforeſaid peece of braſſe. Let this Tongue or Cover bear a little from the braſſe, towards that end that is cloſed. Note that the middlemoſt wooden peece, muſt be of ſufficient wideneſſe for the Tongue to play in without let or hinderance. The like braſſes (but of different ſizes) muſt be made: for every of the forenamed pipes: for it is the ſize of the Braſſe (as I have told you) that alters the voyce.

A Stag and Fox.

THe Stag and Fox Cryes, are made like unto the aforeſaid; only their Tongues bear a little more from their braſſes, and there is no Cornet mouth upon them.

The Hog, Cow, and Lyon.

THe Hog, Cow, and Lyons Cryes, may be imitated after the ſame manner as the Stag and Foxes, but the

brasses of these must bee fuller, and the lowermost wood wherein the brasses must bee fastned, must bee longer.

A Plover and a Puppie.

MAke a small brasse in like manner as you made the Peacocks, and if you blow at the close end it will yeeld the voice of a Plover, but if you put the open end into your mouth, and draw in your breath, it will give a sound just like the whining of a Puppie.

A Call for small Birds.

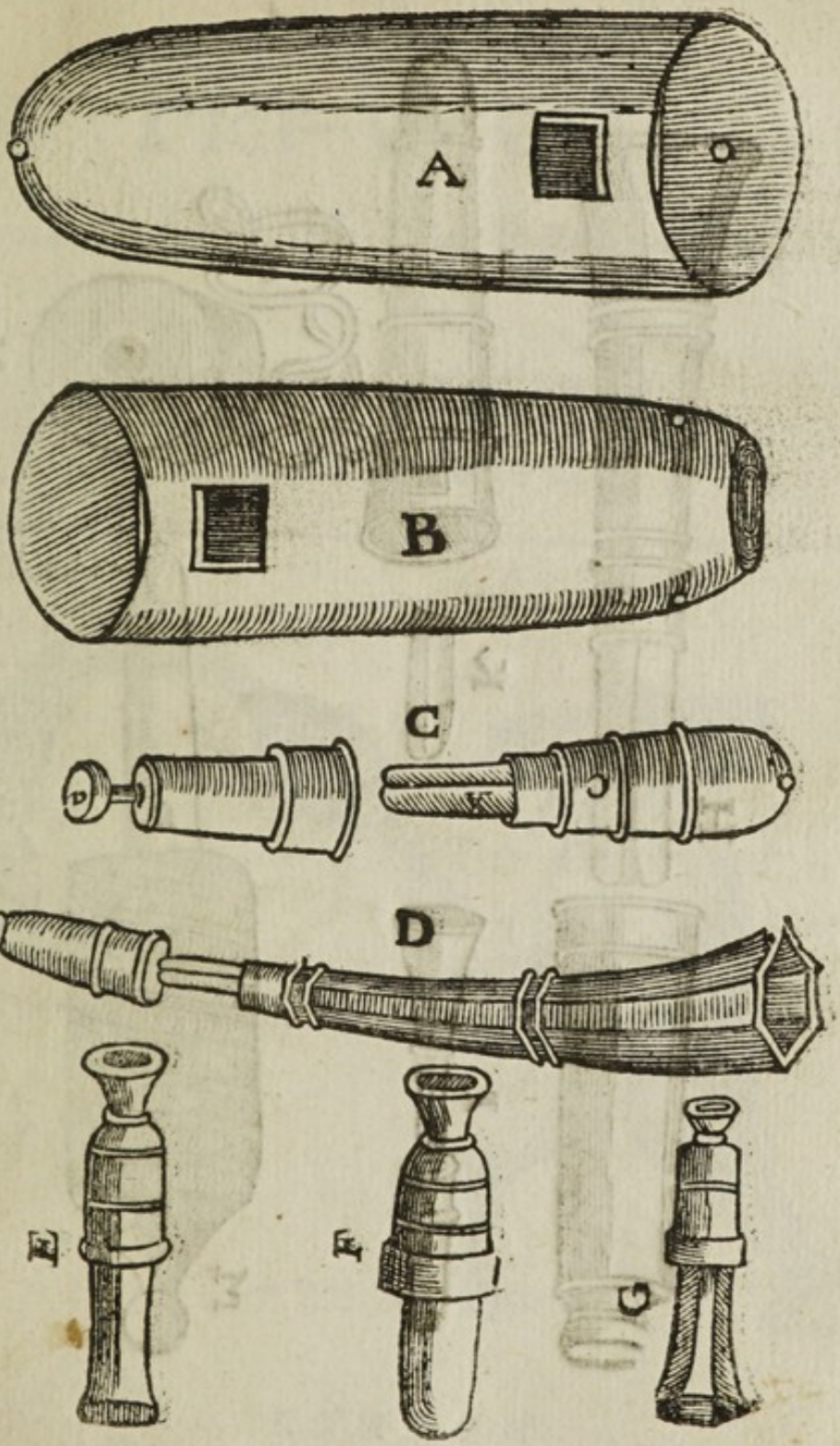
THis is in all respects made like unto a whistle, only there is a little hole at the lower end, as big as you may put the tag of a point into.

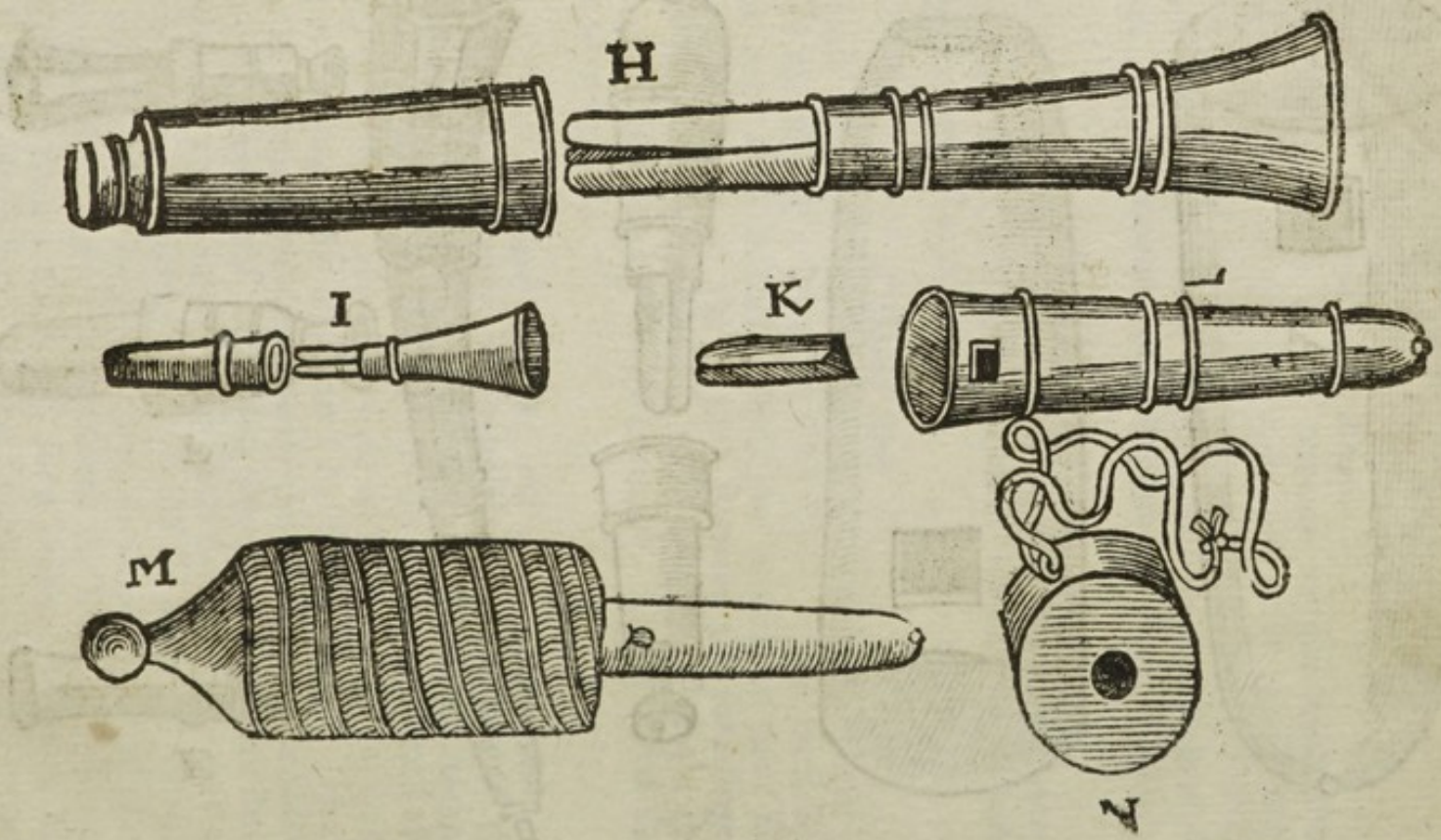
A Quayl Call.

A Quayl Pipe or Call is a small Whistle, and there is over the top of it some writhed wyer, which must bee wrought over with leather ; hold the Whistle in your left hand, and the top of the leather between the fore-finger and thumb of your right hand, and by pulling straight the said leather, and letting it slack nimbly, it will sound like the cry of a Quayl.

A Lark, Linnet, and Kyte.

THe former Call may be sounded by a Sparrow Call, wherewith I have heard a Frenchman sound the singing of a Lark ; also, I have heard him by the same, sound the whistling of a Linnet, the same Call will sound the voyce of a Kyte and Quayl. An Irishman I have seen (which I much wonder at) imitate with his mouth the whistling of a Blackbird, a Nightingall, and Lark, yea almost of any small Bird, as exquisitely almost as the very Birds themselves ; and all is by the cunning holding the artificiall blade of an Onyon in his mouth. The Figures follow, and every one of them is marked with a Letter. A signifieth the Call for a Kooko and an Oul. B for a Cock. C for a Drake. D for a Bittern. E for a Hedg-hog. F for a Levret. G for a Peacock. H a Stag. I for a Fox. K for a Plover and a Puppy. L for small Birds. M a Quayl. N for a Kyte, Lark, and Linnet.


A
B
C
D
E
F
G


H
I
K
M
N

The composing of all manner of

Fier-Works

For Triumph and Recreacion,

Plainly and Exactly taught

By JOHN BATE.

LONDON
Printed by *R: Bishop* for *Andrew Crook*, at the Green
Dragon in Pauls Churchyard. 1654

To the Reader.

COurteous Reader, I once desisted since I began this VVork, by reason of the occurrence of certain Authors, that contrary unto my knowledge had laboured so fully herein: but after Consideracion had (that for the most part they were but Transtacions) I thought it might be no lesse lawfull and commendable for me than for others, to communicate unto such as are yet desirous of further informacion, that wherein I have bestowed both cost & pains. Notwithstanding, I have so used the matter, as that I might not derogate from the Estimacion had of others to encrease my own. Read it throughly, judge indifferently, and if thou likest it, practise consideratly. If thou art ignorant herein, I am sure it will instruct thee; and though well experienced (which perhaps thou art) I make no question, but that thou mayst finde somwhat which thou hast not heard of before: So farwell.

Your Well-willer,

JOHN BATE.

Of Fier-Works.

HAving ever found (in conference with divers desirous of instruction in any Art or Science whatsoever) that those things whose causes have been obvious unto apprehension, have more affected the Learner; I therefore think good (before I come to the matter it selfe) to set down some few *Præcognita* or *Principles* (as I may so call them) whereby such as are ingenious (upon ocasion) may inform themselves, if they stand in doubt of the cause of any thing that is hereafter taught.

Certayn Præcognita or Principles, wherein are contayned the Causes and Reasons of that which is taught in this Part.

1 The four Elements, Fier, Ayer, Water, and Earth, are the *prima Principia,* I mean the materials whereof every sublunary body is composed, and into the which it is at last dissolved.

2 Every thing finding a dissolucion of those *naturæ catenæ,* that is, means whereby their *principia* are connected and joyned together, their lighter parts ascend upwards; and those that are more grosse & heavy, do the contrary.

3 It is impossible for one and the selfe same body to possess at one time two places; It followeth therfore, that a dense body rarified and made thin, eyther by actuall or potenciall Fier, requireth a greater quantity of room to be conteyned in, than it did before. Hence it is, that if you lay your hand upon a Glasse, having a straight mouth reverst into a Dish of water, it rarifieth the Ayer contayned therein, and makes it break out thorow the water in bubbles. Also, that Gun-powder incloſed in the Barrell of a

Gun, being rarified by Fier, applyed unto the touch-hole, it seeketh a greater quantity of room, and therefore forceth the Bullet out of the Barrell. This is called violent mocion.

4 According unto the strength and quantity of a dense body rarified, and according unto the form and length of its incloſure, it forceth its compreſſer further or nearer at hand.

Thus much ſhall ſuffice to have ſpoken concerning the *Præcognita*: Now I will paſſe *ad majora, & ad magis neceſſaria*: to wit, thoſe neceſſary Inſtruments, and ſeverall ſorts of Ingredients, that ought to be had in readineſſe.

As for the inſtuments they are theſe; Morters and Peſtles, Serces; alſo ſeverall ſorts of Formers, Paper, Parchment, Canvas, Whipcord, ſtrong binding Thread, Gleu, Rozin, Pitch, with divers Veſſels meet to contain and mingle your Compoſitions in. The ingredients like wiſe are chiefly theſe, Saltpeter, Rochpeter, Sulphur, Charcoal, good Gunpouder, Filings of Steel, oyl of Peter, and ſpirit of Wine.

Inſtructions for chuſing your ingredients.

SAltpeter is very good, if that being layd upon a boord, and Fier put to, it riſe with a flamed ventoſous exhalacion rayſing on ſcum, nor leaving no pearl, but only a black ſpeck burnt into the boord.

The beſt Brimſtone, is quick Brimſtone, or live Sulphur, and that ſort is beſt that breaketh whiteſt; if this cannot be gotten, take of the whiteſt yellow Brimſtone.

The beſt Coales for uſe are the Sallow, Willow, Hazell, and Beech; only ſee they be well burnt. Every of theſe ingredients muſt be poudred finely and ſearſed.

All kindes of Gunpowder are made of theſe ingredients impaſted, or incorporated with Vineger, or Aquavitæ, and afterward grayned by Art. The Saltpeter is the Soul, the Sulphur the Life, and the Coales the Body of it. The beſt ſort of pouder may be diſtinguiſhed from others, by theſe ſignes:

1 If it be bright and incline to a bleuiſh colour.

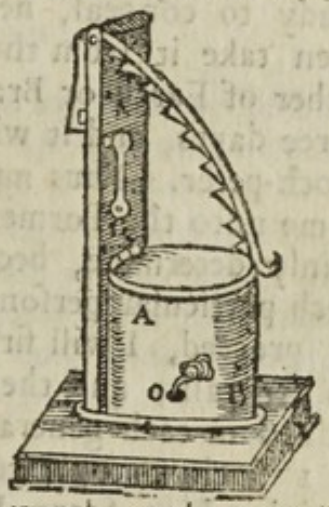
2 If in the handling it prove not moyſt, but avoydeth quickly.

3 If.

3 If being fired, it flash quickly, and leave no dregs nor setlings behinde it.

A Device to try the strength of divers sorts of Gunpouder.

IF so be you have at any time divers sorts of Gunpouder, and it is your desire to know which of them is the strongest, then you must prepare a Box, as A B, being foure inches high, and about two inches wide, having a Lid joynted unto it. The Box ought to be made of yron, brasse, or copper, and to be fastned unto a good thick plank, and to have a touch-hole at the bottom, as O, and at that end of the Box where the hinge of the Lid is, there must stand up from the Box a peece of yron or brasse, in length answerable unto the Lid of the Box: this peece of yron must have a hole quite thorow it, towards the top, and a spring, as A G, must bee screwed or riveted, so that the one end may cover the sayd hole. On the top of all this yron, or brasse that standeth up from the Box, there must be joynted a peece of yron (made as you see in the figure) the hinder part of which is bent down-ward, and entereth the hole that the spring covereth; the other part resteth upon the Lid of the Box. Open this Box Lid, and put in a quantity of pouder, and then shut the Lid down, and put Fier to the touch-hole at the bottom, and the pouder in the Box being fired, will blow the Box Lid up the notches more or lesse, according as the strength of the pouder is: so by fyring the same quantity of divers kindes of pouders at severall times, you may know which is the strongest. Now perhaps it will be expected that I should speak of the making of Saltpeter, Gunpouder, Coales, with the refining of Sulphur: but because they are so commonly to bee had, and to be bought at better rates then I know they can bee made by any that intend it for their private use, I have



for-born it : There are divers I am sure that would willing'y be in action : I have thought fitting therefore to set down the collection of naturall Saltpeter, which is a kinde of white excrescence growing upon stone-walles, and (as I have seen great store) in the arches of stone-bridges. First therefore gather this white excrescence, and ad unto it Quick Lyme, and Ashes, mingle them and put them into a halfe-Tub that hath a hole to draw the liquor out at ; then put into this halfe-Tub warm water, and let it stand untill all the Peter be dissolved ; let it then drayn out at the hole by little and little, and if the liquor be not cleer, double a broun paper, and put it within a Tunnell, and strayn the liquor thorow it. Then boyl it and scum it untill it bee ready to congeal, neither too hard, nor yet too tender : then take it from the fier; and put it into shallow vessels, either of Earth or Brasse ; set them in a cold place two or three dayes, and it will shoot into ysicles, and this is called Roch-peter. Thus much for the ingredients. Now I am come unto the Formers, the number whereof I cannot certainly determine, because it dependeth upon the variety of each particular persons invencion. Now that I may formally proceed, I will first make some distinction of each kinde in generall ; and then I will speak of every particular contained in each generall. Fier-works are of three sorts.

1 Such as operate in the Ayer, as Rockets, Serpents, Raining Fier, Stars, Petards, Dragons, Fier-drakes, Fiends, Gyronels, Fier-wheels, or Balloons.

2 Such as operate upon the Earth, as Crackers, Trunks, Lanterns, Lights, Tumbling Bals, Saucissons, Towers, Castles, Pyramids, Clubs, Lances, Targets.

3 Such as burn in or on the water, as Rockets, Dolphins, Ships, Tumbling Bals, Mermayds.

Part of either of the three kindes are simple, and part are compounded ; part also are fixed, and part moveable. First, I will treat of the divers composicions, and then of the Formers, Coffins, and manner of composing every of them.

Of

Of the divers Compoſicions of Fier-Works *for the Ayer.*

FIrſt, of the compoſicions of Fier-works, for the Ayer; and therein firſt I will ſpeak of the compoſitions for Rockets, becauſe that all moveablt Fier-works have their mocion from the force of them accordingly applyed.

Compoſicions for Rockets of all ſizes, according unto the preſcripcion of the noted Profeſſors, as Mr. Malthus, Mr. Norton, *and the French Author, Des Recreacions Mathematiques.*

TAke this from me, whoſoever thou art that deſireſt to be inſtructed. Never rely abſolutly upon a compoſition, nor make many Rockets, or other ſorts of Fier-works of a compoſition, untill ſuch time as thou haſt made triall once or twice of the ſame, leſt that thou miſſe of thy aym, but after triall you may proceed and perform your intencions with credit. By the compoſitions you may make a gueſſe, and as they prove you may allay or quicken them accordingly.

A compoſition for Rockets of one Ounce.

Take of Gun-pouder, Saltpeter and Charcoall, of each one ounce & a halfe, mingle them together, and it is done. Note here (as I told you before) that all your ingredients ought to be firſt poudred by themſelves, and afterwards mixed very well together.

A Compoſition for Rockets of 2 and 3 Ounces.

Take of Gunpouder foure Ounces and a halfe, Saltpeter one Ounce, mix them together.

A Compoſition for Rockets of 4 Ounces.

Take of Gunpouder foure pounds, Saltpeter one pound, Charcoal foure ounces: mingle them together.

Another Composicion for Rockets of 4 Ounces.

Take of Gunpouder foure pounds, Saltpeter one pound, Charcoal foure ounces; Brimston halfe an ounce, mingle them together.

A Composicion for all middle siz'd Rockets.

Take of Gunpouder one pound, two ounces of Charcoales; mingle them.

A Composicion for Rockets of 5 or 6 Ounces.

Take of Gunpouder two pound 5 ounces, of Saltpeter halfe a pound, of Charcoal 6 ounces, of Brimston and yron scales, of each two ounces: mingle them.

A Composition for Rockets of ten or twelve Ounces.

Take of Gunpouder one pound and one ounce, Saltpeter foure ounces, Brimston three ounces, and a halfe, Charcoal one ounce: mingle them.

A Composition for Rockets of one pound, or two.

Take of Saltpeter twelve ounces, Gunpouder twenty ounces, and Charcoal three ounces, quick Brimston and scales of yron, of each one ounce: mingle them.

A Composicion for Rockets of eight, nine, and ten pounds.

Take of Saltpeter eight pounds, Charcoal two pounds, twelve ounces, of Brimston one pound foure ounces. Note that no practicioner (how exact soever) ought to rely upon a Receipt, but first to try one Rocket, and if that be too weak, add more Gunpouder, if it be too strong let him add more Charcoal, untill he finde them fly according unto his desire. Note that the Charcoal is only to mittigate the violence of the pouder, and to make the tayl of the Rocket appear more bentifull. Note also that the smaller the Rockets be, they need the quicker Receipts, and that in great Rockets, there needeth not any Gunpouder at all

The Composicion for middle siz'd Rockets may serve for Serpents, and for rayning fire, or else the Receipt for Rockets on the ground, which followeth hereafter.

Compo-

Compoſicions for Starrs

Take of Saltpeter one pound, Brimſton halfe a pound, Gunpouder foure ounces; this muſt be bound up in paper or little ragges, and afterwards primed.

Another Receipt for Starrs

Take of Saltpeter one pound, Gunpouder and Brimſton of each halfe a pound; theſe muſt be mixed together, and of them make a paſte, with a ſufficient quantity of oyl of peter, or elce of fayr water; of this paſte you ſhall make little Bals and roul them in dry Gunpouder duſt; then dry them and keep them for your occaſions.

Another

Take a quarter of a pint of *aqua vitæ*, and diſſolve therein one ounce and a halfe of Camphir, and dip therein Cotten bumbaſt, and afterwards roul it up into little Bals; afterwards roul them in pouder of quick Brimſton, and reſerve them for uſe.

Another Receipt for Starrs, whereof you may make Fiends and divers Apparicions according unto your fancy.

Take Gum-dragant, put it into an yron pan, and roſt it in the Embers; then pouder it, and diſſolve it afterwards in *aqua vitæ*, and it will become a jelley, then ſtrain it; alſo diſſolve Camphir in other *aqua vitæ*. Mix both theſe diſſolucions together, and ſprinckle therein this following pouder.

Take Saltpeter one pound, Brimſton half a pound, Gunpouder three pound, Charcoal half a pound; when you have mingled and ſtirred them well together, mix them well with the aforeſaid jelley, and then make it into little Bals, or into what faſhion elſe you pleaſe, then cool them in Gunpouder duſt, and keep them for uſe,

Compoſicions for all Receipts of Fier-works, that operate upon the Earth

For Rockets there needeth only Gunpouder finely beaten and ſearced.

Likewiſe for all the other ſorts, ſearced Gunpouder will ſerve,

ſerve, which may be abated, or alayed with Charcoal duſt at your pleaſure.

Compoſicions for Fier-works, that burn upon or in the water.

A Receipt for Rockets that burn upon the water.

Take of Saltpeter one pound, Brimſton half a pound, Gunpouder half a pound, Charcoales two ounces. This compoſicion will make the Rockets appear with a great fiery tayl. If you deſire to have it burn clear, then take of Saltpeter one pound, three ounces of Gunpouder, Brimſton half a pound.

A Receipt of a compoſicion that will burn and feed upon the water.

Take Maſtick half a pound, white Frankinſence, Gumſandrake, quick-Lime, Brimſton, Bitumen, Camphir, and Gunpouder, of each one pound and a half, Rozin one pound, Saltpeter four pounds and a half: mix them all together.

A Receipt of a compoſicion that will burn under water.

Take Brimſton one pound, Gunpouder nine ounces, Refined Saltpeter one pound and a half, Camphir beaten with Sulpher and Quickſilver; mix them well together with oyl of Peter, or Linſeed oyl boyled, untill it will ſcald a feather. Fill a canvas Ball with this compoſicion, arm it, and ballaſt it with Lead at the bottom, make the vent at the top, fire it well and caſt it into the water, and it will fume and boyl up ſlouly.

A Receipt of a Compoſicion that will tind with the water

Take of oyl of Tile one pound, Linſeed oyl three pounds, oyl of yelks of Eggs one pound, new quick-Lyme eight pound, Brimſton two pounds, Camphir four ounces, Bitumen two ounces; mingle all together.

Another

Take of Rochpeter one pound, flouer of Brimſton nine ounces, Coales of rotten wood ſix ounces, Camphir one ounce

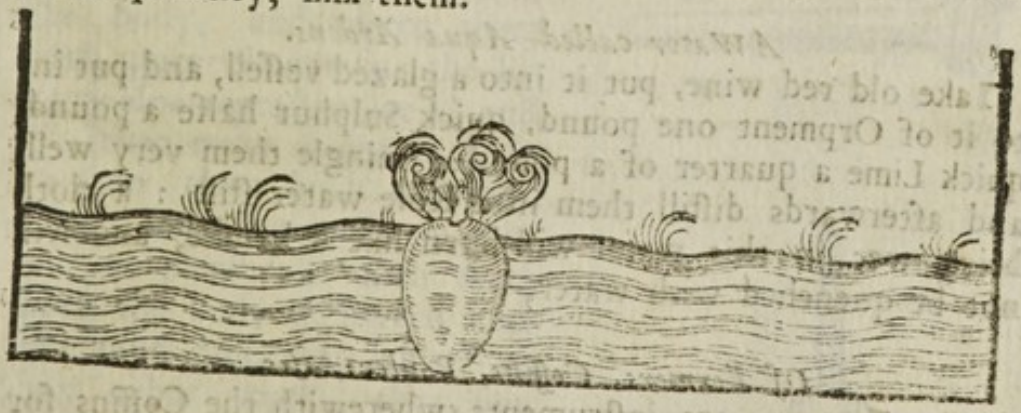
ounce and a halfe, oyl of Egges, and oyl of Tyle, enough to make the mixture into a paſte.

Or take Callamita one pound, Salt-Niter and Aſphaltum, of each foure ounces, quick Brimſton three ounces, liquid Varniſh 6 ounces: make them all into a paſte.

Put either of theſe compoſicions into a pot wherein is quick Lyme, ſo that the Lyme come round about the paſte; then lute it faſt, binde it cloſe with wyers, and ſet it in a Lyme-keel a whole baking time, and and it will become a ſtone that any moiſture will tind.

If you make a hole in the top of an Egge, and let out all the meat, and fill the ſhell with the following pouder, and ſtop the hole with wax, and caſt it into a running water, it will break out into a fier.

Take of Salt-Niter, Brimſton, and quick Lyme, of each a like quantity, mix them.



How to make Stouple, or prepare Cotten-weck to Prime your Fier-works with.

TAke Cotten-week, ſuch as the Chandlers uſe for kandles, double it ſix or ſeven times double, and wet it throughly in Saltpeter water, or *aquavitæ*, wherein ſome

Camphir hath been dissolved, or for want of either, in fayer-water ; cut it into divers peeces, roul it in mealed Gunpouder, or pouder and Sulphur ; then dry them in the Sun, and reserve them in a Box where they may lie straight, to prime Starres, Rockets, or any other Fier-works.

How to know the true time, that any quantity of fired Gun-match shall doe an exployt at a time desired.

Take common Gun-match, rub, or beat the same a little against a post to soften it ; then either dip the same in Saltpeter water, and dry it again in the Sun, or else rub it in a little pouder and Brimston beaten very small, and made liquid with a little *aqua vitæ*, and dryed afterwards ; try first how long one yard of match thus prepared will burn, which suppose to be a quarter of an houre, then four yards will be a just houre. Take therefore as much of this match as will burn so long as you will have it to bee ere your work should fier, binde the one end unto your work, lay loose pouder under, and about it lay the rest of the match in hollow, or turning so that one part of it touch not another, and then fier it.

A Water called Aqua Ardens.

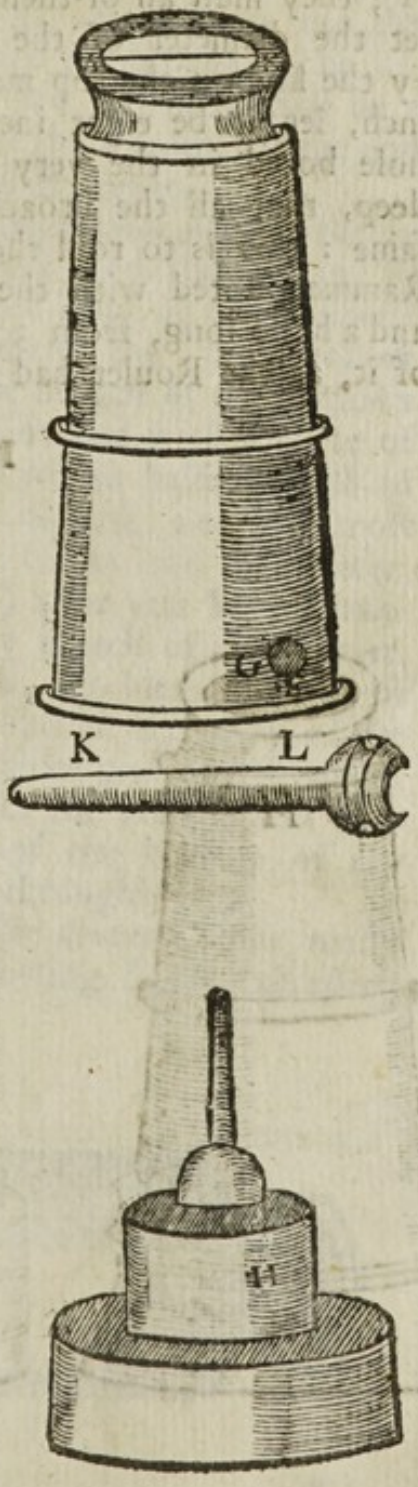
Take old red wine, put it into a glazed vessell, and put into it of Orpment one pound, quick Sulphur halfe a pound, quick Lime a quarter of a pound ; mingle them very well, and afterwards distill them in a Rose water still : a cloth being wet in this water will burn like a kandle, and will not be quenched with water,

Of Formers, Coffins, Roulers, &c.

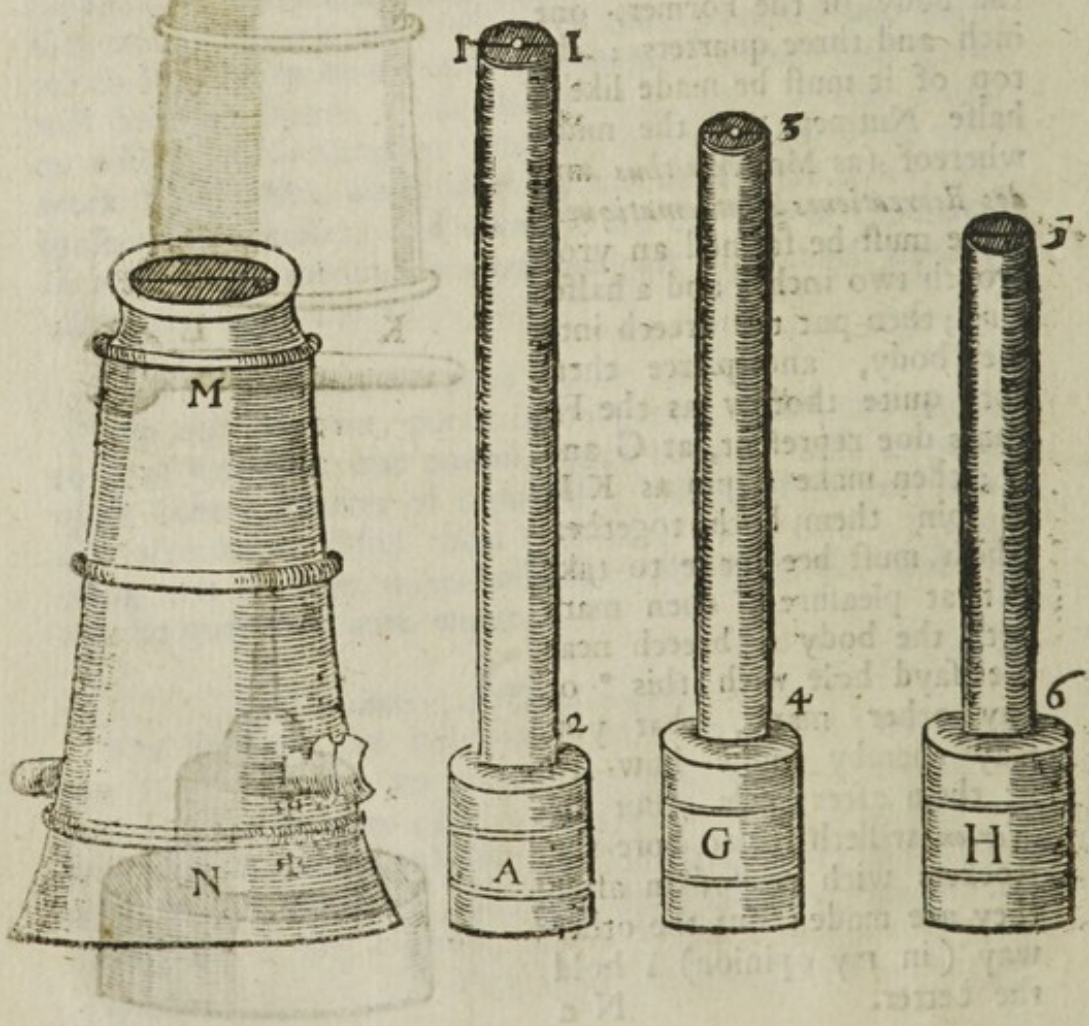
The Formers are instruments wherewith the Coffins for the Fier-works are made and formed, whereof in order ; and first for Rockets that operate in the Ayer. The Formers for Rockets consist of two parts, represented by the two next figures following, the uppermost whereof representeth the body of the Former, which must be made of Maple, Wallnut-Tree, or of other close and well seasoned wood,

or

or elſe of braſſe, ſeven inches wanting halfe a quarter in length, turned equally, and exactly hollow quite through, the diameter of whoſe hollowneſſe, repreſented by the Line at the top marked at each end with A E, muſt bee one inch and a quarter : the breech of the Former is repreſented by the loweſt Figure, the upper part whereof muſt bee made to enter the body of the Former : the heigth of the whole breech, beſide the broach is 3 inches and a halfe ; it entreth the body of the Former, one inch and three quartets ; the top of it muſt be made like a halfe Nutmeg, in the midſt whereof (as Mr. *Malthus* and *des Recreationes Mathematiques*) there muſt be faſtned an yron broach two inches and a halfe-long ; then put the breech into the body, and pierce them both quite thorow as the Figures doe repreſent, at G and H ; then make a pin as K L, to pin them both together, which muſt bee made to take out at pleaſure : then mark both the body & breech near the ſayd hole with this * or any other mark, that you may thereby know how to fit them afterwards. But Mr *Norton* willeth for to bore the Rockets with a Bodkin after they are made : But the other way (in my opinion) I hold the better.



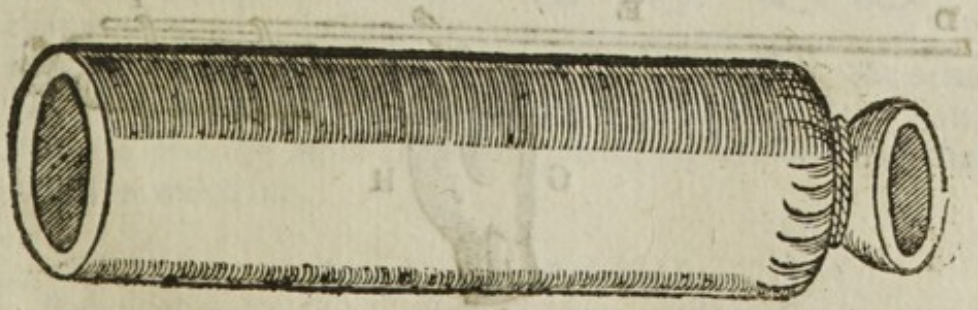
The next Figure marked with M N, doth expreſſe both the parts of the Former pinned together ; unto this Former there muſt be made one Rouler expreſſed by ehe Figure A ; alſo two Rammers expreſſed by the Figures G, and H ; they muſt all of them be turned very even and ſmooth; let the diameter of the thickneſſe of the Rouler expreſſed by the line on the top marked I I, be three quarters of an inch, let it be eight inches long from I to 2, and have a hole bored in the very midſt of the end, ſo wide and ſo deep, that all the broach of the Former may enter the ſame : this is to roul the Coffin of paper upon. The firſt Rammer noted with the Figure G, muſt be ſeven inches and a halfe long, from 3 to 4, and have a hole at the end of it, as the Rouler had ; this Rammer is to ram the com-



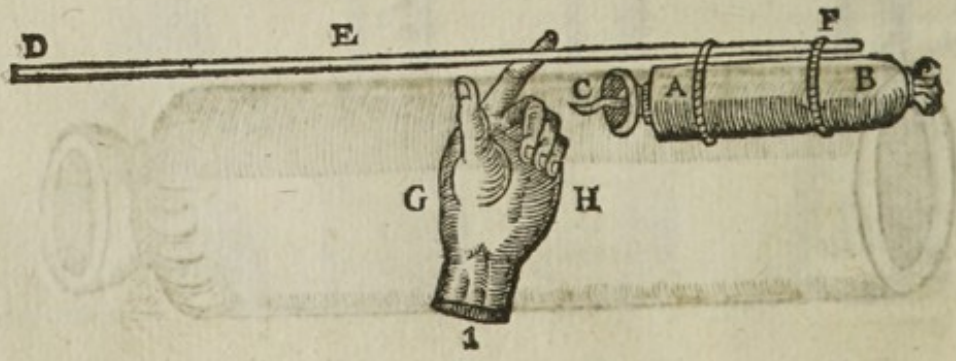
poſition into the Former (having the Coffin in it) untill it be rayſed above the broach. The ſecond Rammer noted with the figure H, muſt be five inches and three quarters long from 5 to 6 and it muſt have no hole at the top as the other had; it ſerveth to ram the compoſition into the Coffin, when it is once rayſed above the broach. The diameter of the thickneſſe of theſe two Rammers muſt be a thought leſſe than the diameter of the Rouler, to the end they may not hurt the Coffin, being driven in.

Now to make the Coffins you muſt take paper, parchment, or ſtrong Canvaſs, roul it hard upon the Rouler, ſo often untill it will go ſtiffe into the body of the Former: then thruſt it Rouler and all thorow the ſayd hollow body of the Former; put then the broach of the Formers breech into the hole of the Rouler, and with a peece of ſtrong packthred choak the Coffin within halfe an inch of the Roulers end (which you may do beſt, and with moſt eaſe, if you firſt dip the end of the Coffin into fayr water, ſo that it may be wet quite thorow) after you have choaked the coffin, you muſt thruſt the breech of the Former, the Coffin alſo with the Rouler in it, up into the body of the Former: then pin the breech faſt to the body of the Former with the pin, and on the Rouler give one ſtroak or two with a Mallet lightly, then unpin the breech, and with the Rouler thruſt the Coffin out of the bottom of the Former; lay it by untill the end be throughly dry.

Thus you may at leiſure times make divers Coffins ready to uſe upon any ocaſion. The following figure expreſſeth an empty Coffin.



Take one of these Coffins, put it into the Former, and take the Composicion for middle siz'd Rockets (mencioned before) and put thereof spoonfull after spoonfull, untill you have filled the Coffin unto the top of the Former, after the putting of every second spoonfull into the Coffin, with a Mallet give two or three blowes upon the head of the Rammer, that the Composicion may be well rammed into the Coffin: every third or fourth driving M. *Norton* wisheth (if the Rockets are to be fired in three or four dayes) to dip the Rammer in Gum-dragant, and Camphir dissolved in spirit of wine, or good *aqua vitæ*: but if it will be a month before they will be fired, then dip the Rammer in oyl of peter. If you would have the Rocket to give a report or blow, then within one diameter of the top, drive a bottom of leather, or six or eight double of paper; peirce and prime eyther of them thorow in three or four places, and fill the rest of the Coffin with whole Gunpouder; afterwards drive another bottom of Leather, and then with strong pack-threed choak the Coffin close unto it: then take the Rocket out of the Former, and prime it at the broach-hole with a peice of prepared Stouple, bind unto it a straight rod 6 or 7 times the length of the Rocket, and so heavy that being put on your finger, it may ballast the Rocket within two or three diameters of the same: mark the following Figure, which represents a Rocket ready made and finished; A B, the Rocket, C the Stouple that primeth it, D E F the rod bound unto the Rocket with two strings; G H I, the hand that poyseth it.



1

How to make Serpents.

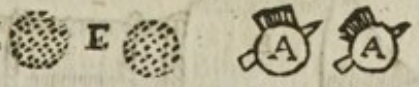
The Coffins for Serpents are made of paper rouled nine or ten times upon a Rouler not much thicker then a gooſe quill, and about four inches long. The Coffins muſt bee choaked almoſt in the midſt, but ſo that there may be a little hole, thorow which one may ſee: the longeſt part of the Coffins for Serpents muſt be filled with the compoſition ſpecified before: if you would have it wamble in the Ayer, then choak it not after the compoſition; but if you would have it not wamble, then half-choak it, as is demonſtrated by the following Figure: the ſhorter end of the Coffin muſt be filled with whole Gun-pouder, and choaked quite up, as appeareth at B, in the Figure M N O, which is the Figure of a Serpent ready made.

How to make Raining Fire.

Take divers Gooſe quils, and cut off the hollow ends of them, and fill them with the compoſition before mentioned, ſtopping them afterwards with a little wet Gun-pouder, that the dry compoſitions may not fall out.

How to make Stars.

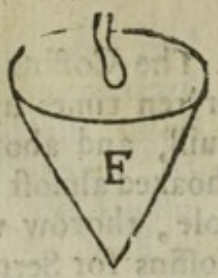
I have ſufficiently taught the making of theſe in deſcribing their compoſitions, wherefore I will now onely preſent the Figures of them unto your vieu; A A, ſignifieth two that are bound up in Paper or Cloth, and pierced, and primed with Stouple: the other two, E E, ſignifie thoſe that are made up without Paper, and need no priming more than the pouder of Sulphur duſt that they are rouled in.



How to make Petards.

You muſt make the Coffins of them either of white Iron, or elſe of Paper, or Parchment rouled upon a Former for the purpoſe,

purpose, and after fitted with a Cover, which must be gleued on: these Coffins must be filled with whole Gun-pouder, and pierced in the midst of the broad end, and primed thereat with prepared Stouple; the Paper ones must be covered all over with Gleu, and the pierced. The Figure of a Petard ready made, and primed, is signified by the Figure E.



How to make compounded Rockets.

First, you must make the Rocket I taught you before; you must not choak the end of it, but either double down half the Coffin, and with the Rammer and Mallet, give it one or two good blows; then with a Bodkin pierce the Paper unto the composition, or else drive a bottom of Leather fitted unto the bore of the Rocket, and pierce it thorow into two or three places; then pare or cut off the Coffin equal thereunto; to this end of the Rocket you must binde a Coffin wider a great deal than the Rocket is; strew into it a little Gun-pouder dust, that it may cover the bottom of this Coffin, and put therein with their mouths downward either Golden Rain, or Serpents, or both; also Stars or Petards: you must put some Gun-pouder dust among these; when you have filled the Coffin with these or such like, cover the top of it with a piece of Paper, and paste upon that a picked crowned Paper, ballast it with a Rod, and it is finished; the Figure followeth.

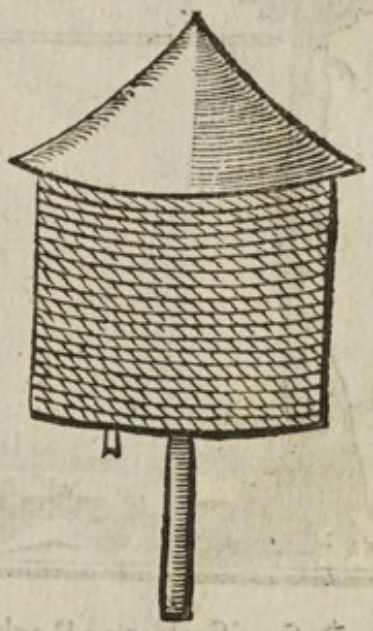
How

How to make Fiends, or fearfull Apparicions.

These must be made of the compositions for Stars, wrought upon Cotton-wick dipped in *Aqua vitæ*, wherein Camphire hath been dissolved, and after what fashons your fancy doth most affect.

How to make Fier Boxes.

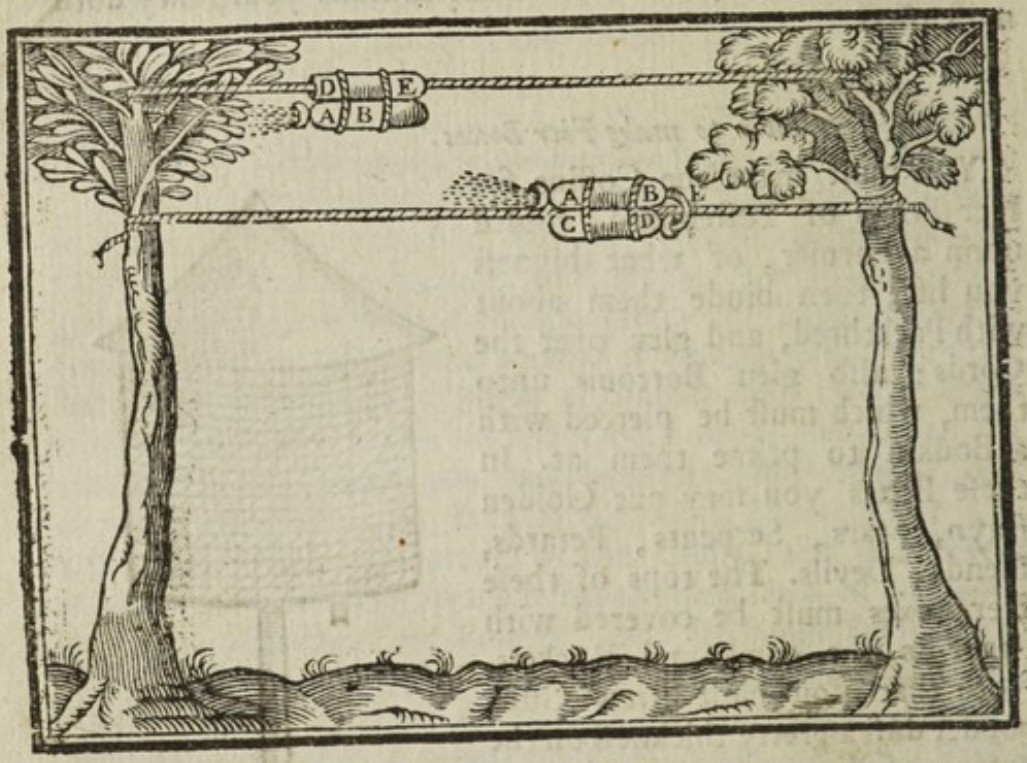
You must make the Coffins for Fier Boxes of Pasteboard, rouled upon a Former, of what bigness you list; then binde them about with Packthred, and gleu over the Cords; also gleu Bottoms unto them, which must be pierced with a Bodkin to prime them at. In these Boxes you may put Golden Rayn, Stars, Serpents, Petards, Fiends, Devils. The tops of these Fier Boxes must be covered with Paper as the compound Rockets. Note that you must strew Gunpouder dust a pretty thickness on the bottom of the Fire Boxes, and prime the hole at the bottom with prepared Stouple.



How to make Swevels.

SWevels are nothing else but Rockets, having in stead of a Rod (to ballast them) a little Kane bound fast unto them, where-thorow the Rope passeth. Note that you must be careful to have your Line strong, even and smooth, and it must be rubb'd over with Sope that it may not burn. If you would have your Rockets to return again, then binde two Rockets together, with the breech of one towards the mouth of the other, and let the Stouple that primeth the one, enter the breech of the other; both kindes are expressed by the Figures; the upper-

most whereof representeth the single one; A B signifieth the Rocket; D E the Kane bound unto it, thorow which a Rope passeth. The lowermost representeth the double Rocket;

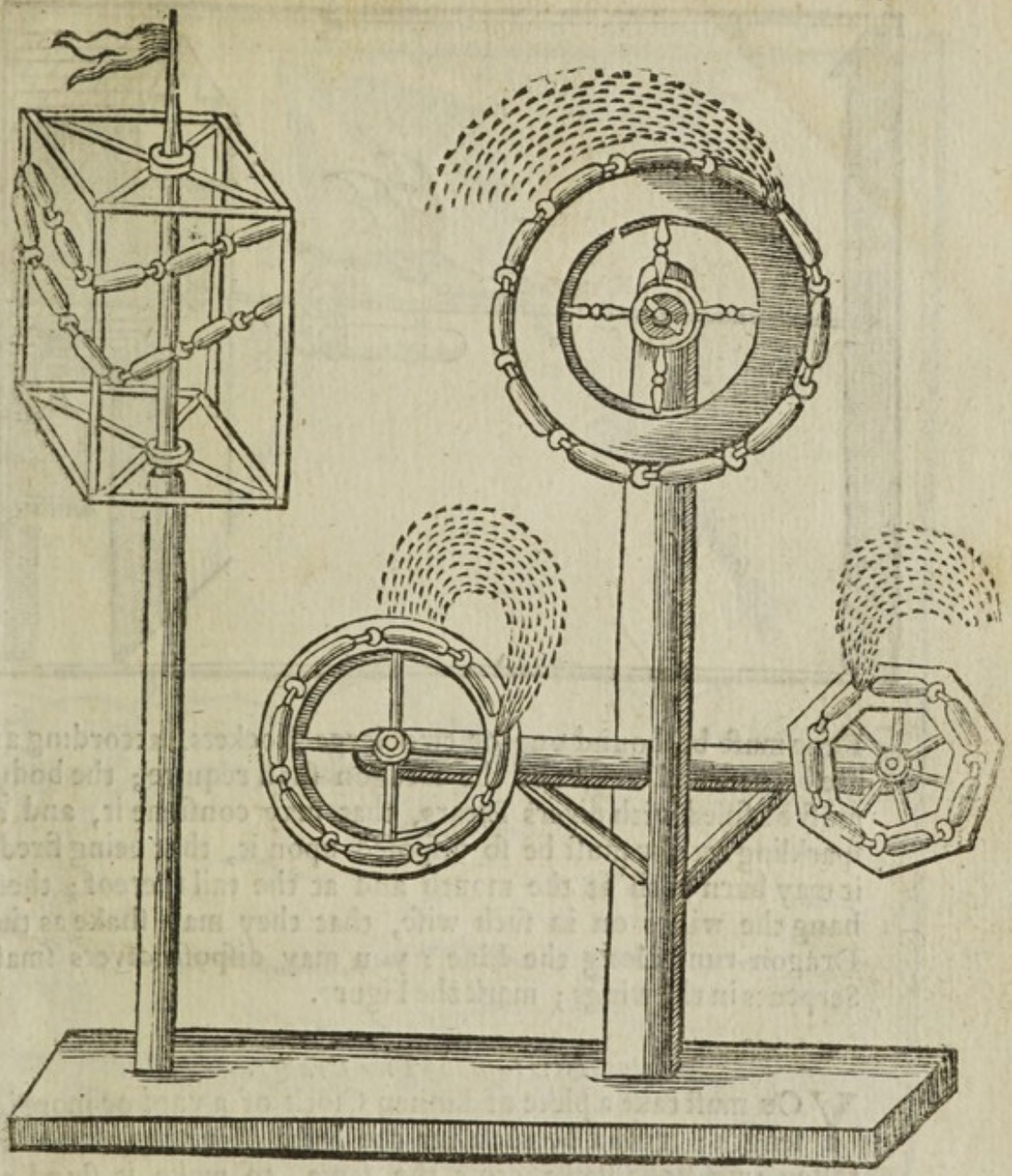


A B signifieth one Rocket, and C D another, E the Stouple that primeth the one, and entreth the breech of the other; the Cane that the Rope passeth thorow is supposed to be behinde the two Rockets.

How to make Gironels, or Fier-wheels.

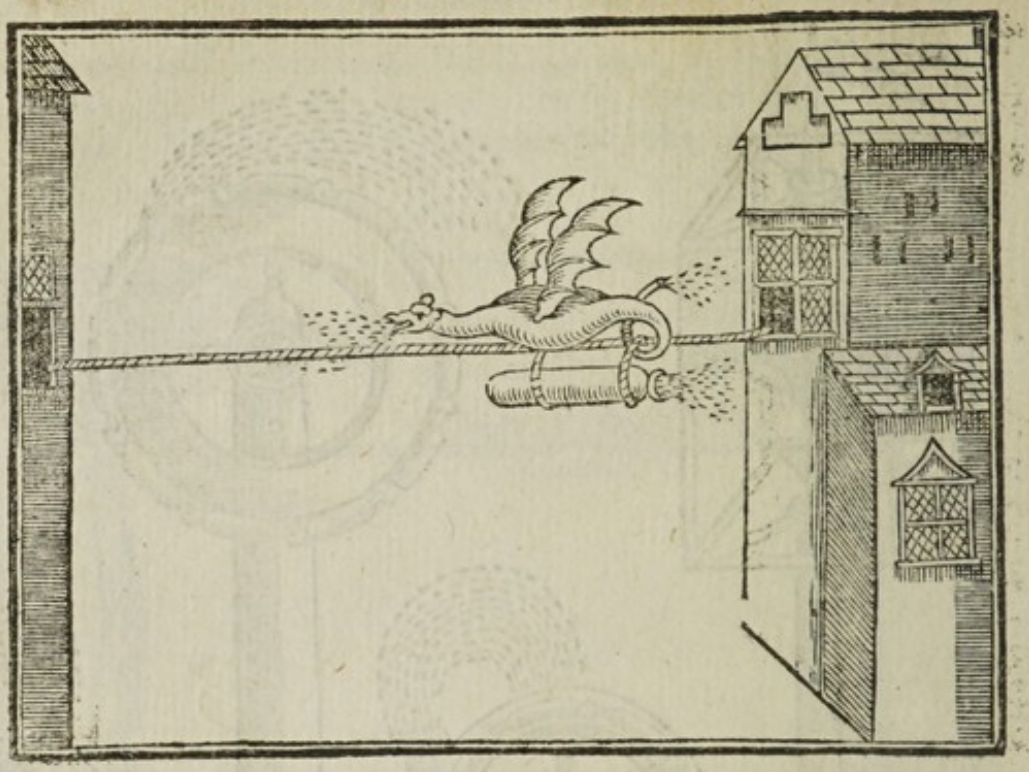
THe making of Fier-wheels consisteth onely in the placing of Rockets, with the mouth of one towards the tail of another, round about certain moveable Whels; wherefore I think it sufficient onely to describe the diversity of their fashions.

How



How to make flying Dragons.

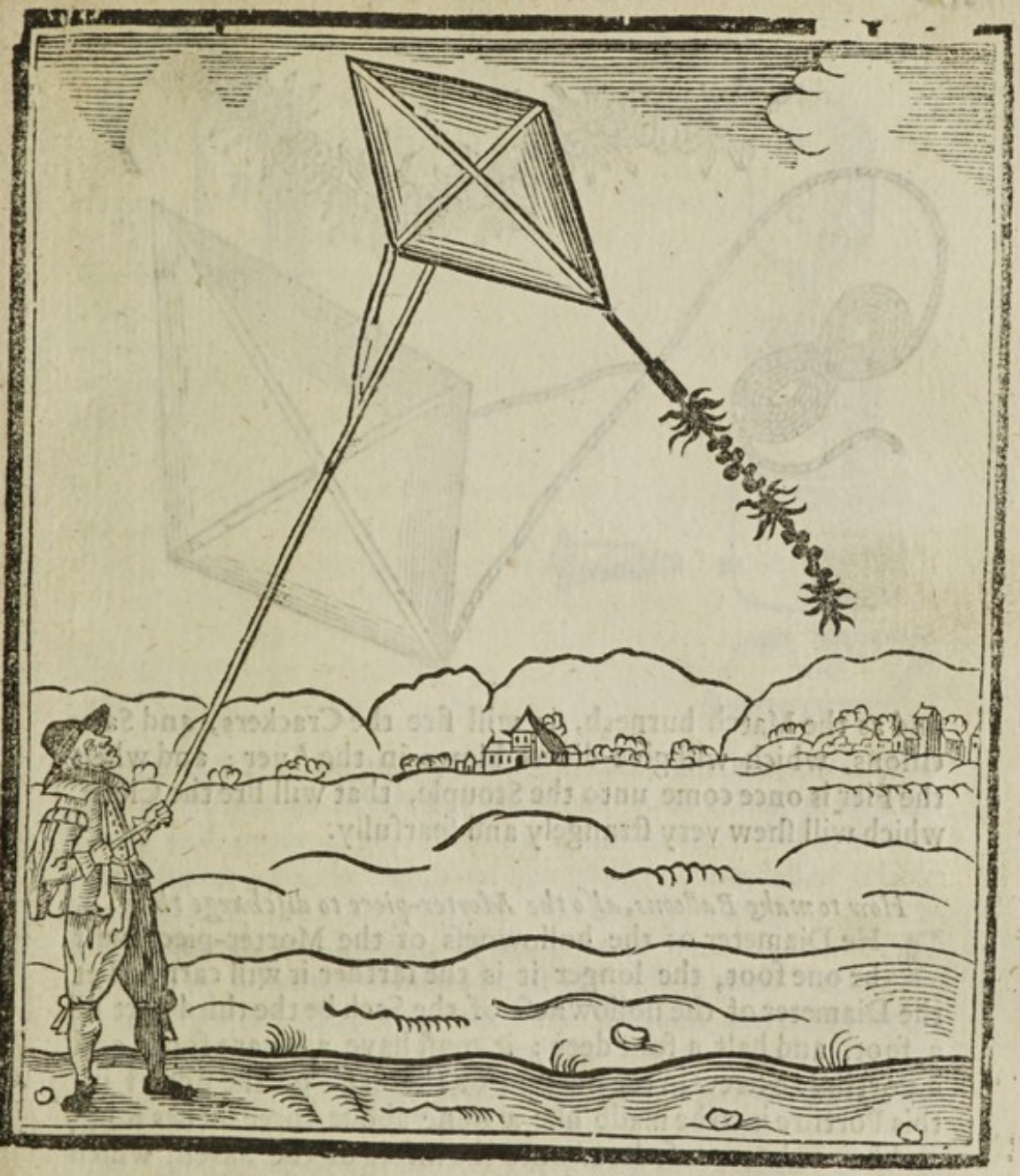
THe flying Dragon is somwhat troublesom to compose; it must be made either of dry and light wood or *Crooked-Lane* Plates, or of thin Whale-bones covered with *Muscovy* Glass, and painted over. In the body thereof, there must be a void Kane to pass the Rope thorow; unt the bottom of this



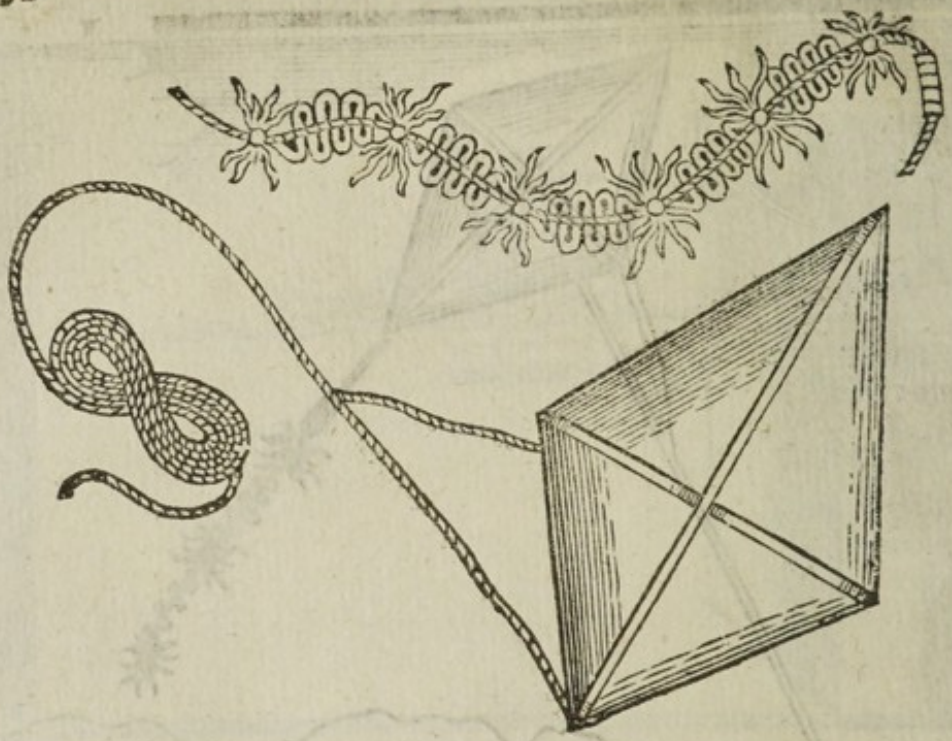
Kane muſt be bound one or two large Rockets, according as the bigneſs and weight of the Dragon ſhall require; the body muſt be filled with divers Petars, that may conſume it, and a ſparkling receipt muſt be ſo diſpoſed upon it, that being fired, it may burn both at the mouth and at the tail thereof; then hang the wings on in ſuch wiſe, that they may ſhake as the Dragon runs along the Line; you may diſpoſe divers ſmall Serpents in the wings; mark the Figure.

How to make Fier Drakes.

YOu muſt take a piece of Linnen Cloth of a yard or more in length; it muſt be cut after the form of a pane of Glaſs; faſten two light ſticks croſs the ſame, to make it ſtand at breadth; then ſmear it over with Linſeed Oyl, and liquid Varniſh tempered together, or elſe wet it with Oyl of Peter, and unto the longeſt corner faſten a Match prepared with Saltpeter water (as I have taught before) upon which you may faſten divers Crackers, or Sauciſſons; betwixt every of which binde a knot of Paper-ſhavings, which will make it flie the



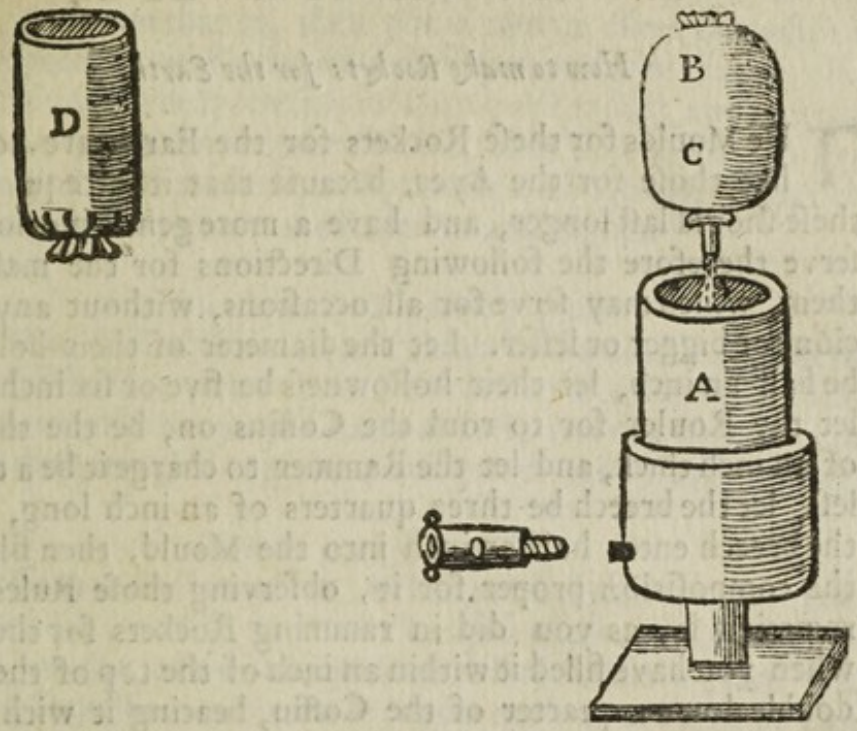
the better; within a quarter of a yard of the Cloth, let there be bound a piece of prepared Stoupel, the one end whereof, let touch the Cloth, and the other enter into the end of the Sauciſſon: then tie a ſmall Rope of length ſufficient to raiſe it unto what heighth you ſhall deſire, and to guide it withall: then fire the Match, & raiſe it againſt the wind in an open field;



and as the Match burneth, it will fire the Crackers, and Sauciſſons, which will give divers blows in the Ayer; and when the Fier is once come unto the Stouple, that will fire the Cloth, which will ſhew very ſtrangely and fearfully.

How to make Balloons, alſo the Morter-piece to diſcharge them.

THe Diameter of the hollowneſs of the Morter-piece muſt be one foot, the longer it is the farther it will carry. Let the Diameter of the hollowneſs of the Sack be the third part of a foot, and half a foot deep: it muſt have a ſquare foot, and a Portfire to ſtrew in the bottom of the Sack on the ſide of it; this Portfire is to be made like a Kane about three inches long, and have a bottom ſodered unto the inſide of the Skreu, which bottom muſt be pierced with a ſmall touch-hole. This Morter-piece may be made of Iron, Red Copper, or for a need with Paſtboard, armed with Cord, and gleued over, but the Sack and foot of it muſt be made of Wood, and the Paſtboard muſt be nailed faſt upon it. A Balloon muſt be made of Canvas rouled eight or nine times upon a Former, it muſt be made ſo, that it will eaſily go into the Morter-piece; into this Balloon you may



may put Rockets, Serpents, Stars, Fiends, Petards, and one or two Sauciſſons to break the Balloon; then choak it up with Cord, and prime it with a little Kane rammed full of a ſlow compoſition; fill the Stock of the Morter-piece full of whole Gun-pouder, then skrew on the Portfire O, then put the Balloon down to the bottom of the Morter with the Kane that primeth it, downward into the Stock; then with Tallow or Greaſe ſtop the Chinks between the Balloon and the Morter, and it is ready to be diſcharged, which you may do by putting fire to the Portfire, and while that burneth, retreat out of harms way.

A, the Figure of the Morter-piece with its Portfire. O B C a Balloon ready made. D, an empty Coffin for a Balloon.

Of

Of Fier-works for the Earth.

How to make Rockets for the Earth.

THe Moulds for these Rockets for the Earth are not made like those for the Ayer, because that it is required that these should last longer, and have a more gentle motion: observe therefore the following Directions for the making of them, which may serve for all occasions, without any alteracion for bigger or lesser. Let the diameter of their hollowness be half an inch, let their hollowness be five or six inches long, let the Rouler for to roul the Coffins on, be the third part of an inch thick, and let the Rammer to charge it be a thought less, let the breech be three quarters of an inch long, and let the breech enter half an inch into the Mould, then fill it with the composition proper for it, observing those Rules in the ramming it, as you did in ramming Rockets for the Ayer; when you have filled it within an inch of the top of the Mould, double down a quarter of the Coffin, beating it with three or four strokes of the Mallet; then with a Bodkin pierce it in two or three places, and then put in the quantity of a Pistol charge of whole Gun-pouder, then double down the half of the Coffin, giving it a gentle blow or two with the Mallet, and with a strong packthred choak the rest of the Coffin, and what remaineth after the Coffin is choaked, cut it off, and it is made.

How to make Crackers.

IT is well known that every Boy can make these, therefore I think it will be but labour lost, to bestow time to describe their making: onely thus much, if you would make a Cracker to give forty, fifty, a hundred, or two hundred blows, one after another, then binde so many Crackers upon a Stick, so that the end of the one may joyn to the mouth of the other.

How to make Trunks.

THese you may make of Pastboard, Paper, or Wood, and of what bigness and length you please, and ram them full of the compoficion of Rockets for the Earth; if you would have them

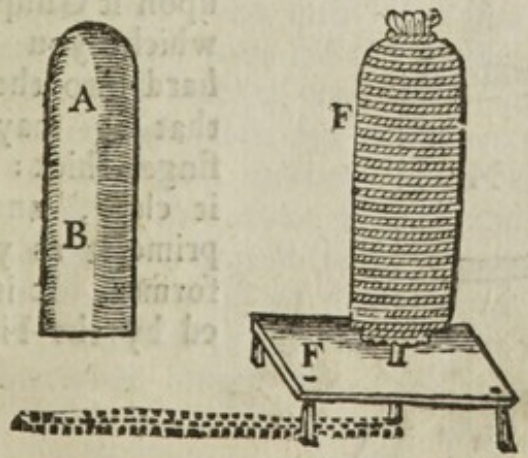
them to change colour, then alter the compoſicion; that is, put in 2 or 3 ſpoonfuls of the compoſition of Rockets for the water, and ram that in, then put in two or three ſpoonfuls of the compoſition of Rockets for the Ayer, and ram that in, then put in two or three ſpoonfuls of Gun-pouder duſt, and ram that in, do ſo till you have quite filled it, then tie a bottom of Leather upon it, and pierce it, and prime it with Stouple. After the ſame manner may you make Lanterns and Lights.

How to make Tumbling Balls.

MAke a Ball of Canvas, and faſten in it a double Rocket for the Earth; you may ſtuff the reſt of the Ball with a ſlow compoſition of two parts Charcoal duſt, and one part of Gun-pouder duſt, mingled together, and put divers Petards amongſt it.

How to make Sauciſſons.

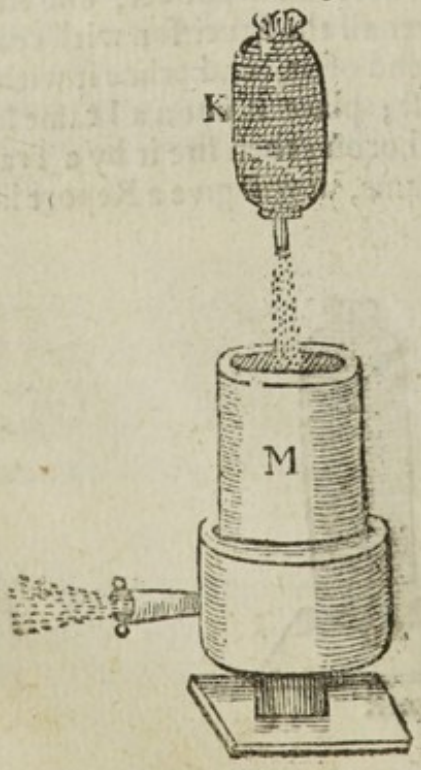
SAuciſſons are of two ſorts, either to be placed upon a frame, or ſuch like, and ſo to be diſcharged wich a Train of Gun-pouder, or elſe to be diſcharged out of the Morter-piece. The ſtanding Sauciſſon is thus made; you muſt roul Paper or Canvas, nine or ten times upon a Rouler as A B, and choak the one end of it; fill it then with whole Gun-pouder, and then choak the other end alſo, then cover all the Sauciſſon with cord, and gleu it over; then pierce one end of it, and prime it with a Quill filled with Gun-pouder duſt; place it upon a Frame having a Hole for the Quill to paſs thorou; then fire it by a Train of Gun-pouder laid under the Frame, it will give a Report like a Canon: Mark the Figure F F.



How to make Chambers.

TAke a Rocket Caſe of what ſize you ſhall think fitting, according to the report you would have it give; choak one end of it cloſe, and put it into a Former without a broach, then fill it one inch and a halfe or more (as you think fit) with whole Gunpouder, and drive a bottom of leather hard into it; this bottom of leather muſt be pierced with a ſmall hole in the middle, with a hot yron, or elce it will bee apt to cloſe again. Fill then the other part of the Coffin with a ſlow compociſion, up to the top, then take it out and binde 6 or 7 times about it a ſtrong pack-thred in that place where the bottom of leather is, and it is made: you may binde divers of theſe on a row upon a Frame, Rayl, or ſuch like, and then put fier to their open ends, and they will burn ſlowly untill they come to the bottom of leather, and then each will give a report or blow one after another orderly as you gave fier unto them. And theſe are uſually called Chambers, but more properly Sauciſſons.

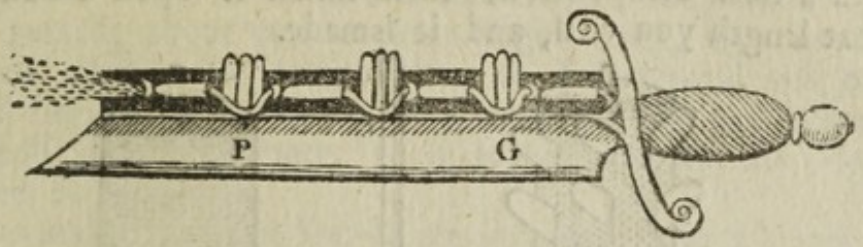
How to make the flying Sauciſſon to be delivered out of the Morter-peece.



MAke a Coffin for this, as you did for the former; firſt fill it almoſt full with whol Gunpouder, then put upon it Gunpouder duſt, which you muſt ram hard into the Coffin, ſo that it may bee one finger thick: then choak it cloſe, and arm and prime it as you did the former. It is repreſented by the Figure K M.

How to make a Fier-Sword.

YOu must make a Sword of Wood, having a deep channel in the back of it, wherein place first a Rocket for the ground ; then two or three Serpents upright ; (with thier mouthes inward) let the stouple that primeth the Rocket, come under the mouth of the Serpent, so that being tinded, it may set them on fier, and enter the breech

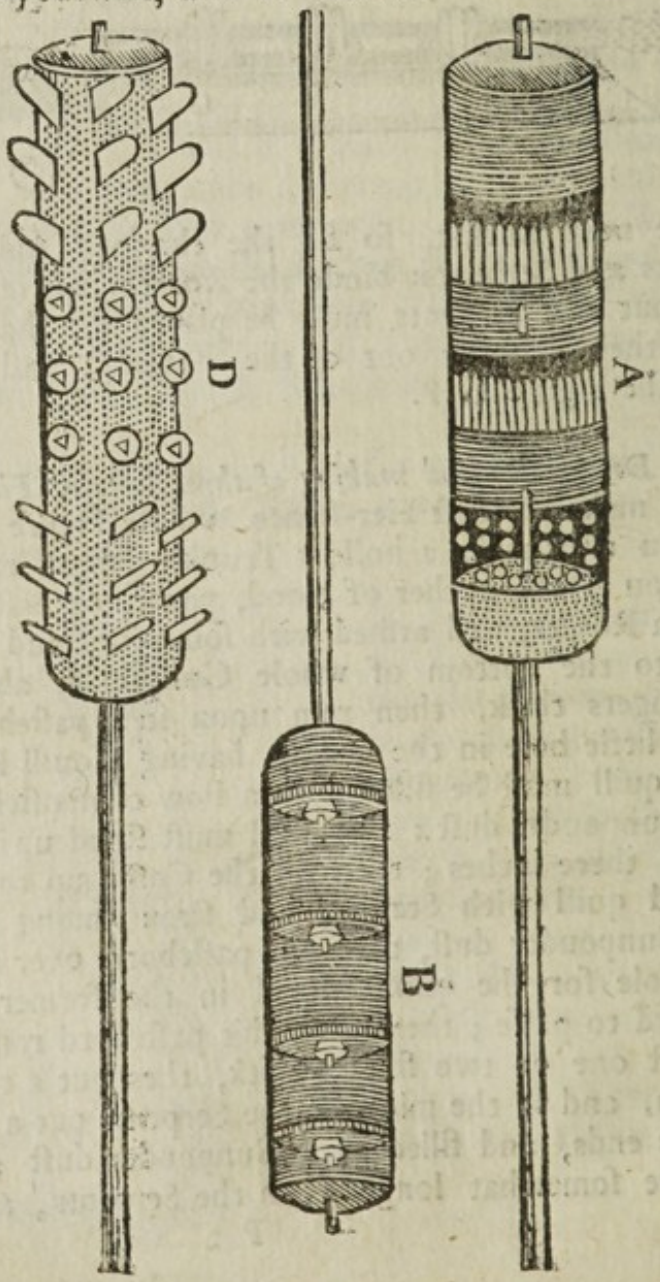


of the next Rocket, so fill the channell quite full with Rockets and Serpents: binde the Rockets fast into the channell, but the Serpents must be placed so, that being once fired, they may fly out of the channell, and it is made: mark the Figure G P.

The Description and making of three sorts of Fier-Lances.

TO make the first Fier-Lance, whose Figure is noted A, you must make a hollow Trunk of what length or bignesse you please, eyther of wood, paper, or pastebor d rouled on a Rouler, and armed with some cord and gleu ; first put into the bottom of whole Gunpouder about one or two fingers thick, then ram upon it a pastebord pierced with a little hole in the middle, having a quill fastned in it, which quill must be filled with a slow composicion, or else with Gunpouder dust : this quill must stand up in the Lance two or three inches ; then fill the Coffin up to the top of the said quill with Starres, and streu among the Starres some Gunpouder dust, then put pastebord over them, having a hole for the quill fastned in the former bottom of pastebord to passe ; then upon this pastebord ram Gunpouder dust one or two fingers thick, then put a row of Serpents in, and in the midst of the Serpents put a kane open at both ends, and filled with Gunpouder dust ; this kane must bee somewhat longer than the Serpents, and it must

paſſe thorow a paſtebord, which muſt be put over : then put ſome more Gunpouder duſt, and ram it in upon it, and upon that put another row of Serpents, with a kane in the midſt of them filled with a ſlow compoſicion, and upon them put Gunpouder duſt, or elſe a ſlow compoſicion, ramming it in till the Lance be full ; then put a paſtebord upon it, and in the midſt of the paſtebord put a little kane filled with a ſlow compoſicion, then faſten it upon a ſtaffe of what length you will, and it ismade.



To make the second Fier-Lance, you must prepare a Trunk like unto the former, first ram in the bottom of it some of the composicion of Rockets for the Earth about two fingers thick, then put a pastebord upon it, having a petard fastened in the middest ; this pastebord must bee pierced in three or foure places, round about the petard, that thereby the pouder that is rammed over the pastebord may take fier ; then ram in some more composicion upon the petard, about two or three fingers thick, then another petard, then more composicion, so doing untill you have filled the Trunk : then fasten it upon a staffe, and prime it as you did the former, it is represented by the Figure noted B.

To make the third Fier-Lance you must have a Trunk also, which must be rammed full of a slow composicion, of two parts charcoal dust, and one part Gunpouder dust well mixed, prime it as the former, then bore divers holes round about it, from the top to the bottom, into every of which holes gleu a Saucisson, or a Serpent, or a little ball filled with Gunpouder dust, and having a petard in the middle : eyther of these must be well primed, and their primed ends must be towards the inside of the Lance, so that as the Lance burneth downward, it may orderly give fier unto the Saucissons, Bals, and Serpents : the Figure D representeth a Lance having three rowes of Serpents, three rowes of Bals, and three rowes of Saucissons, fastned round about it.

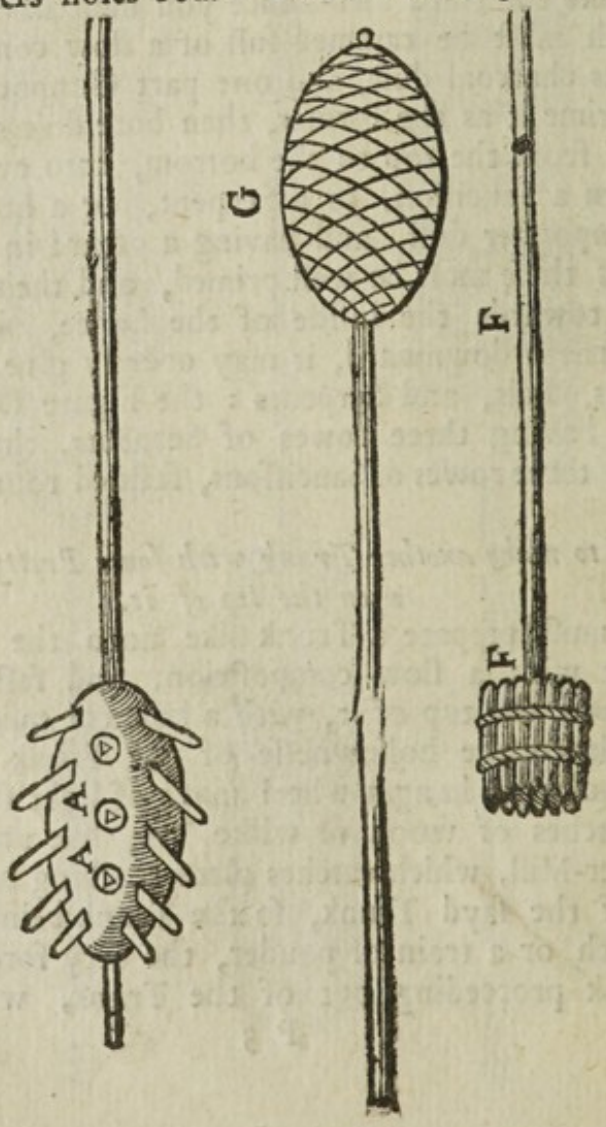
How to make another Trunk with some Pretty Mocion upon the top of it.

YOu must prepare a Trunk like unto the former, and fill it with a slow composicion, and fasten a square boord upon the top of it, with a hole cut quite thorow it, answerable to the hollownesse of the Trunk ; upon this boord you may hang a wheel made of light stuffe, having divers catches of wood or white Tin, like unto the wheel of a Water-Mill, which catches place reaching halfe over the mouth of the sayd Trunk, so the Trunk being fired either by a match or a train of pouder, the very force of the fier and smoak proceeding out of the Trunk, will cause the

wheel to turn round. You may make alſo another wheel with poppets round the top, and ſo place it that it may receive mocion from the former mencioned wheel; or inſteed of placing a wheel or wheeles upon the top you may faſten divers poppets made with joynts after ſuch a Device that they may ſeem to fight and combate one with another, by the force of the fired Trunk.

The Deſcripcion and making of two ſorts of Fier-Clubs.

TO make the firſt, you muſt make an ovall Ball of paſt-boord, canvaſſe, or parchment gleued together, which you muſt firſt fill with a ſlow compoſicion, ram it in, and then bore divers holes round about it, and put therein Ser-



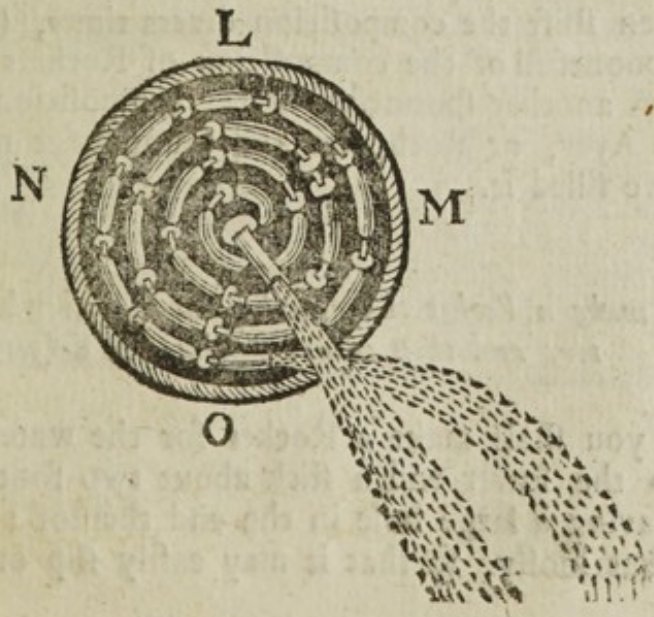
pents, fier-Bals, or what you will : faſten it upon a ſtaffe and prime it in the top with a kane filled with a ſlou compoſicion : this is repreſented by the Figure A A.

To make the ſecond you muſt fill divers kanes open at both ends (and of a foot long, or more, or leſſe, as you think fit) with a ſlou compoſicion, and binde them upon a ſtaffe of foure or five foot long ; prime them ſo that one being ended, another may begin ; you may prime them with a ſtouple or match (prepared as before) then make an Oſier Basket about it with a hole in the very top to fier it by, and it is done.

The Figure F F, repreſenteth the ſtaffe, with the kanes bound upon it. The Figure marked G repreſenteth the ſtaffe having a Basket wrought over it.

How to make a Fier Target.

MAke a Target of Oſier twigs or elſe of light wood, and binde upon it divers kanes filled with a very ſlow compoſicion : the kanes muſt be open at both ends, and primed with ſtouple, that one may give fier unto another: in the midſt of all you may ſet up a large kane alſo, if you pleaſe, which you may fill with the ſame compoſicion as you did the other. Mark the Figure L M N O.



Of Fier- works for the Water.

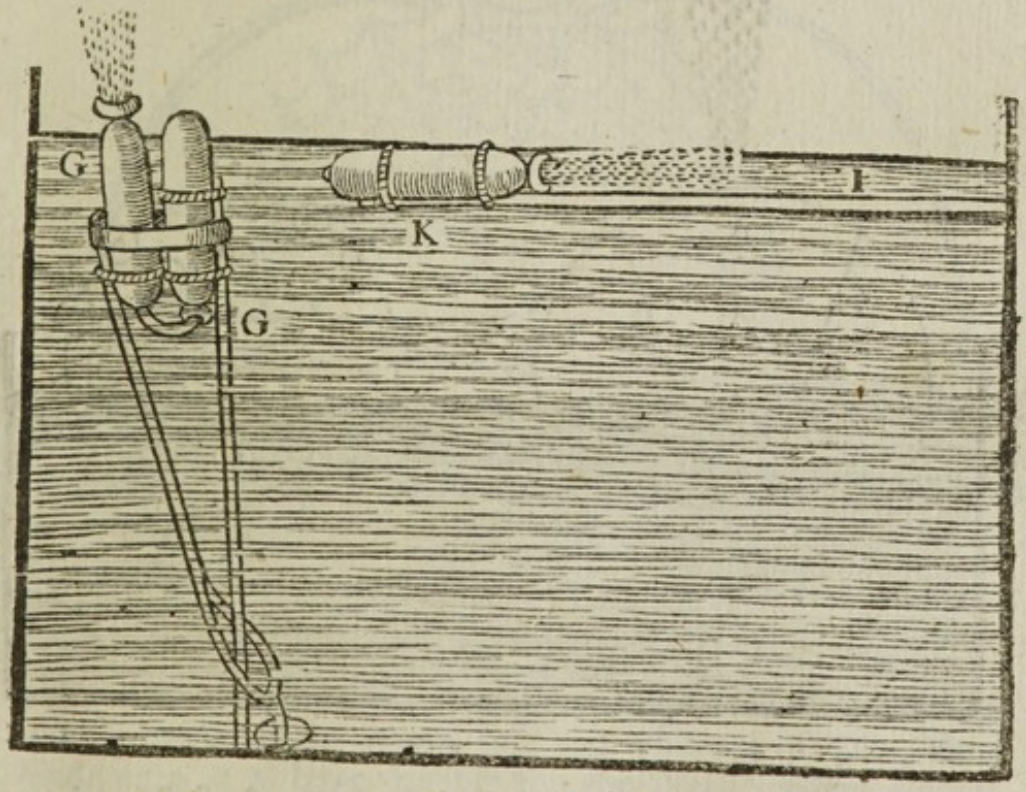
How to make Rockets for the Water.

THe diameter of the hollowneſſe of the Mould for Rockets that ſwim on the water, muſt be one inch, and eight inches long : let the breech enter into the body of the Rocket one inch, and it muſt have no broach at all in it. Let the diameter of the thickneſſe of the Rouler bee three quarters of an inch, the Rammer muſt be a thought leſſer : then ram it full of the compoſicion of Rockets for the water ; joyn to the upper end of it a Sauciſſon : then cover it all over with melted Pitch, Rozin, Wax, or Tallow, to the end that the water may not ſpoyl the Coffins ; and to make it float along the water, binde a rod about two foot long, as you did unto the Rockets for the Ayer : now if you would have the Rocket to change his actions, (that is to ſwim one while above the water, and one while under the water) then put into it in the filling, one ſpoonfull of compoſicion, and ram that in ; then one ſpoonfull of whole pouder, and ram that in ; and then another of compoſicion, and after that another of whole Gunpouder : ſo doe untiil you have filled it quite. If you would have it change colour, then ſhift the compoſicion divers times, (that is, put in one ſpoonefull of the compoſicion of Rockets for the water, then another ſpoonefull of the compoſicion of Rockets for the Ayer, or Rochpeter and Gunpouder mixed) untill you have filled it.

How to make a Rocket that ſhall burn a good while in the water, and then mount up into the Ayer.

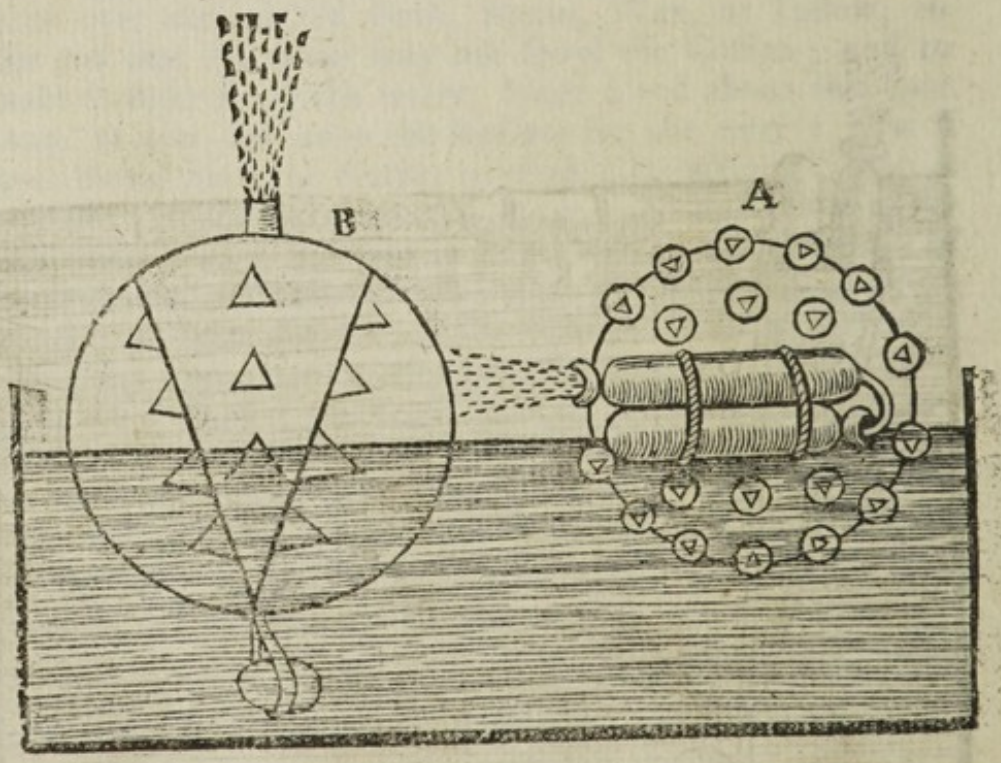
FIrſt, you ſhall make a Rocket for the water, and binde unto the lower end a ſtick about two foot and a halfe long, having a large hole in the end thereof : then tie unto it (but looſly, ſo that it may eaſily ſlip out) a Rocket for

for the Ayer, and let the ſtouple that doth prime the Rocket, for the Ayer, enter into the breech of the water Rrocket, then let the end of the rod of the Rocket for the Ayer enter into the hole of the rod of the Rocket for the water ; beſmeare then both the Rockets with tallow, greaſe, or wax, or any oyl colour, that the water may not ſpoyl the coffins of the Rockets ; then hang a ſtone at the bottom of the ſtick that hath the hole in it to make it ſink down into the water ; then fier the water Rocket and caſt them into the water ; the fired Rocket will burn in the water, and being conſumed, will give fier unto the other Rocket, which being looſly tyed, will ſlip the bond, and mount up into the Ayer. This is repreſented by the Figure G G. The floating Rocket mencioned before, is expreſſed by the Figure noted I K.



The Deſcripcion and making of two ſorts of Fier-Bals for the Water.

FOr to make the firſt, you muſt make a Ball of Canvas, about the bigneſſe of a Foot-ball, or bigger if you pleaſe, and faſten in it a double Rocket for the water : if you will, alſo you may ſtuffe the reſt of the Ball with the compoſicion that will burn under the water, and cut holes in the ſides, and therein faſten other Bals, and petards in them : then cover the Ball over with Tallow, Pitch, or painting, except the place where the Rocket is primed, and it is done. It is repreſented by the Figure noted with A, and it will tumble up and down in the water.

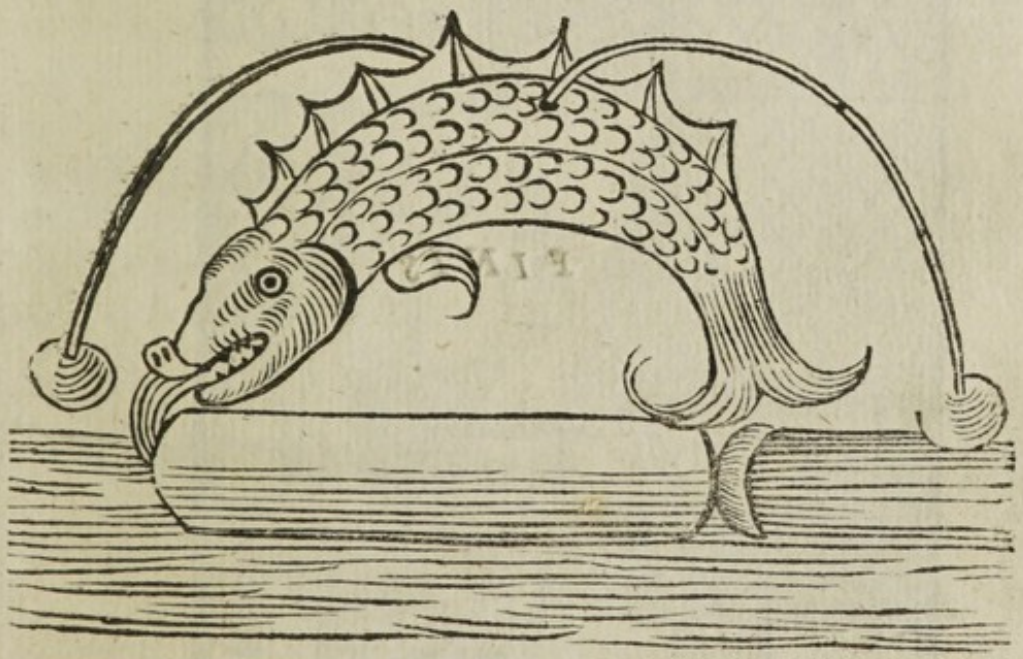


To make the ſecond Fier-Ball, you muſt firſt make a Ball of Canvas, Paſteboord, or ſuch like, and cut a wide hole in the top of it, and place it in a channell of Tinne pierced

pierced in divers places : fill the channell with the compoſicions of Rockets for the water ; againſt every hole ther-of, place a petard : cover it with a Cover, Pitch it over, and prime it, then ballaſt it with Lead, or a ſtone, that the vent may burn upwards, and it is done. It is repreſented by the Figure B,

How to make a Dolphin.

YOu muſt make the body of it of Paſteboord gleued together, fill the body with the compoſicion of Rockets for the water, pierce it in the back with divers little holes, wherein put Serpents, beſmear the body all over with the following Pap. Take Gunpouder duſt, foure ounces, Cam-



phir, and Sulphur, or Brimſtone in pouder, of each one ounce, make them into a ſoft pap with oyl of Tiles, then binde unto it a large Rocket for the Water, which Rocket muſt be armed (as afore) that the water may not hurt it, then faſten it unto a peece of wood or cork cut like a ſharp

boat, or ballaſt it with a wyer, having at each end a piece of Lead of weight ſufficient, and it is done. Mark the Figure. After the ſame manner you may make Mermayds and other delightfull repreſentacions.

I might have beene infinite in the deſcribing of ſuch like with Ships, Towers, Caſtles, Pyramids. But conſidering that it would but increaſe the price of the Book, and not better your underſtanding: ſince all conſiſt of the former works, which are ſo plainly deſcribed, as that the moſt ignorant may eaſily conceive thereof, and (if any whit ingenious) thence contrive others, of what faſhion they liſt.

FINIS

The Excellent Arts and Sciences
OF
Drawing, Colouring, Limming, Paynting, Graving, and Etching.

Plainly and accuratly demonſtrated
By JOHN BATE.

LONDON,
Printed by *R: Biſhop* for *Andrew Crook*, at the Green Dragon in Pauls Churchyard. 1654

To the Reader.

THe Art of Drawing is in it selfe most Excellent, and worthy of commendacions in whomsoever it is: yea it is an Art so necessary unto all ingenuous Artists, as that they can in no wise be without it. My selfe have often known it true, that the sight of a good Figure is more unto an ingenuous person, then a whole Chapter of informacion: Wherefore I have according unto my Knowledg and practice in the same, faithfully penned it, for such as bear affection unto the Art, and are desirous to be informed therein, adding thereunto such instructions as I have received from such Professors as I have had familiarity with; also other Collections that I have gathered from time to time out of such as have written of this Subject. And for divers persons that cannot attain unto it, or are loth perhaps to bestow any time to practise it, whereby they might come to a requisit perfection; for such I have set down certain Directions, and those so facil and easie, that persons altogether unskilfull may (having a pattern) work very well thereby.

First, I will speak of Drawing in generall.

Secondly, of washing or colouring Maps and other Pictures.

Thirdly, of Limming.

Fourthly, of Painting in Oyl upon Cloth or Boord, and of Distempering.

Fifthly, of Painting upon Glasse, and Annealing.

Sixthly and lastly, of Graving and Etching.

Farewell.

Of Drawing

DRawing is an Imitacion or lively Repreſentacion of things, according unto their likeneſs and ſimilitude : It is performed with the Pen or with Paſtils. In one that would bee accounted abſolute and eminent in this moſt Excellent Science, there is required ; Firſt, a good affection or love thereunto : Secondly, that he have ſome knowledge in *Naturall Philoſophy* : Thirdly, a copious and plentifull invencion. From the two firſt, he himſelſe ſhall receive wonderfull delight and contentment in his practiſing : and the laſt, will make his work pleaſing, and to be deſired of others.

Of neceſſary Implements, or Inſtruments for Drawing.

FIrſt, he muſt provide ſtore of drawing pens made of Ravens quils, good thick and ſmooth paper : alſo light coloured bleu paper, and fine parchment, a flat thin braſſe Ruler, and a payr of Compaſſes : alſo a Wing, and ſundry Plummets or Paſtils to draw with all.

Of Plummets or Paſtils.

PLummets or Paſtils are of to ſorts ; the one wee may call naturall, becauſe they are ſuch as of themſelves being pointed, are made meet or fitting to draw withall : ſuch are theſe ; Black Lead, Black chalk, Charcoal ſplit, Red ſtone, white Chalk.

Others there are which we call artificiall, becauſe they are made by tempering ground colours artificially, and after forming them into little roules, meet and convenient to draw withall.

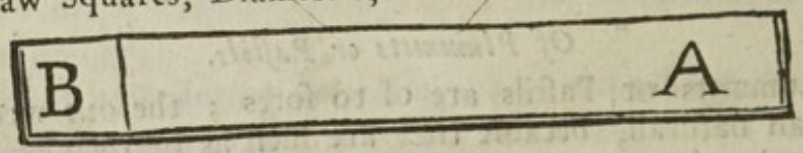
The manner of making artificiall Paſtils or Plummets to Draw withall.

TAke a great Chalk-ſtone, and make furrowes or concavities in it two or three inches long, and ſo wide that you may lay into each a quill. Then take a proporcion of white chalk ground very fine, temper it with Ale or Wort, and a little new Milk, and ſo make Pap thereof: then pour it into the furrowes of the chalk: ſoon and in a ſhort time, you may take them out and roul them up, or let them lie in the ſame untill they are quite dry, and then take them out and ſcrape them into a handſom form.

You may temper Lake with burnt Alabaſter for a red. Alabaſter burnt and Bice for a bleu, and ſo for others; having regard to ſome colours that will binde over hard, which muſt have a little water put to them in their grinding.

The practice of Drawing.

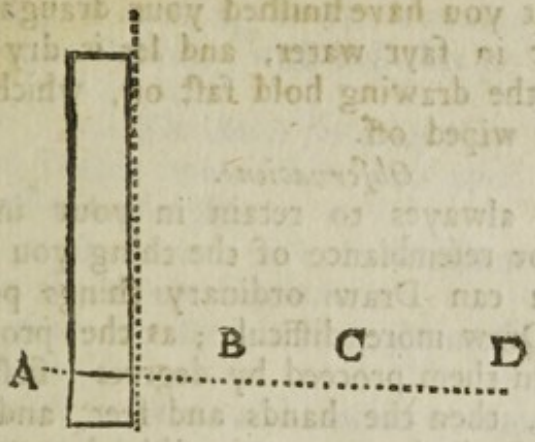
THe firſt practices of a Beginner, muſt bee readily and quickly to Draw with his Pen, Cirkles, Ovals, Squares, Pyramids, Paralels, Diameters, and other Geometricall ſollid bodyes, for theſe will fit his hand for the performance of other bodyes: and unto theſe and ſuch like, he may reduce all other works whatſoever. You may in the beginning aſſiſt your ſelfe in the performance of theſe: as alſo try whether your operacion be done aright, by your Ruler and Compaſſe. Let the end of your Ruler bee marked with a croſſe ſtroak athwart it. The Figure of the Ruler followeth, and it is noted with the Letters B A, it will help you to Draw Squares, Diameters, Paralels.



Example.

Let A B C D be a Line given, whereon to erect another Line that they may both ſtand ſquare; Lay but the Ruler ſo that the croſſe at the end of it, may be full upon the Line, then Draw a Line by the ſide of the Ruler, and it is done. Obſerve the Figure following.

Your



Your Compaſſes will ſerve to mark your diſtances aright, and to aſſiſt you in deſcribing Cirkles and Ovals: theſe I ſay may aſſiſt you, but you muſt endeavour to attain to the performance of the ſame, without the help of theſe. Next, let him practice to Draw Pots, Balls, Candleſticks, Pillers, Houſes, and other ſuch like Figures, that come neareſt unto the former. Then to Draw Leaves, Flowers, Slips, Flyes, and Creeping things; and Laſtly (becauſe it is the moſt difficult to Draw Men) four-footed Beaſts, and other ſuch difficult works.

Of the manner of Pourtraiting or Drawing With the Pen.

LEt the thing whoſe pourtraiture you intend to take, ſtand before you, ſo thar the light be not hindred from falling upon it, and with a pointed peece of Charcoal Draw it rudely and lightly; which when you have done, conſider a while whether all the parts thereof are proporcionable, and whether it carry the ſemblance of the thing whence you drew it from; which if it doe not, wipe it out with your Wing, and beg n anew. But if it bee faulty in one part only, wipe out that part only, and Draw it again; whenſoever it liketh you, or that you have ſo drawn it, that you can finde no great fault in it, wipe it over gently with your wing, ſo that you may perceive your former ſtroakes; then with your black Chalk or other Paſtils, Draw it as perfectly and as curiouſly as you can, and ſhadow it accord-

ing as the light falleth upon it. If you Draw upon bleu paper, after that you have finiſhed your draught, you muſt wet your paper in fayr water, and let it dry of it ſelfe, this will make the drawing hold faſt on, which other wiſe would eaſily be wiped off.

Obſervacions.

1 Endeavour alwayes to retain in your imaginacion, the very Idæa or reſemblance of the thing you Draw.

2 When you can Draw ordinary things pretty well, then aſſay to Draw more difficult; as the proporcions of Mankind, and in them proceed by degrees: firſt, learn to Draw the head, then the hands and feet, and laſtly, the other ſhape of the body, proporcionable thereunto.

3 Be not out of conceit with your works, although they give you not at the firſt contentment according unto your minde, for daily practice with a continued reſolucion and intencion of the minde, muſt gayn the true proporcion by little and little.

Of Drapery, or drawing Apparell and Cloaths.

DRapery conſiſteth in the drawing or figuring of cloth, and garments, with their doublings and foldings ſhadowed accordingly.

The Rules for Draperie.

1 Firſt, you muſt Draw the utmoſt lines of your garments, leaving ſpare places, where there is need of foldings.

2 Draw alwayes your greater folds firſt, which continu throughout the whole garment, from the skirt upward, and be ſure that you let no one touch or croſſe another.

3 Break your greater folds into leſſe, not ſparing to ſhadow them, though they be never ſo ſmall, and that with a double or treble hatch, if ſo bee that they fall inward and from the light.

4 The cloſer the Garments ſit, the narrower you muſt make the folds.

5 Order your Garments ſo, that the folds thereof may fall one way according unto the mocion of the ayer.

6 Fold not your Garments where they ought to ſit cloſe, and leave the formes of eminences appearing; as of the Breaſts, and Legs.

Of

Of Diapering.

DIapering, is a paſſing or over-running your work (after it is quite finiſhed) with branches or other work.

The Rules for Diapering.

1 If you Diaper upon folds, you muſt make your Work to break off accordingly.

2 You muſt have a care to continue the ſame Work throughout the whole Garment.

3 You muſt ſet the faireſt in the moſt eminent and perſpicuous place.

4 You muſt cauſe your branches to run all upwards, elſe your Work will be ridiculous.

Of Landskip.

LAndskip is the expreſſion of Land by Hills, and Mountains, Rocks, Ruines, Rivers, Valleys, and ſuch like.

The Rules for expreſſing of Landskip.

1 You muſt make a fayr Horizon, expreſſing the Heavens more or leſſe over-caſt with Clouds; and if you expreſſe the Sun, make it riſing or ſetting behind ſome Hill or Mountain, and then let all the light of the Trees, be given thitherward, and your Clouds muſt be ſhadowed from the Sunne.

2 Never expreſſe the Moon or Starres, but upon neceſſity.

3 Be very carefull to leſſen your bodyes, proporcionable to their diſtance, expreſſing them more faintly or fully according as your Eye judgeth of them.

Of Emblem, or Empreſs Work.

EMblem or Empreſs work, is the moſt hard or difficult of all others, and the moſt to bee commended above all other works: It is to imitate the face of Mankinde ſo near after the life, as that not only the party in all likeneſſe both in favour and complexion, but alſo his beſt graces and countenance is moſt notably expreſt. This indeed ought not to be attempted untill one were reaſonable good in Story work, which you may in a reaſonable time attain unto, by the imitacion of good prints.

The comelineſſe of the Face conſiſteth in three parts,

Firſt, in the fayer and beautifull colour and complexion, Secondly, in the good favour and proporcion. Thirdly in the grace of the countenance. The curious Drawer muſt watch, and as it were catch the lovely graces, witty ſmilings, and ſullen glances which paſſe ſuddenly like lightning, obſerving how in ſmiling the Eye changeth, and narroweth, holding the ſight juſt between the lids, as a center ; how the mouth extenderh a little both ends of the line, upwards ; the Cheekes rayſe themſelves to the Eyes-ward ; the Noſtrils play, and are more open ; the veynes in the Temples appear more, the neck commonly erecteth it ſelfe, the eye browes make ſtraight Arches, and the Forehead caſteth it ſelfe, as it were, into a plain. In likeſort, the countenances of Wrath, Fear, and Sorrow, have their ſeverall alteracions.

The Dawer muſt make the eyes of his picture ſo like one another, as Nature doth ; for in the Eye is the life of the picture. Be ſure that the circle of the ſight be perfectly round, for ſo much thereof as appeareth ; and the Center truly placed in the midſt thereof. The reflection of the ſight which appeareth as a white ſpeck, muſt be placed accordingly unto the light.

The fartheſt Eye from the Drawer, muſt be a little higher than the hithermoſt, becauſe of the proſpective, if the Drawer ſit any higher than the party drawn ; But if lower, then the fartheſt eye muſt be a little lower. If level, then to be of one heigth. So ſhall the work by well placing and true doing of the Eye have great life ; for of all the Features in the Face of a picture, the eyes give the moſt life, the Noſe the moſt favour, and the mouth the moſt likeneſſe ; although likeneſſe bee contayned in every part, even Feature in the Cheekes, Chin, Fore-head, with the compaſſe of the Face, but principally and eſpeciall in the Mouth.

The Drawer muſt mark when the partty removeth, though never ſo little, if on the ſuddon he remove a great deal, then he may eaſily mark it, and recall him unto his firſt line, but the little moving (if he perceve it not quickly) will lead him into a great Error.

In drawing after the life, ſit not nearer than two yards from off the party, and ſit as even of one heigth as poſſi-

bly

bly you may, but if the party you draw, be a very tall person, let him ſit a little above you, becauſe men are commonſy under him, and will not judge ſo of the picture, becauſe they undervieu it. If the perſon you draw be very low or a child, then uſe the like diſcrecion in placing him ſom what lower than your ſelfe. If you draw from head to foot, let the party ſtand at the leaſt 6 yards from you when you take the diſcripcion of his whole ſtature ; and ſo likewiſe for the ſtelling of your picture of what length ſoever, according unto the proporcions of the Face : let the party ariſe and ſtand, (for very few can ſit ſo upright as they ſtand) whereby the Drawer oft times is greatly deceived, and the partie drawn diſ-figured. Stell not a Childe when you draw the hand, but when you eſpy a good grace in the hand, take it quickly, and pray them not to ſtand ſtill, for commonly they give the hand a more unnaturall or affected grace.

Firſt, draw the ſtroak for the Fore-head, which muſt bee done moſt exactly, becauſe that according unto that ſcantling and proporcion, muſt all the reſt be drawn ; as if the Fore-head be ſo long, then from the Fore-head to the chin, muſt be twice ſo long ; next draw the fartheſt Eie, thirdly draw the Noſe, fourthly draw the neareſt Eye, leaving the juſt length of an eye between it and the other ; having continuall regard that the parties fartheſt eye, ſeem to your appearing to be juſt ſo much diſtant from the Fore-head ſtroak, as it was when you firſt began ; if it be not, proceed on further untill you have recovered or recalled him to his former place, then draw the Mouth, next the Chin, then finiſh the out line of the Face ; and laſtly, the hayr : having finiſhed the Head, draw the whole Bodie proporcionable thereunto.

Of Shadowing.

THe chiefeſt part of Drawing, conſiſteth in the tru proporcioning of a Picture, for the Line ſheweth all unto a good judgment : but the Shadow without the Line ſheweth nothing. The Line only ſheweth the Countenance, but the Line and Shadow, ſheweth the lively likeneſſe.

Shadows beſt become great pieces, and ſuch as are to be vieued afar off.

To shadow sweetly, and round withall, is a far greater cunning than to shadow hard and dark; for to round a work cannot be without some Shadows, but to shadow as it were not shadowed, is best of all. Every thing must bee done in its proper kind.

Shadows do shew the effect or defect of the Light in the place where the picture was drawn.

Thus much for those that are contented to take some pains to attain to so noble a Science: Now there follow certayn Directions for those that are unskilfull, and have not spare time sufficient to spend in the practice of the forementioned Directions, yet are desirous (upon occasions, and for certayn ends) to take the coppy of some Letters, Prints, and Pictures that they oftentimes meet withall: the which are so facil and easy, as that children of but indifferent discrecion, may perform the same.

How to take the perfect draught of any printed, or paynted Picture.

TAke a sheet of Venice paper, or else of the finest white paper that you can get: wet it all over with clean Sallet-oyl, then wipe the oyl off from the paper as clean as you can, so that the paper may bee dry, otherwise it will spoyl a printed picture by the soaking thorow of the oyl: Having thus prepared your paper, lay it upon any paynted or printed picture, and you shall see the picture thorow the same more perfectly appearing than thorow glasse, and so with a black Lead Pen, you may draw it over with ease, and better first with a soft Charcoal, and then with a Pen. After that you have thus drawn the picture upon the oyled paper, put it upon a sheet of clean white paper, and with a little stick pointed, or (which is better) with a feather taken out of a Swallowes wing, draw over the picture agayn, and so you shall have the same very prettily and neatly drawn upon the white paper, which you may set out with Colours, as shall be taught hereafter.

Another way.

Having drawn the picture, (first open the oyled paper) put it upon a sheet of clean white paper, and prick over the same drawing with a good big pin, then from the clean sheet that is pricked, pounce it upon another; that is, take some Small coal,

coal, ponder it fine, and wrap it in a peece of Tiffany or such like, and binde it up therein loosly, and clap it lightly over all the pricked lines by little and little, and afterwards draw it over agayn with a Pen or Pencill, or otherwise as you please.

Another way.

Take a sheet of thin white paper, and rub it all over one side with black Lead, or else with Vermilion tempered with a little fresh Butter; then lay the coloured side upon a sheet of clean paper; then lay the Picture you would coppy out, upon the other side of the coloured paper, and with a small pointed stick, or with a Swallow's feather, go over all the stroaks of your picture that you desire, and then you shall have all the stroaks drawn very prettily on your white paper.

Another way.

Take a peece of clear Lantern horn, and lay it upon your picture; then with a Pen made of a Ravens quill, draw the stroaks of your picture upon the horn, and when it is dry, breathe upon the horn twice or thrice, and presse it hard upon a peece of clean white paper a little wetted, and the picture that you drew upon the horn will cleav fast upon the paper.

Another way

Take a sheet of white paper, rub it all over with fresh Butter, and dry it by the fier; then rub one side of it all over with Lamper black-lake, or any other colour finely ground, lay this paper upon a sheet of clean paper with the coloured side downwards, and upon it lay the picture you would coppy out, and trace the stroaks over with a feather of a Swallow's wing, and you shall have your desire.

Another way very pretty, and easy to be performed.

Take some Lake and grinde it fine, then temper it with Linseed oyl, and afterwards with a pen draw with this mixture (instead of ink) all the out stroaks of any printed picture, also the muscles: then wet the contrary side of the picture, and presse it hard upon a sheet of clean paper, and it will leav behind it all the stroaks of the sayd picture that you drew over.

Another

Another way much like the former.

Take Printers Blacking, grinde it fine, and temper it with fayr Water, and with a pen dipt therein, draw over the maſter ſtroaks and out lines of the Muſcles : wet then a fayr paper with a ſpunge, and clap the picture upon it, preſſing it very hard thereupon, and you ſhall finde the ſtroaks you drew, left upon the fayr paper.

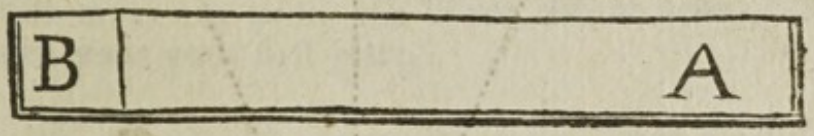
An eaſie way to leſſen any picture : that is, to draw a picture from another, in a leſſer compaſſe.

FIrſt, with a Ruler and a black Lead Plummet, draw a line at the very top, and another at the bottom, paralell or equally diſtant from the other : from the upper Line let fall two perpendicular or plum-lines yeven unto the lowermoſt Line, ſo thoſe four Lines will make a Square : now you muſt divide this Square into divers equall parts with a payr of Compaſſes, and draw Lines with a Ruler and a black Lead Plummet, quite over the picture ; ſo the leſſe Lines will divide the picture into equall parts or Squares ; then take a fayr paper, and make as many Squares upon it as there is in the picture : yon may make them as little as you will, but be ſure that they are equall, and of juſt number with thoſe in the picture. Having thus croſſed your picture, and drawn over your fayr paper into Squares, take a black Lead pen, and draw the picture by little and little, paſſing from Square unto Square, untill you have finiſhed the

whole ;

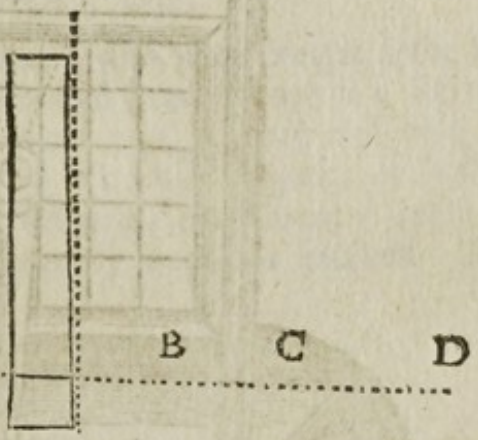
whole ; ſtill obſerving the order of the Squares as they ſtand in either : then draw it over with a pen, in which ſecond drawing of it over, you may eaſily mend any fault : when it is dry, rub it over with the crum of white bread, and it will take off all the black Lead ſtrokes, and your draught only will remain fayr upon the paper or parchment.

The following figure noted B A ſignifieth a Ruler, which will aſſiſt you to croſſe your paper with Squares.



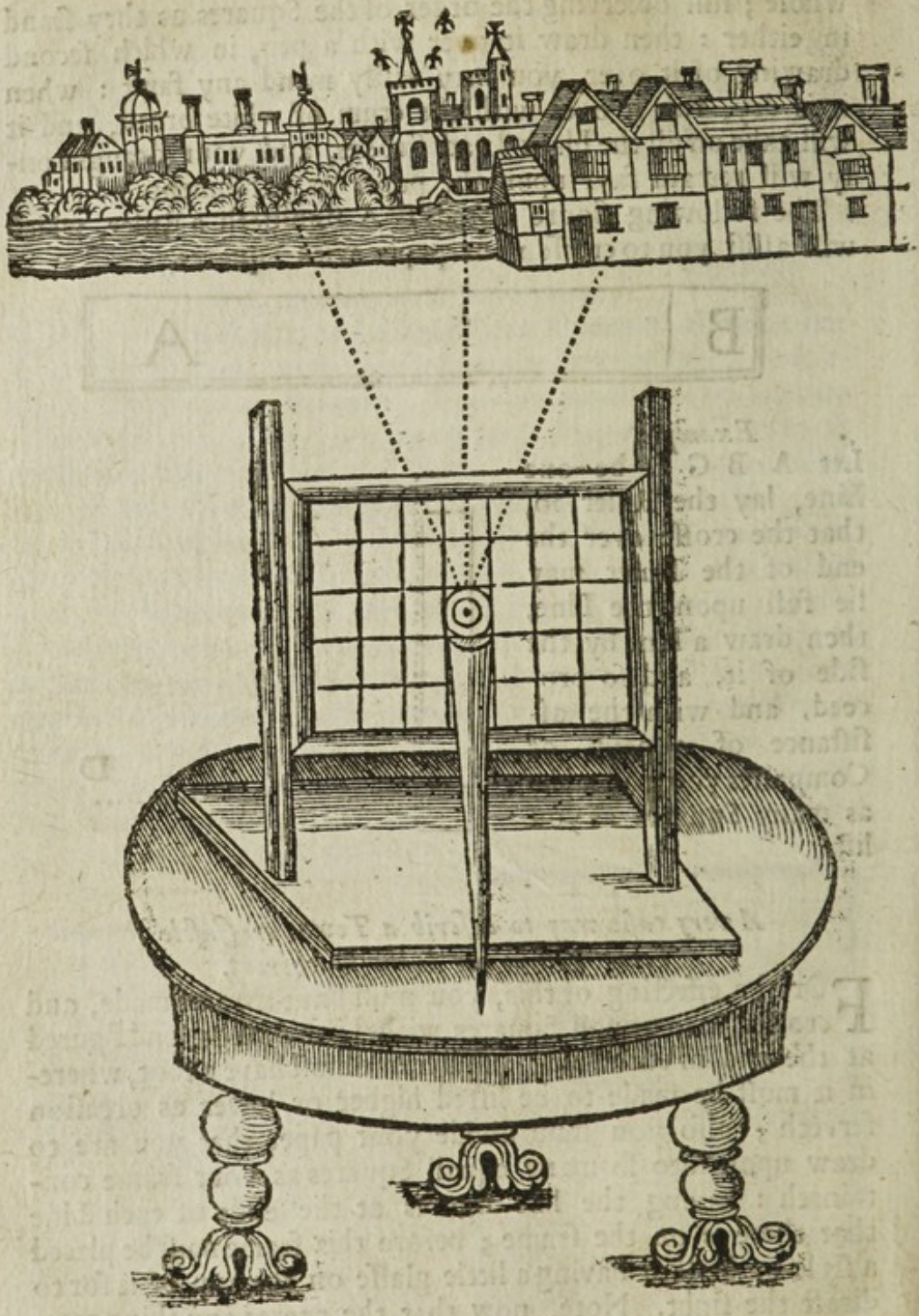
Example.

Let A B C D be one Line, lay the Ruler ſo, that the croſſe over the end of the Ruler may lie full upon the Line, then draw a Line by the ſide of it, and ſo proceed, and with the aſſiſtance of a payr of Compaſſes you may make as many Squares as you liſt.



A very eaſie way to deſcrib a Town, or Caſtle : being within the fullſight thereof.

FOr the effecting of this, you muſt have a frame made, and croſſed into equall Squares with Lute ſtrings, and figured at the end of each ſtring : this frame muſt have a foot, wherein it muſt be made to be lifted higher or lower as occaſion ſerveth ; alſo you muſt divide your paper that you are to draw upon into ſo many equall Squares as your frame containeth : having the like figures at the ends of each Line that there is on the frame ; before this frame muſt be placed a ſtyle or bodkin having a little glaſſe on the top of it for to direct the ſight. Note, now that the neerer any thing commeth unto the center, the leſſer it appeareth : hence it is,

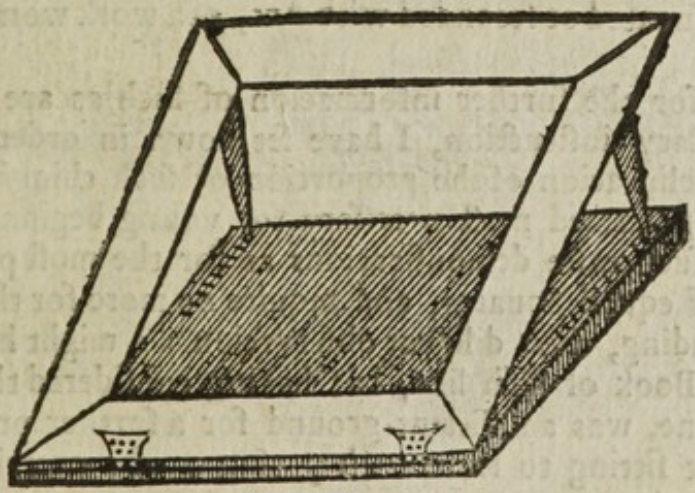


that a Town of a mile, or more long, or a huge great Caſtle, at a diſtance may be comprehended, and that eaſily within the limites of ſo ſmall a frame ; By the ſide direct your ſight from one part to another, beginning at one Square, and proceeding through the reſt in order as they lie ; mark well the foregoing figure.

By which figure you may make the thing you imitate bigger or leſſer according as you ſhall move it nearer or farther off from the thing, tracing the Work with a cole. Note, that if you move any part, the Work will be falſe, except you return unto your firſt place.

How to make a Desk ; by meanes whereof you may draw, and that moſt exactly with great facility any printed picture, or ſollid Image.

FIrſt let there be a Frame made, and with hinges let it bee joynted unto a board of equall bredth unto it : let this Frame alſo have two ſtayes at the top, at each end one, by meanes whereof the Desk may bee raiſed higher, or lower, as need ſhall require ; then faſten to the Frame a peece of pure clear glaſſe fitted thereunto, and it is finiſhed. The figure followeth.



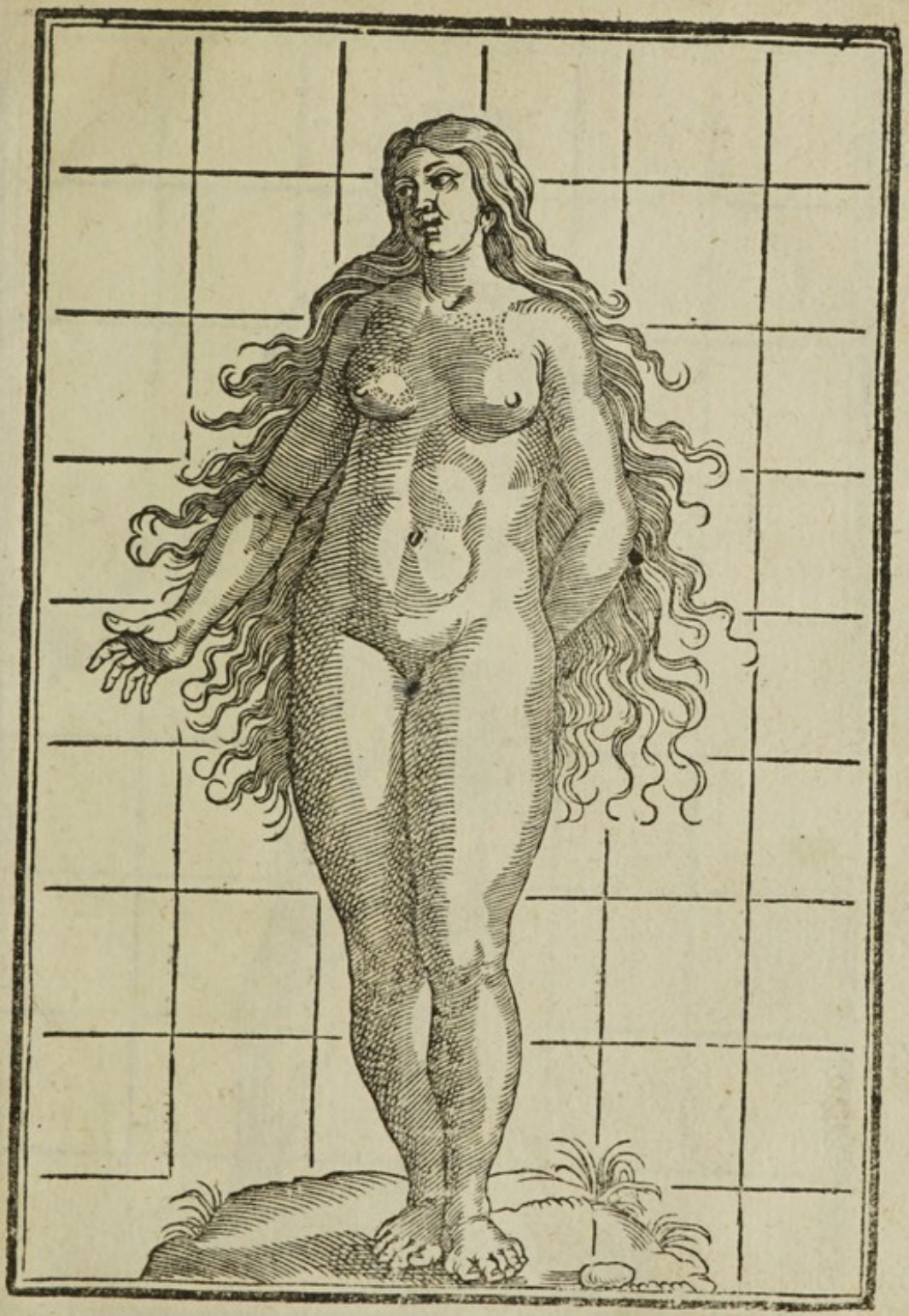
The manner of uſing this Desk is thus : If the picture that you intend to draw be a printed one, then firſt faſten it next unto the Desk with wax, paſte, or ſuch like : upon it faſten a ſheet of fayr paper : If it be in the day-time, place the

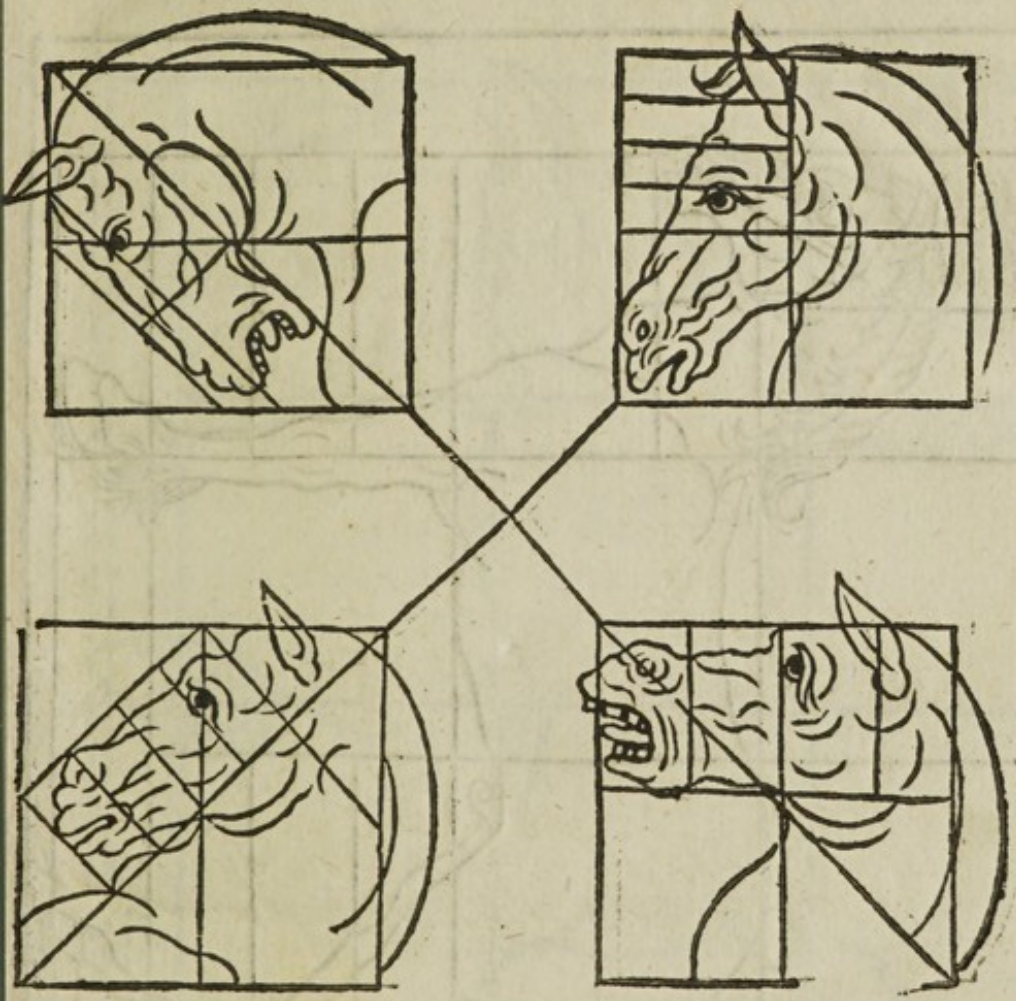
back of it towards the Sunne ; if it be in the night that you work, place a Lamp behinde it, and so you shall see perfectly every (even the least) stroak of the picture, which with your pen you may draw as acurately as any Limmer whatsoever. If it be a sollid peece, then place it behinde the Desk, between the light and the Desk : then fasten a sheet of clean white paper upon the Desk ; rayse then the Desk higher or lower, untill you see the perfect shadow of the Image thorow your Desk, and paper, and then draw the posture of the Image, and shadow it afterwards (without the Desk) as light falleth upon it.

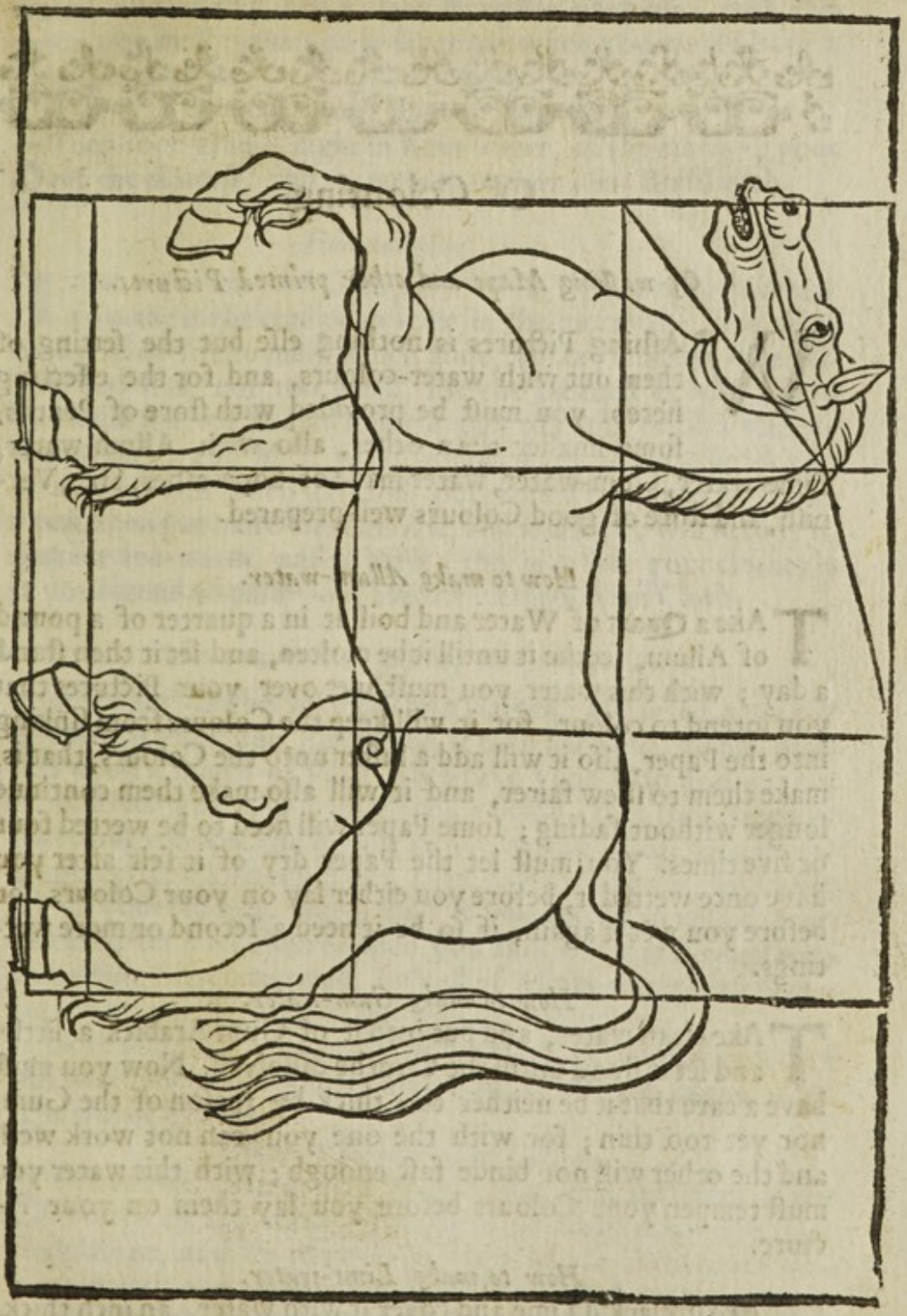
An easie way to take the naturall and lively shape of the leafe of any Herb or Tree, which thing passeth the Art of Man to imitate with Pen or Pensill.

FIrst take the leafe that you would have, and gently bruise the ribs and veynes on the back side of it, afterwards wet that side with Linseed oyl, and then presse it hard upon a peece of clean white paper, and so you shall have the perfect figure of the said leafe, with every veyn thereof, so exactly expresst, as being lively coloured, it would seem to be truly naturall: by this we learn, that Nature being but a little adjuvated or seconded with Art, can work wonders.

Now for the further informacion of such as are desirous of exemplary instruction, I have set down in order following the delineacion of the proporcion of such things as in my judgement seemed most necessary for young beginners, and those in such easie demonstracions as for the most part they consist of equall Spuares, and require no more for their right understanding, then diligent observacion : I might have filled a whole Book of such like, but having considered that what I had done, was a sufficient ground for a further procession, I thought fitting to leave each person to the exercise of his best Invencion.







Of Colouring.

Of washing Maps and other printed Pictures.

WAshing Pictures is nothing else but the setting of them out with water-colours, and for the effecting hereof you must be provided with store of Pencils, some smaller than other, also with Allum-water, Lime-water, Gum-water, water made of Sope-ashes, Size, Vernish, and store of good Colours well prepared.

How to make Allum-water.

TAke a Quart of Water and boil it in a quarter of a pound of Allum, seethe it untill it be molten, and let it then stand a day; with this water you must wet over your Pictures that you intend to colour, for it will keep the Colours from sinking into the Paper, also it will add a luster unto the Colours, that is, make them to shew fairer, and it will also make them continue longer without fading; some Paper will need to be wetted four or five times. You must let the Paper dry of it self after you have once wetted it, before you either lay on your Colours, or before you wet it again, if so be it need a second or more wettings.

How to make Gum-water.

TAke clean water, and put into it of Gum Arabick a little, and let it stand untill the Gum be dissolved. Now you must have a care that it be neither too thick by reason of the Gum, nor yet too thin; for with the one you can not work well, and the other will not binde fast enough; with this water you must temper your Colours before you lay them on your Picture.

How to make Lime-water.

TAke unslack'd Lime and cover it with water, an inch thick, let it stand so one night, in the morning pour off the clear water,

water, and reserve it in a clean thing for your use; with this water you must temper your sap green when you would have a bleu colour of it.

How to make water of Sope-ashes.

STeep Sope-ashes a night in Rain-water, in the morning pour off the cleareſt: this water is to temper your Brasil with.

How to make Size.

TAke a quantity of Gleu, and let it steep a night in water to make it the readier to melt in the morning; then set it on a coal of fire to melt, which done, (to try whether it be neither too stiff, nor too weak, for the meaneſt is best) take a spoonfull thereof, and set it in the ayer to cool, or fill a Muscle-shell with it, and let it swim in cold water to cool the sooner, If it be too stiff when it is cold, put more water unto it, if too weak, then put more Gleu unto it, and when you will occupy it, make it leu-warm, and so use it: this is to wet your clothes in if you intend to paste your Map or Pictures upon Cloth.

Of the manner of pasting Maps upon Cloth.

FIrst, your Clothes must be clean washed, and dried, then wet them in your Size, and wring it then hard out, so nail them stiff upon a Board or Wall, then take your Map and wet the printed side with Allum-water and a Brush, then turn the other side while it is wet, and paste it all over with a Brush, & so spread it upon your Cloth being wet, then dry it thorowly, and lastly lay on your colours. Note, that if you intend to verniſh your Picture after it is coloured, then you must wet it at the first with thin white Starch warmed, instead of Allum-water, but Size is better, or else the Verniſh will soak quite thorow it.

Note also, that unto every half pound of Verniſh you must put two ounces of Oyl of Turpentine, or else you cannot work it, it will be so thick.

How to prepare your Colours.

SUch colours as have need of grinding, you must first grinde them with fair water, and then put them upon a smooth chalk-stone, and let them dry; then grinde them again with Gum-water, and reserve them in Muscle-shels for your use.

Chuse to lay on the thinneſt and most transparant colours,

especially if it be good work that you are to colour, so the one will set out the other; but if the work be none of the best, then endeavour to hide the imperfections thereof by laying your colours the thicker on it.

A Sea Colour.

Take Privet-berries when the Sun entreth into *Libra*, about the thirteenth of *September*, dry them in the Sun; then bruise them, and steep them in Allum-water, and strain them into an earthen Porringer that is glazed: or you may use them before yon dry them, for the drying of them is to make them keep long.

Another.

Take bleu Inde and steep it in water, and put to it a little Verditer.

A yellow colour.

Take yellow berries and bruise them a little, and steep them a quarter of an hour in Allum-water, then strain them if you will, or let them stand in the liquor, and work therewith.

A Russet colour.

Take the fattest Sut you can get, and put it into a Pot of clear water, so that it be covered two or three fingers, and let it seethe well, which done, strain it thorow a cloth, and set it on the fire again to thicken, (but take heed you set it not on too hot a fire, for fear of burning it) so let it boil gently untill it be as thick as you would have it.

Colour for faces.

First, lay upon the cheeks little spots of Lake or red Lead, then come all over it with white, and a little Lake; shadow it with Lam-black or Umber, and white Lead.

Hair colour.

Take Umber of Spanish brown, grinde it and temper it with Gum-water.

Colours for naked Pictures.

Take white Lead and a little Vermilion, temper them and lay them on, shadow it with Bolearmenick in the middle, and add a little Sut to the utmost or double hatches.

A colour for dead Corps.

Change white Lead with a little of the water of yellow berries,

ries, and wash the Picture all over, then change it with bleu Inde, and shadow it in the single hatches and leaneſt places; then take Sut, yellow berries, and white Lead, and with that shadow the darkeſt places.

A bloud-red colour.

Sinaper, Lake, and Vermilion make a good bloud-red; some have commended Mutton-bloud very highly, but I never tried it.

How to make Mutton-bloud red.

Take some of the cleareſt bloud of a sheep, and put it into a bladder, and with a needle prick holes in the bottom of it, then hang it up to dry in the Sun; this saith a Painter (that told it me for a special experiment) will make transparant and excellent bloud-red colour, which you may dissolve in your Allum-water, according as you have need thereof.

Colours for Garments.

A Purple colour.

Take Logwood and seethe it in Vineger and small Beer in an earthen Pot, and put a little Allum therein, untill you taste it to be strong on the tongue.

A red colour.

Boil Brasil as you did the Logwood, and it will make a red colour: if you would have it a sad red, mingle it with Pot-ash-water, if you would have it of a light red, temper it with white Lead.

A Crimson.

Cynaper tops: Cynaper lake: or Vermilion.

A green colour.

Take Privet berry water, and change it with yellow berry water, and it giveth a perfect green for the ground, and it is much used.

Another green.

Take Spanish green clean pickt and steeped in Rhenish wine; strain it, and put it into a little Honey or white Sugar-candy, and it will make an excellent green.

For a light green.

Temper Verdigreaſe and white Lead: 2 Verdigreaſe, as much yellow berries, and a little white.

Yellow colours.

Orpiment and Saffron, Maſticot, Gambougium; either of theſe give a very good yellow.

Bleu colours.

Verditer, Azure or Bice, bleu Inde.

Colours for building.

Lay black and white Lead for the wals of Churches, Conduits, and greater buildings; Bolus for the pillers, and leſſer houſes; red Lead for Tiles; for the Leads bleu and white; for cottages Sut alone.

Colours for Landskip.

Lay Verditer, bleu, white, and green; or firſt go all over it with Saffron, and white; then put a little Sut to them, and go over it again.

Or firſt take green and white Lead, and go over it, ſhadow it with a little more green, then with white, and laſt of all with green, a little white and yellow berries.

Skie colours.

Braſil and white Lead is the lighteſt, then light purple and white, then Inde bleu and white, the darkeſt of all is Inde bleu.

Cloud colours.

The lighteſt of all is white Lead and Inde bleu, a like quantity of each: the next, a great deal of Inde and a little white; then purple and white with a little Braſil; then white Lead and yellow berries.

Colours for the Sun-beams.

Lay yellow berries with a little white, ſhadow it with Saffron and red Lead.

A motley green.

This colour is compounded of red and green.

A Lincoln green.

This colour is compounded of a good green and Saffron.

A popinjay green.

This colour is compounded of Azure and Maſticot, or bleu and yellow.

An excellent green.

Take Copper plates, put them into a pot, and put some distilled Vineger unto them, set them in a warm place until the Vineger become bleu, then pour that Liquour or coloured Vineger into another Pot well leaded, and pour more Vineger upon the Copper-plates again, letting that also stand untill it be of a bleu colour, then pour it unto the former Liquour, this you may do so often untill you have Liquour enough, then let that Liquour stand in the Sun until it be thick enough.

A Lion-tauney.

This colour is made of red Lead and Masticot.

A Peach colour.

This colour is compounded of Ceruse and Vermilion.

A Brass colour.

This is made of Masticot and Umber.

A Marble or Ash colour.

This colour is made with black and white.

A russet colour.

This colour is made with a little white, and a good quantity of red.

A brown bleu.

It is made of two parts Inde baudias, and a third of Ceruse.

A Crane colour.

It is made onely of black Lead ground with Gum-water.

To write Gold with the Pen or Pencil.

Take a shell of Gold, and put a little Gum water into it, and stir it about, and then you may work with it as with colours.

Thus by a little practising and tempering your colours one with another, you may with the same colours compound divers others that I have not mencioned, nay almost what you list.

Of

Of Limming.

LImming consisteth not onely in the true proporcioning of a Picture, but also in a neat and lively colouring of the same, whereby the work is so graced oftentimes, that smaller faults are seldom perceived, except it be by those that have very good judgment: and herein I will speak first of the names of all the colours pertaining thereunto; also of the names of your Gums and Golds; then how you shall dissolve your Gums; then of grinding your Colours, and making them operative; of all your Waters to diaper, damask, and set out your Colours. Lastly, of making your Gold sizes both for burnished and set Gold, and to make your Gold small to armoniack with a Pencil, for writing, stock-painting, and other work.

The names of all the Colours pertaining unto Limming.

Bleus.

1 *Bleu Bice,*
2 *Inde Baudias.*
3 *English Inde.*
4 *Litmose bleu.*
5 *Flory bleu.*
6 *Cork or Orchal.*

Greens.

1 *Green Bice.*
2 *Verdigrease green.*
3 *Verditer green.*
4 *Sap green or Pancy green.*

Reds.

1 *Vermilion red.*
2 *Red Lead.*

Sanguins.

1 *Sanguis Draconis,*
2 *Turnsole.*

Yellows.

1 *Orpiment yellow.*
2 *Pinck yellow.*
3 *Oker de Luce.*
4 *Masticot or General.*

Crim-

Crimsons.
1 *Fine Rosset.*
2 *Sinaper lake.*
3 *Sinaper tops.*

Whites.
1 *White Ceruz.*
2 *White Lead.*
3 *Spanish white.*

Blacks.
1 *Black chalk.*
2 *Coppres black.*
3 *Sable black.*
4 *Base black.*
5 *Lamp black.*

Browns.
1 *Spanish brown.*
2 *Bole armenick.*
3 *Umber.*

The names of your Gums.
1 *Gum Armoniack.*
2 *Gum Lack.*
3 *Gum Hedere.*
4 *Gum Arabick.*

The names of your Golds.
1 *Liquid Gold.*
2 *Gold Armoniack.*
3 *Gold burnished.*
4 *Set Gold.*

How to dissolve your Gums.

The manner of dissolving Gum Armoniack, and for what use it serveth.

TAke Gum Armoniack and grinde it with the juyce of Garlick as fine as possible may be, then put thereto two or three drops of weak Gum-water of Arabick, and temper it so that it bee not too thick, but that it may bee conveyed out of your Pen; then write therewith what you will, and let it dry; when you would gild it, cut your leaf Gold or Silver in small pieces according to the writing you are to lay it on: first then breathe upon your writing or Drawing, and incontinently set your Gold or Silver hard on with a piece of Wooll, then let it dry thorowly, afterwards with a fine Linnen cloth strike away the loose Gold or Silver, and you shall finde the sithe you formerly drew to, though it be as small as the hair of your head, to be clean Gold or Silver, and this is called Gold Armoniack, and it may serve also to temper liquid Gold with.

Gum Hedere, how to make it, and to what use it serveth.

Seek a Tree that hath a great branch or arm of Ivie, then then hew the Ivie asunder in the midst, and bruise both the ends of it with the head of your Ax, so let it remain three or four weeks, and then you shall finde a pure Gum much like an Oyl to issue forth of the ends thereof, which gather up, for it is good to put into your Gold-size, and also into your other Colours, and that for three causes: first, it will stay the taste and odour of your size. Secondly, it will prevent the bubbles that would arise upon your Gold-sizes and other colours. Thirdly, it will make that the colours shall not be fat and clammy.

How to make Gumlack, and the use thereof.

Take the glayr of Eggs, and strain them as short as you can, in the Moneth of *March*; to a pint of this put a spoonfull of the finest Wort that you can get, also take Honey and Gum Hedere, of each as much as a Hazle-nut, and put to them four spoonfuls of the finest Wort, strain them with a piece of Sponge so long that you see them a clear Oyl; put both these together into a Glass, and let it dry, and it will be hard like Amber, which you may dissolve in clean water, as you do Gum Arabick. This is the best Vernish that is, and it is good to lay many Colours with, as you shall finde in the temperature of them.

How to make Glayr.

Take the whites of Eggs, and beat them with a spoon (or whisk, which is better) till it rise all in a foam, then let them stand all night, and by the morning they will be turned into clear water, which shall be good Glayr, wherewith you shall temper your Colours.

How to make Gum-water for the same use.

Take Gum-Arabick that is white and clear, knit it up in a clout, and lay it in clean water untill it be dissolved and make the water clammy: if you put too much water and too little Gum, you shall have a weak Gum-water, and so of all other Gums. Let it not be so stiff that your fingers stick together being wet therewith, but of a reasonable stiffness.

Of

Of the tempering and making Colours.

Some Painters uſe firſt to grinde all their Colours except white, with the Gall of a Neat, and then let them dry, and afterwards they grinde them again with Gum-water, and ſo uſe them; water, they ſay, killeth the brightneſs, and the Gall maketh the colour more lively.

Obſervacions.

The practices of a Limmer muſt be neat and cleanly in all the operacions, in grinding Colours where there is neither ſmoak nor duſt; the water of ſome clear Spring, the Gum of the whiteſt and cleareſt Arabick, broken into pouder: he muſt alſo have white Sugar-candy in pouder, and theſe muſt be kept cloſe in gally-pots, or jar-glaſſes: his grinding-ſtone muſt be of Chryſtall, Porphyr, or green Marble; his apparel ſuch as ſheddeth leaſt duſt.

Of bleu Bice, how to grinde and temper it.

Take fine Bice, and grinde it upon a clean ſtone with fair water, as ſmall as you can grinde it, then put it into a Horn or Horſe-Muſcle-ſhell, and waſh it in this manner following: Firſt, put thereto your Horn full of clean Water or Vineger, and ſtir it well, then let it ſtand the ſpace of an hour, and all the Bice will fall to the bottom, and the corruption ſhall fleet upon the water, then pour away that water, and then put to it ſomwhat a weak Gum-water, that the colour may fall to the bottom; let it then ſtand untill the Bice be all ſettled to the bottom, then pour away that Gum-water clean from the Bice, and put thereto other clean water, and ſo waſh it up, and if you will have it riſe to the ſame colour it is of when it is dry, then temper it with a weak Gum-water, if otherwiſe, then temper it with a ſtiff Gum-water of Lack.

If you will have it light, grinde it with a little Ceruſe.

If you will have it deep, put to it the water of Litmoſe.

If you will make a falſe colour hereof, put to it twice ſo much Ceruſe, and deep it with deep Azure, but after that diaper or trace with Ceruſe or white Lead.

Bice, Sinaper, Lake, and a little Roſſet make a fair Violet colour.

Ultermerine of *Venice* is the higheſt bleu, inſtead whereof you may uſe Smalt of the beſt bleu Bice.

Litmoz bleu.

Take fine Litmoz and grinde it with Ceruz: and if you take Litmoz and a little Ceruz, it maketh a deep bleu.

If you put much Ceruz and a little Litmoz, it maketh a light bleu, you muſt grinde it with weak water of Gum Arabick.

How to make bleu water to diaper and deepen upon all other colours.

Take fine Litmoz cut into pieces, and lay it in a weak water of Gum-lack, and let it lie twenty four hours therein; and you ſhall have a pure bleu water, as bleu as azure: with this water you may diaper, damask, and ſet out all other bleus.

Or take a little quantity of unſlak'd Lime, and a good quantity of Litmoz, and grinde it with a ſtrong Lime Lye, then put it into a Horn, and let it rot in Horſ-dung, the longer the better.

Inde-baudias and Engliſh Inde.

Take Inde-baudias and grinde it with the water of Litmoz, if you will have it deep; if you will have it light, grinde it with fine Ceruz, and weak water of Gum-Arabick. In the ſame manner muſt you grinde your Engliſh Inde, but it maketh not ſo good a colour as your Inde-baudias, you muſt diaper upon it with Litmoz-water.

Some inſtead of this colour uſe Flory with a little Inde-roſſet, and Ceruz twice as much, and it maketh a light violet.

With one part of Inde, and two parts of Roſſet is made a deep violet.

Inſtead of Inde one may have a little Flory, and for a violet colour it is better than Inde.

Flory muſt be tempered as is Inde.

Inde is a colour between bleu and black, and muſt be well ground with Gum-water, and tempered as Roſſet is.

Flory bleu.

Take fine Flory bleu, and grinde it with a little Roſſet, and it maketh a light violet. Put much Ceruz, and a little red Lead, and it maketh a Crane-feather colour. Grinde this with any yellow,

yellow, general excepted, and also Saffron, and it maketh a fair green.

This colour ground with a little bleu Bice, and a little quantity of Chalk, maketh a light colour.

This colour must be ground with glayr, and tempered with some Spanish white, else it will be little better than Chalk.

Kork or Orchal.

Take fine Orchal and grinde it with unslaked Lime, and with a quantity of urine, and it maketh a pure violet. If you put much Lime, it maketh a light violet. If you put too much Kork or Orchal, it maketh a deep violet; but Orchal is the better colour.

Green colours.

The best green for Limming is Cedar green, instead whereof you may use Verditer green.

How to grinde and temper green Bice.

You must grinde your green Bice on the same manner you did your bleu Bice, also temper and mash it after the same manner; and you must diaper upon it with the water of deep green, as you shall finde hereafter. The longer it is ground, the finer it will be, but the more waste. The refuse of this Bice may serve to make hils and stalks of flowers. Moreover, this colour being a false colour, must be deepened with Sap green, and diapered with Gals.

Verditer green.

Take your Verditer, and grinde it with a weak water of Gum Arabick. This is the fainteſt green that is, but it is good to velvet upon black, to make the sleeve of an Image, or to velvet a quishion.

Verdigrease green.

Take some Verdigrease, and grinde it with the juyce of Reu, and with a little weak Gum-water, and you shall have the purest green that is: and if you will have it to diaper upon, then you must grinde it onely with the juyce of Reu, and that will make it a worse green, and then your damask or diapering will be perceived.

You must diaper upon it with the water of Sap green.

Sap green.

Take Sap green and lay it all night in tart Vineger, or clean water not gummed, and put a little Allum thereto to raise your your colour, and you shall have a good green to diaper and deepen upon all other greens.

How to make Sap green.

Take the Berries of wine Thorn, which is much like uoto a Slo-tree, the Berries whereof are black, and grow in clusters like the Berries of Sartridge, whereof Butchers make their pricks; but these Berries differ in this from the Berries of Sartridge; these are full of juyce, and those are dry, and have a hard kernel within them. Take, I say, the Berries of Winethorn, and wring the juyce from them thorow a course cloth, and put thereto the pouder of Allum, to preserve the colour of the juyce, then seethe them together untill it be almost wasted away; when it is somewhat stiff, take it out of the vessel wherein it was boiled, and make of it a Ball; when you shall use it, take thereof a little, and put it into a shell of fair water, for it is strong enough of it self.

Of Vermilion red.

Vermilion is a principal and excellent red colour; in the grinding of it add a little Honey to make his colour bright and perfect. There are two sorts of this Vermilion, the one is natural, and the other artificial; the natural is very hardly to be got, and it is a far more excellent colour than the artificial. It is found in small quantities amongst your red Orpiment, and you may easily know it, for it doth much resemble the artificial. The artificial Vermilion is made of Quicksilver, and Citrin, Sulphur or Brimston burned together.

Of red Lead.

Red Lead is made of Ceruse burnt, and unto it you must add a little Saffron in the grinding, for that will make it of an orient and Marigold colour; you must wash it, and take the finest for Limming.

Of Orpiment.

Orpiment is a Mineral, and resembleth Gold when it is broken, it must be first ground with a stiff water of Gum-lake; it giveth the best colour of it self without any mixture: if you lay it upon green, white Lead, red Lead, or Ceruse, they will

stain

ſtain it. There are two ſorts of yellow Orpiment; the one, which when it is broken, looketh, as I ſaid, like unto Gold; the other is more brittle, and it is of a deep Marigold colour, but being ground, it maketh of it ſelf a moſt excellent yellow, which I have often uſed.

Of Pinck yellow.

You muſt grinde this colour with Saffron if you will have it ſad, if light, with Ceruſe.

Of Oker de Luce.

Oker de luce is a good hair colour, and a natural ſhadow for Gold.

Of Maſticot or General, or general yellow.

Grinde the Maſticot with a ſmall quantity of Saffron in Gum-water, and never make it lighter than it is. It will endure and lie upon all colours and metalls.

Of Roſſet, Cinaper lake, and Cinaper tops.

Theſe colours you muſt grinde each by themſelves with Gum-water. Lake of India is of a Crimſon colour, other Lakes there are that are blacker, and they muſt be ground with Sugar-candy or Sugar.

Of Sanguis Draconis.

Sanguis Draconis muſt firſt be purified from his droſs, and then ground with Gum-water.

Of Turnſoil.

Turnſoil is made of old linnen rags dyed; you ſhall uſe it after this manner; lay it in a Saucer of Vineger, and ſet it in a Chafing-diſh of coals, and let it boil a little, then take it off, and wring it into a ſhell, and add thereto a little Gum Arabick, and let it ſtand untill the Gum be diſſolved; it is good to ſhadow all carnations and yellows.

Of Brown of Spain, and Umber.

Grinde your Spaniſh brown with Braſil-water: in like manner grinde your Umber.

Of Bole-armoniack.

Grinde Bole-armoniack with Gum-water.

Of Ceruſe.

Ceruſe muſt be ground with glayr of Eggs that hath lien rotting a moneth or two under the ground, and it will make a moſt perfect white; this colour being ground and waſhed, will yield

three

three sorts of whites; the first whereof is the fineſt, and it will glizen, this I call Sattin-white: the second is good for Limming; and the courſeſt of all being once ground again, is beſt to be uſed for the fleſhy colour, properly called Carnacion, which in no sort ought to have any glizening in it. This colour with a little Red Lead maketh the fayreſt Carnacion. If the party be pale, leſſe Red Lead and a little Maſticot among it; if brown, more of each, and a little Oker de rous withall.

Of white Lead

This is the ſame with Ceruz, but it is not refined as that is; grinde it with a weak water of Gum-lake, and let it ſtand three or four dayes; Roſſet and Vermilion make it a fayr Carnacion.

Of Spaniſh White.

You muſt grinde your Spaniſh white with a weak Gum-water. It is the beſt white to lace or garniſh withall, and it is thus made; take fine Chalk and grinde it with the third part of Allum, in fayr water, untill it be thick like pap, then make it up into Bals, and let them lie by untill they are dry; when they are dry, put them into the fire, and let them remayn untill they be red hot, like burning coales, then take them out, and let them cool.

To make liquid Gold or Silver.

Take five or ſix leaves of Gold or Silver, and lay them upon your grinding ſtone, and grinde them with a ſtiffe Gum-water, and a pretty quantity of Salt, as fine as poſſibly you can, then put them into a jar-glaſſe, aud fill the glaſſe almoſt full of fayr water, to the end the ſtiffe water may diſſolve, and ſo the Gold may fall unto the bottom of the glaſſe: let it ſtand three or four hours, then pour away the liquor from the Gold, and put more clean water, and ſtir it about, and let it ſettle again, and then pour off the ſame water; do this ſo often untill you ſee your Gold or Silver clean waſhed; then take clean water, and put thereto a little peece of Sal-armoniack, and great Salt, and let it ſtand the ſpace of three dayes in a Box made of wax, then take a peice of Glovers leather, and pick away the skin-ſide, and put the Gold and the water therein: ty it up then, and hang it on a pin, and the Salt will fret thorow, and the gold will remayn, which you ſhall temper with the glayr of Eggs and ſo uſe it with your pen or pencill.

The

Of Gold-armoniack.

The making of Gold-armoniack you are taught before in the dissolving of the Gums

To make Size for burnished Gold,

Take three parts of Bole-armoniack, and the fourth part of fine Chalk, grinde them together as small as you can with clear water, three or four times, and after every time let it dry, and then take your glayr of Egs, and strain them as short as water, and then grinde your Bole and Chalk therewith, and in the grinding put a little quantity of Gum-hedere to the quantity of a fatch, and four or five blades of Saffron, grinde them all as small as possible you can, and put them into an Ox horn, and let it rot in horse-dung the space of five or six weeks, and then take it up, and let it have the Ayer, for it will have an ill savour, then occupy it when you will, after this manner; lay this Size first upon your parchment, and with a feather lay your Gold or Silver upon it, and when it is dry, burnish it.

How to make another double Size to lay Gold or Silver upon an Embossed ground.

Take *Venice* Ceruz, white Lead, Plaster of an old Image, or Chalk; any of these made into fine Pouder, and ground with the white of an Eg, and a little water; this will make a good bottom to lay Silver on. But when you use any of these to lay under Gold, put to it a little Saffron, Put not too much water, mingle it after discrecion, and look the Size be thick standing; put the Size thus tempered, in a Horn or Shell, in some Cellar or shadowed place, where it may stand moyst seven dayes, till it be perfect clammy and rotten, and once a day stir it; the older the Size is, the better it is. If there stand any bubbles upon the Size, put in a little eare-wax, for that is a remedy against it, and before you lay it on your work, lay the Size upon a horn, and dry it, and when it is dry, bend it, and if it bend and break not, then it is perfect; if it break, put a little water to it, to make it weaker, and proov it if it cleaveth fast unto the paper, if not, put glayr thereto, and it will make it more stedfast, The like Size you may make of Gipsum, Bole-armoniack, red or yellow Oker, Orpiment, or Masticot, with the Brown of Spain, or Red-Lead, if every of them be ground and tempered as the former.

How to ſet Gold or Silver.

Take a peice of Gum-lack, and diſſolve it to a ſtiffe water; then grinde a blade or two of Saffron with it, and with your Pen or Pencill make what work you pleaſe, and cut your Leafe Gold or Silver into peeces, according unto your drawings, and take them up with a feather, and lay them on your drawings, and preſſe them down with a peece of wooll; when it is through dry, ſtrike off the looſe Gold or Silver, and burniſh it with the tooth of a Dog faſtened in the end of a ſtick.

Aurum muſicum.

Take one ounce of Sal-armoniack, one ounce of Quick-ſilver, of Counterfoin one ounce, and of Brimſton half an ounce, bruiſ the Brimſton, and ſet it on the fire, but let it not be overhot (leſt it burn) then put in the Sal-armoniack being in pouder, alſo the Quick-ſilver, and Counterfoin, being well mixed therewith, put them, I ſay, into the Brimſton, and ſtir them very well, and quickly, with a ſtick, untill the Brimſton become hard, then grinde it on a ſtone, and put it in a glaſſe well ſtopped with wax, and ſet it in a Pan of Aſhes, make a fire under it, and let it ſtand half a day in that manner, till a yellow ſmoak ariſeth on it, and when the yellow ſmoak is gone, it is prepared.

Argentum muſicum.

Take one ounce of Tin, melt it, and put thereto one Ounce of Tartar, and an ounce of Quick-ſilver, ſtirr them well together, untill they be cold, then beat it in a morter, and grinde it with a ſtone; temper it with Gum-water, write therwith and afterward polliſh it.

How to write a Gold Colour

Take a new layd Hens Egg, make a hole at one end, and let the ſubſtance out, then take the yolk without the white, and foure times ſo much Quick-ſilver in quantity, as of the former; grinde them well together, and put them into the ſhell, ſtop the hole thereof with Chalk and the white of an Egg, then lay it under a Hen that ſitteth, with ſix more, for the ſpace of three weekes, then break it up and write with it.

To diaper on Silver or Gold

Diaper on Gold with Lake and yellow Oker, but upon Silver diaper with Ceruz.

Of

Of the light and place moſt meet to be choſen, and of certain neceſſary Obſervacions

Let the light whereby you work, be Northward, ſomwhat towards the Eaſt, which is commonly without Sun-ſhine; let it be one only light, and that great and fayr, without reflections of wals or Trees, a free sky light, the greater the window, the better, but no bay window; in ſuch a place alſo where neither duſt, ſmoak, noyſe, nor ſtink may offend, for the colours themſelves may not endure ſome Ayers, eſpecially the Sulphurous Ayers of Seacoal; and in any wiſe avoyd anger, and ſhut out buſybodies, and ſuch as love to be fingering; and ſpeak not over your picture, for the leaſt ſpot of wet falling upon it, can never be amended.

In drawing after the life, change not your light, but end your work by the ſame light that you begin it in; if poſſibly you may.

Virgin parchment, that is, ſuch as is made of the skins of caſtlings or abortives, free from ſpots, and fine and ſmoothly dreſt, ſtrained and paſted with ſtarch upon ſmoothed paſtbord, is the beſt to Lim upon.

When you begin your picture, lay firſt too fayr a carnacion, for in working you may make it as brown as you will, but being choſen to brown, you ſhall never work it fayr enough; for Limming is but the ſhadowing of the ſame colour that your ground is of. All ground colours in Limming muſt be layd ſomewhat flowing, that it dry not before your pencill, leſt your work ſhew rough and patched.

When you draw upon the ſame ground, be very adviſed what lines you draw, and draw them very lightly with ſome of the ſame carnacion and a little Lake thinly mixed, or with a little thin Lake alone, with a very ſmall pencill, that it may ſcarce at the firſt be diſcerned, untill you be ſure that you are in the right way, for afterwards it is very hardly altered. In ſhadowing alſo uſe the ſame diſcrecion, let it be preformed by little and little, at the firſt too white, for the face at the firſt being made never ſo little too red, or too brown, can never be amended; ſhadowing to much is never to be amended; alſo if the hayr be made too dark, or the

forehead too low, they are very hardly or never to be amended ; wherefore make the forehead too high at the first, and you may be sure to amend it, bee not too hasty to lessen it, but proceed with judgment and consideracion.

To draw the trace after the carnacion is layd, and to give the red to the cheeks, take Lake and Vermilion, and for to give the light, take *Venice* Ceruz only, for an old man ad a little Oker unto it, for the shadows take a little black and Lake, but for a woman make it very white, for an old man take the other shadows and a little soot, for the last shadow for the compassing of the face, take Lake, a little black, with some Russet Oker, and soot ; as for the hayr, it must be shadowed according unto the colour thereof.

Shadowing in Limming must not be driven with the flat of the pencill, as in oyl-work, but with the point of the pencill; distemper or washing, with little touches, of colours, very thin and like hatches, though the shadows be never so great, yet must it be made after the same manner, with little touches, but trench not to long in one place, lest it glissen, but let it dry an houre or two, and then deepen it again.

And to make one the more perfect in this work, it were good to practise to hatch some well graven small peeces of *Albertus Durer*, to the end you may handle the point of the pencill in like manner.

Keep your colours ready washed, dried, and ground, each in severall boxes, apart by themselves, and temper them by little and little, as you have occasion to use them ; for a colour after it is once dried in the shell, never worketh so well afterwards. But if it happen that you have tempered too much of a colour, and that it bee dried in the shell, you must temper them with your finger very clean, when you will use thereof, ad a little gum, if it temper not well, but beware you put not too much gum in.

If any colour crack too much in the shell, temper therewith a little Sugarcandy, but not too much, lest it make it shine.

If a colour will not take by reason of some sweaty hand that hath touched your parchment, temper with your colour a little ear-wax, to give it as it were a taste. The same

is

is good likewiſe if any colour peel off, to temper the colour that you mend it with, and it will never peel any more.

Want of Gum is the cauſe that your colours temper like lome or clay, and will draw no line at all.

Of mixing and tempering Colours.

White Lead with yellow Oker, maketh a ſtraw colour; with adding azure, it maketh a ſky colour; and ſo likewiſe by adding Smalt and Verdigreaſe, or pinck, it makes the colour of leaves, and herbs. White with the ruſt of iron maketh the Agat colour. White with Endego, makes a ſky colour. White with Vermilion, makes the colour of unripe Strayberries. White with carnacion, makes the colour of damask Roſes. White with Umber and other ſhadowing Earth, makes the colour of barks of Trees, blocks, wood, and ſtones.

Yellow with Vermilion, makes the colour of fier ſhining, alſo an orange Tawny.

Lake and Azure make a Violet or Columbine colour: Vermilion and Lake make the colour of ripe Strayberries, Roſes, Rubies, red Lips, blood and ſcarlet.

Verdigreaſe with pinck, maketh a very freſh green. Azure ſmalt, and pinck make a dark green.

Azure with Turnſole makes a purple or violet colour, and ſo with Roſſet, Azure, Sinaper, and black, makes a ſanguin or murry colour.

Red Lead and Maſticot make a Lion-tauney.

Now all theſe mixtures may be lightned, and diverſly varied, according as they are mixed with more or leſs, whence ariſe ſundry medlies, which would be too tedious for me here to recite.

Of Liquours to diaper withall.

Cut fine Litmoz in pieces, ſteep it twenty four hours in Gum-water, and the water will be as bleu as azure, with which you may diaper, and ſet out all other bleus and Gums for a need. Flory-bleu ground with Roſſet, maketh a deep vio-

let, add to it a little Ceruz, and it will be a light violet; put a little more Ceruz, and a little Allum, let it lie all night, and it will be good to diaper on other greens. Cinaper-lake ground with the water of Turnsoil, and stiff Gum-water, will be a deep Crimson, and therewith you may diaper upon a light Crimson.

How to represent Diamonds, and other precious stones.

First, lay the ground, Gold or Silver, as the colour of the stone requireth; when it is dry, burnish it, and draw upon it squares, according as you will have the cuts or squares, then shadow it with transparant colours, according unto the colours of the stones that you endeavour to represent.

How to wash your Pencils.

Rub the ends of them well with Soap, then lay them a while in warm water to steep, then take them out, and wash them well in clean water.

Of Painting in Oyl.

FIrſt, I will ſhew you how to make Size; ſecondly, how to prime your Boards and Cloaths; and alſo how to black your Frames: then how to temper, order, and lay on your Colours.

How to make Size for your Boards.

Take Gleu and ſeethe it very long in fayr water, untill the Gleu be quite diſſolved, and it is done.

How to make Whiting.

Take the aforeſayd Size, and mix it with Whiting ground, heat it, and ſo white your Boards, being made ſmooth, after you have whited them, let them dry; white them over a ſecond or third time, letting them dry after every whiting, then ſcrape them ſmooth, then draw it over with white Lead tempered with Oyl.

How to white or prime Cloth.

Take the fineſt Canvace that you can get, and ſmooth it over with a Sleekſtone, then ſize it over with Size, and a little Honey, and let it dry, then white it over once with Whiting and Size mixed with a little Honey; Honey keeps it from cracking, peeling, and breaking out, then you may draw your picture on it, with a Coal or ſuch like, and laſtly lay on your Colours.

How to black your Frames.

Temper Lamp black with Size, and therewith black your Frames, you muſt only put your black unground into your Size, ſtir it with your Bruſh, and ſo work it.

How to gild the Edges of your Frames.

Take white Lead, and a little red Lead, grind them together with

with Linſeed oyl, and lay it over the place which you will gild, and let it dry a day or two, then lay it over again with the ſame Colour, and two dayes after you may cover it with leafe gold ; firſt with a ſharp knife cut the gold in ſtrips, according unto your work, then with a feather lay it on, and preſſe it down with wooll, when it is dry, burniſh it.

Linſeed oyl is the beſt for pictures, but Nut oyl is the beſt for Ruffes, and all Linnen ; for your Linſeed oyl will turn yellow : divers Painters there are, who having haſte of work, do uſe to temper their Colours with one part of fat oyl, and two of common Linſeed oyl, and by this meanes they make the Colours dry the ſooner : this fat oyl is only Linſeed oyl expoſed to the weather, and ſo it becometh thicker, yet ſomtimes you ſhall ſee it ſo thick, that you may cut it almoſt like butter. It may bee made by boyling the oyl awhile, but the former is the better ; if your Cloth have any knots on it, or uneven threds, then weare them off by rubbing it with a fine pummice ſtone.

Fleſh colour.

Take white Lead, grinde it with oyl, Lake, and Vermilion, ſo you may make it pale or high coloured, at your pleaſure.

White.

Whiting is a white to white Boards only, but white Lead ground with Nut-oyl, maketh a perfect white.

Black, Lamp black, Printers black.

Lamp black is a good black ; the black Earth that the Printers that print Maps and copper plates, is far better ; but for velvers, Hart's-horn black, or Ivory black are the beſt, and it is thus made.

Hort's-horn or Ivory black or velvet black.

Take Hart's-horn, or Ivory, burn it to coales, and then grind it with oyl. It is made by burning Hart s-horn in a Crucible cloſe ſtopt that the Ayer come not in, for halfe an houre, afterwards ground and waſhed.

Charcoal black.

Charcoal black is good to ſhadow Ruffes, or Linnens, and it is thus made ; grinde charcoales very ſmall with water, let it dry, and then grinde it with oyl.

Sea-

Seacoal black.

Seacoal black ſerveth for divers uſes, as Hart's-horn black doth, and it is made as charcoal black is.

A falſe bleu.

Bleu of Inde is to make a falſe ground for a bleu, and it muſt be ground with oyl.

Azure bleu, Byce bleu.

Azure bleu or Smalt muſt never be ground nor your Byce, but they muſt bee tempered with your knife upon the pallet.

Red, red Lead, Vermilion, Lake.

Red Lead is a good colour to lay under gold, vermilion is a Crimſon colour, Lake is the beſt blood colour.

A hayr colour.

Umber is a hayr colour.

Yellow, Maſticot, Orpiment, Gambaugium.

Maſticot is a perfect yellow, when you grinde it, you muſt rub it very lightly, elſe it will loſe the colour; alſo Orpiment and Gambaugium are both very good yellows.

Green Verdigreaſe.

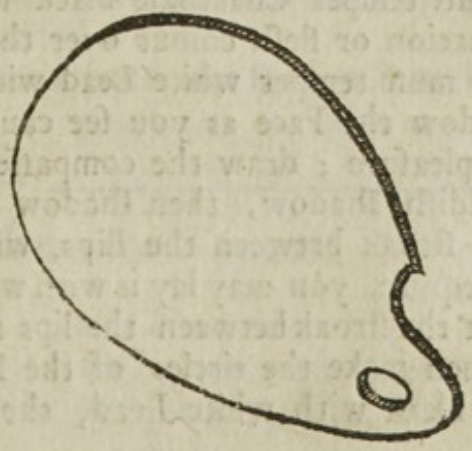
Verdigreaſe is a good green, and it is uſually mixed among your blacks, to make them dry.

Yellow, yellow Oker, reddiſh.

Yellow Oker maketh a bright hayr colour. Brown of Spain maketh a kinde of reddiſh colour.

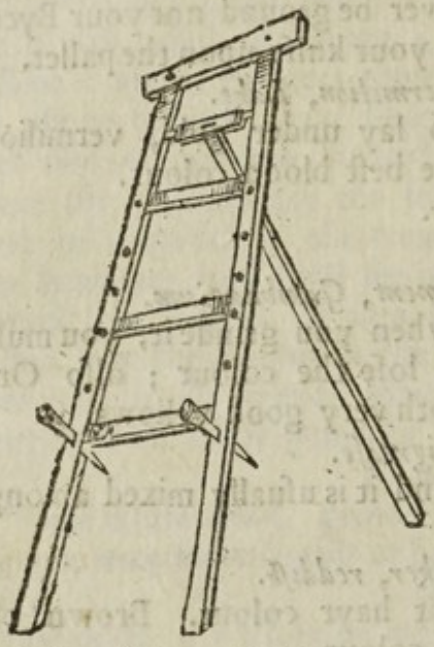
Red Lead and Verdigreaſe are drying colours, for being mixed with others that of themſelves will not dry, they make them for to dry.

The figure of the Pallet to put your Colours upon.



How to order your Colours upon your Pallet.

For the drawing of a Picture you must first lay your single colours in order upon your Pallet thus; a little white Lead, a little Vermilion, a little Lake, so Tauney colour, or Sea-coal black, Oker, Verdigrease; then your Byces for your Bleus, Yellows, and other colours, at your pleasure, each apart: when you have so disposed them, make your mixtures under them.



You must have a Frame made with a stay upon the back, to set it higher or lower; and it must have divers holes in the two former Rayls of it, and there must be two pins, on each side one: this Frame is called by Artists an Easel, and it is to place your Board or Cloth nayled on a Frame that you intend to work upon, for the more convenience of working it, and ease to the workman.

Now followeth the manner of mixing and laying your Colours.

How to temper and lay your colours upon a Picture.

First you must begin with the white of the Eye, and for it you must temper Charcoale black with white Lead, then lay a carnacion or flesh colour over the Face, and for to make this, you must temper white Lead with Lake and Vermilion; then shadow the Face as you see cause, and make the Nose at your pleasure; draw the compasse of the Nose with some dark reddish shadow, then shadow your Cheeks and Lips, with the stroak between the Lips, with Vermilion and Lake: if need require, you may lay it with white, or some light shadow, but the stroak between the lips must be all Lake, or most of it; then make the circles of the Eyes: for a gray ey, mix charcoal black with white Lead, the brighter you will have it,

it, put the more white Lead ; the ſadder, the more black ; for the black circle of the Eye, Lake, Umber, Seacoal black, and a little white, mix them according to diſcrecion ; to make the round black in the midſt of the Eye, mix Lamp black with Verdigreaſe ; for the hands, you muſt firſt lay them with fleſh colour, as the Face, and ſhadow the veines with the ſame ſhadowes, making the ſhadowes between the fingers, ſomewhat ſadder, and the knuckles ſomewhat redder with Vermilion and Lake : go over the nayles with a light ſtroak of white, and ſhadow them above with a dark fleſh colour ſhadow, ſomewhat ſad : if you would have your fleſh colour to look any thing yellow, you may put a little yellow oker to it, and make it as much or as little as you will : for a black or ſwarthy colour or complexion, you muſt make it as it followeth ; mix Vermilion, white Lead, Lake, and yellow Oker, the browner you will have it, put the more Umber into the ſhadowes, make the ſhadow of Umber and Seacoal black.

For the Hayr and Teeth.

For black hayr take Lamp-black, and where you would have it brighter, mix it with Umber, and white Lead, and red Lead : for flaxen hair, take Umber and white Lead ; the browner, the more Umber ; the brighter, the more white ; yet if you will have it a little brown, mingle a little Sea-coal black with it : for yellow hair take Maſticot, Umber, yellow Oker, and a little red Lead ; the redder you will have it, put to the more red Lead and Umber : for white hair take half Ivory-black, and half Umber, temper them with your Knife, with white Lead ; the whiter you would have them, put to the more white ; the darker, the more Umber and Ivory.

For the Teeth take white Lead, and ſhadow it with Charcoal black.

Colours for Apparel.

For Linnen.

For Ruffs take Charcoal black, and mix it with white Lead, make it darker or lighter at your pleaſure ; but when you make

your Lace on Ruffs, Cuffs, or such like, you must put to it a little Oyl and Smalt; you must remember (as I have already told you) to temper all your colours for Linnen with Oyl of Nuts, for Linseed Oyl will turn yellow.

For Velvets.

For black Velvet take Lamp-black and Verdigrease, for your first ground; when that is dry, take Ivory-black, and Verdigrease; shadow it with a little white Lead mixed with Lamp-black.

For green Velvet take Lamp-black and white Lead, and work it like a Russet Velvet, and let it dry; then draw it over with Verdigrease tempered with a little Pink.

For Sea-green Velvet take onely Verdigrease, lay it over the foresaid Russet: if you will have it a Grass-green, put a little Masticot unto it; you must shadow these Greens in Russet; for the lighter or sadder you would have your Green to be, you must first lay your Russet accordingly.

For red Velvet take Vermilion, and shadow it with brown of Spain; where you will have it darkest, take Sea-coal black and brown of Spain to shadow among the foresaid colours; let it dry, and then gloss it over with Lake.

For crimson or carnacion Velvet take the more or less white Lead to the Vermilion at your pleasure.

For bleu Velvet take Oyl and Smalt.

For yellow Velvet take Masticot and yellow Oker, and where you will have it darkest, shadow it with Umber.

For tauney Velvet take brown of Spain, white Lead, and Lamp-black, mixt with a little Verdigrease, to shadow where there is occasion; when it is dry, gloss it over with Lake and a little red Lead.

For purple Velvet take Oyl, Smalt, and Lake, of each a like proporcion, temper them together with white Lead, bright or sad it according to your discretion.

For Ash-colour Velvet take Charcoal-black and white Lead, lighten it as you please with white Lead; you must temper a colour like unto a dark Russet, and this will be an Ash-colour.

For hair coloured Velvet take Umber ground of it self, and where your glass shall be brightest, mix some white Lead,

and

and where you make the folds about the edges, lighten or darken it with white Lead and Umber.

Note that when you work Velvet, you must at the first work it somewhat sad, and then give it a sudden brightnesse.

Sattens.

For black Satten take Lamp black, and grinde it with Oyl, and then temper it with white-Lead, and where you will have it to shine most, mix a little Lake with the white-Lead.

For white Satten take white-Lead, and grinde it by itself, also grinde Ivory black by it self; these you must temper lighter or darker according as you would have your Satten shew.

For green Satten take Verdigrease, and grinde it by it self, then mix some white-Lead therewith, and where you would have it shew brightest, ad some Pinck to it. If you would have it more Popingey ad more Pinck to your white-Lead; where you would shaddow it deepest, ad more Verdigreas.

For yellow Satten take Masticot, and grinde it by it self, yellow Oker by it self, and Umber by it self; where you would have it brightest, use Masticot alone, where you would have a light shadow, let Oker serve; where darkest, take Umber; you may mix them at pleasure, but where you will have the sadest shadow use Umber onely.

For bleu Satten take Oyl, Smalt, and white-Lead, mix them, where you would have it saddest, use Smalt, where lightest, use white-Lead.

For a purple Satten lay Smalt alone, and where you would have it brightest, use white-Lead.

For Orange tauny Satten take red-Lead, and Lake, where you will have it brightest, use red-Lead, and where saddest, use more Lake.

For red Satten grinde Brown of Spain by it selfe, mix it with Vermilion, and where it shall be brightest, mix white-Lead with your Vermilion.

For hayr colour Satten mix Umber and white-Lead, where you will have it shew brightest, put more white-Lead, and where you will have the cuts most shadowed, use a little Sea-coal black with your Umber.

For Taffaties.

You must make your Taffaties as you do your Sattens, laying,

ing the changable Taffaties thus: take divers colours, as you shal see best, and lay them one by another upon your work, and so shadow them with another, and work them finely one amongst another, at your pleasure.

For Cloth.

It is in a manner all one to make Cloth and Satten, but you must not give your Cloth so sudden a shining glosse. To make Cloth of Gold, take brown Oker and liquid Gold, water and highten upon the same with small gold stroaks.

For Leather.

For Buffe take yellow Oker and some white Lead, work it, and where you would have it dark by degrees, mix it with a little Vmber, and when you have wrought it all over, take a broad Pencill, and size it over with a little Vmber, and Sea-coal-black.

For yellow Leather take Masticot, and yellow Oker, and Vmber to shadow it more or lesse at your pleasure.

For black-Leather for shooes take Lamp black, and shadow it with white-Lead more or lesse.

For Metals.

For yron take Lamp-black well tempered with white-Lead; if you will have it dun or rusty, take some Seacoal-black, and mix it with a little white.

For Silver take Charcoal black and white-Lead, and where you will have it darkest use more Charcoal, and work your Silver somewhat rustish then give it a sudden glosse with white Lead only, where you think good.

For Gold take Lake, Vmber, red-Lead, and Masticot; these are the colours for Gold; you must lay the ground with red-Lead, and a little dry Pinck, if you please; where you will have it darkest, shadow it most with Vmber, and where lightest, with Masticot.

Note, that when you grinde your red Lead to make your Gold Size, you must put a little Verdigrease into it, to make it dry the sooner.

For Pearles.

For to make Pearles you must temper Charcoal-black with white-Lead, untill it become a perfect Russet; then make your Pearl with it: and give it a speck of white-Lead, onely to make

it

it ſhine: note, that the glizening Ceruz which was mencioned in the Art of Limming, being tempered with Oyl of white Poppy, is moſt excellent to highten up pearles.

For precious Stones.

To make Carbuncles, Rubies, &c. you muſt firſt lay theyr counterfeit grounds, then with tranſparent colours, (ſuch as are Lake, Verdigreaſe, and Verditer) give them a ſhining gloſſe.

For Fier

For Fier where it is reddeſt, lay red-Lead, and Vermilion tempered together; where the flame is bleu, take Oyl, Smalt, and white-Lead; where it is yellow, take Maſticot, and work it over in ſome places, where you will have it ſhine moſt, with Vermilion, yet ſo as your Vermilion may appear.

For the Skie.

Take Oyl and Smalt, mix them with Linſeed Oyl on your pallet; you muſt not grind it at all, (for then it will loſe its colour) temper it with white-Lead only, as bright as you will have it, and where it looketh red, uſe Lake with your white-Lead, and Smalt.

For Wood.

For ſome kindes of Wood you muſt take Lake, Vmber, and White; for others, Charcoal and White; for others, Sea-coal and White; for ſome alſo, Vmber, Black, White, and a little green: alſo if your Wood look red, take a little Lake or Vermilion among your aforeſaid colours, as you ſhall think beſt.

How to waſh your Pencils.

Take a deep drinking Glaſſe, and fill it half full with clean Linſeed oyl, then put your Pencils that you have wrought with Oyl, into the ſame, and rub their bruſh ends againſt the ſides of the Glaſſe, and the Oyl will looſen the colour from off them, which will ſink to the bottom of the Glaſſe; you may uſe theſe ſetled colours for to prime your Cloth and Boards.

How to preſerve your Oyl colours, and keep them from drying.

Put each colour by it ſelf in little Pans or Pots, and ſet them in the water that they may be covered over therewith, and they will keep moyſt a great while, that you may work with them at your pleaſure, other wiſe they will dry quickly, and being once dry, will never be tempered again to work with.

Payntings must bee placed in their proper places, with their shadows from the light.

Of distempering or working in great with water colours.

This kinde of work is all one with paynting in Oyl, saving that the colours are tempered with Gum-water, or Size: it is more speedily performed, but the colours will not continue so fresh as in Oyl.

To make Colouring called Vernix: to vernish Gold, Silver, or any other colour on Vellom, Paper, Timber, Stone, &c.

Take Bengewin, and bray it well betwixt two Papers, then put it into a Violl, and pour on it aqua vitæ, that it may stand above the Bengewin three or four fingers, and let it steep so a day or two; then put to it for half a Violl of aqua vitæ five or six Chieves of Saffron slenderly stamped; this done, strain it, and with a Pencill vernish therewith any thing gilded, which will become bright and shining, drying it self immediatly, and will continue the brightnesse many yeares; but if you will vernish on Silver, then take the white that is found in Bengewin, and dresse it with aqua vitæ as afore, leaving out the Saffron, and the sayd Vernish made with these only, is very good to vernish all things, as well painted as not painted; for it maketh Tables of Wal-nut Tree and Hebene to glister if it be layd on them, and all other things, as yron, Copper, or Tin gilded, or not; it maketh bright, preserveth and aydeth the Colour, and dryeth incontinent without taking dust.

How to paynt Glasse.

THere are two manner of wayes of paynting upon Glasse: the one is for Oyl colour, the other for such colours as are afterwards to be annealed or burnt on. First of the first.

How to lay Oyl colours upon Glasse.

First you must grinde your colour with Gum-water once, and afterwards temper it with Spanish Turpentine; lay it on, and let it dry by the Fier and it is done.

How

How to paint Glasse with Colours, and to annea lthem.

There are six principall Calours used in paynting Glasse, whereof divers others may be made by mixing some with other; the names are these, Yellow, White, three Blacks, four Bleuss, three Reds, and six Greens; the making whereof followeth in order.

Yellow,

Take an old Groat, or any other peece of the Purest refined Silver, then take a quantity of Brimston, and melt it, and then put your Silver unto the melted Brimston, and with a payr of small Plyers take it out again, and light it in the fire, hold it in your plyers untill it leave burning, then beat it to Pouder in a brazen Morter, afterwards grinde it on a Marble with Gum-arabick water, and a small quantity of yellow Oker; work with this what you will upon Glasse, and let it dry of it self.

Another fairer Yellow

Take a quantity of good Slver, cut it into small peices, take then twice so much Antimony beaten to Pouder, put them togc-ther in a small Crucible, and set it in a hot fire for the space of half an hour, then take it out of the fier, and cast it into any brasse thing, and afterwards beat it into Pouder. Note that you must weigh the Silver before you burn it, and weigh six times as much yellow Oker, and seven times the weight of old Earth that hath been scraped off yron annealed work, grinde all very well together with your burnt Silver, put it in a Pot, stir it well, and so use it.

White.

This Colour is the Glasse it self, and it may serve very well without any other Colour; you may diaper upon it with other Glasse or Chrystal ground to Pouder.

Black.

Take Jet and the scales of yron, and with a wet feather take up the scales that fly from the yron after the Smith hath taken a heat; these scales you must grinde on a Paynters stone with the Jet and Gum-water, to be used as the former Colours.

Another Black.

Take a quantity of Yron sca'es, as many Copper scales, stamp them small, and make them red-hot in a clean fire-shovell, then take half as much jet as one of them; first grinde them small,

temper them with Gum-water, use them as the aforesaid.

Bleu, red, and green.

These three colours are to be used after one manner; provide beads, the clearest that you can get, of the forenamed colours, beat them to pouder in a brazen morter, each colour by it self, then buy some Amel at the Gold-smiths of the same colours, which must also be very clear and transparant, grinde each by it self, then take two parts of Beads, and one part of Amel, grinde them together, as you did your Silver.

Another fayr Red.

Take a quantity of Dragons bloud, beat it to pouder, and put it into a Linnen-cloth, and put thereto some rectified Spirit of Wine, cover it close a little while, and it will grow tender, then wring it out into a Pot, so the clear will come, and all the dross will remain in the Cloth, so you may use it when you need.

A fayr Carnacion.

Take an ounce of Tyn-glass, three ounces of Jet, five ounces of red Oker, Gum a quarter of ounce, grinde them together, and use them.

Another Carnacion.

Take a quantity of Jet, half as much Litharge of Silver or glass-tyn, half as much iron-scales, as much Gum, and as much red chalk as all the rest do weigh, then grinde them, and use them.

Another excellent Green.

Take a quantity of Verdigrease, grinde it well with Turpentine, when you have so done, put it in a Pot, and when you use it, warm it on the fire.

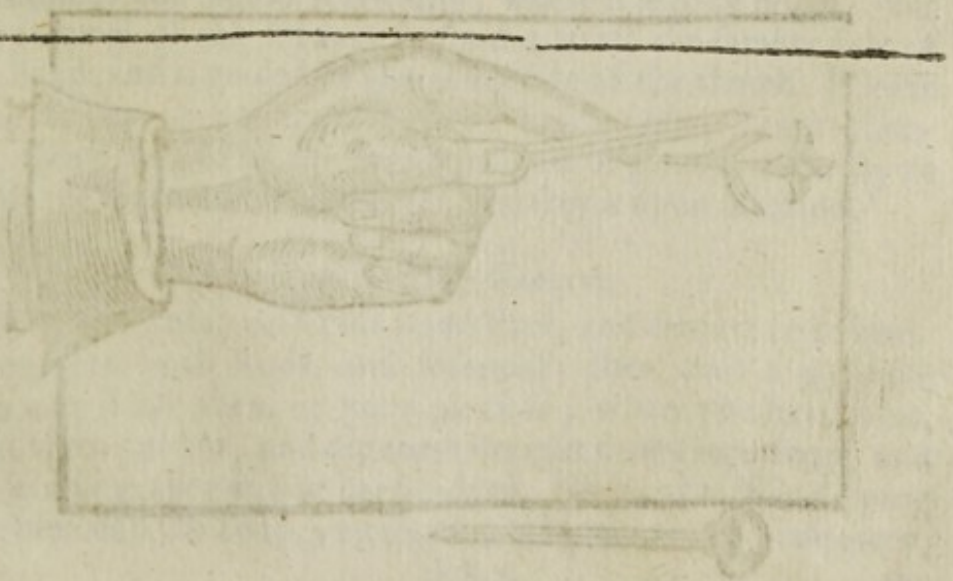
How to anneal or burn your Glass, to make the Colours abide.

You must take Bricks, and make a Fornace four-square, one foot and a half broad, and a foot and a half high; when you have so done, lay divers little barrs cross the top of it, five or six, or as many as you shall think fitting, then raise the Fornace a foot and a half high above the bars, and it is done; you must have a plate of iron to lay all over the bars.

How

How to place your Glaſs in the Fornace.

Take ſlaked Lime, and ſift it through a ſieve upon the plate, then lay a row of glaſs upon that bed of Lime, then ſift another bed of Lime, and lay another bed of glaſs upon it, this do until your Fornace be full, lay alſo with every bed of glaſs a piece of glaſs which you may wipe over with any colour; theſe are called watches, for when you think your glaſs is ſufficiently enough burnt, then with a pair of pliers take out the firſt and loweſt watch, lay it on a board, and when it is cold, try if you can ſcrape off the colour, if it hold faſt on, then you may take out that row, but if the colour ſcrape off then it may abide the fire longer.

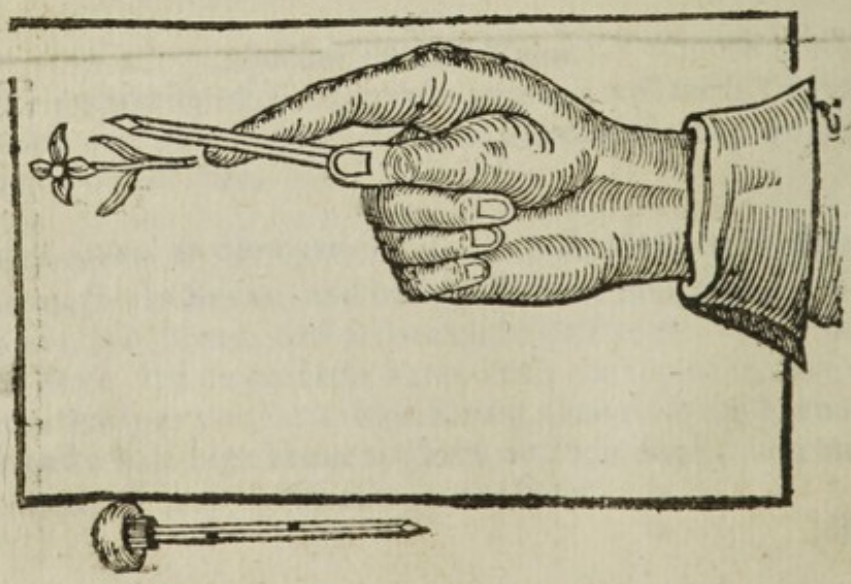


Of Graving.

IT is poſſible for one to be a good Painter, & yet not to be able to draw well with the Pen, becauſe there is not required in a Painter ſuch a curious and exact carriage of the hand: but it is impoſſible for one ever to Grave or Etch well, except he can draw well with the Pen. Firſt therefore, preſuppoſing you can do the firſt before you attempt the ſecond, you muſt provide divers graving tools, both long and ſhort; ſome for hard work, ſome for ſweet work; ſome for ſmaller work, and ſome for greater: alſo a piece of a Beaver-hat, and a good Oyl-ſtone, ſmoothed on one ſide, and free from pin-holes, and plates of Copper or Braſs exactly poliſhed.

Of Gravers.

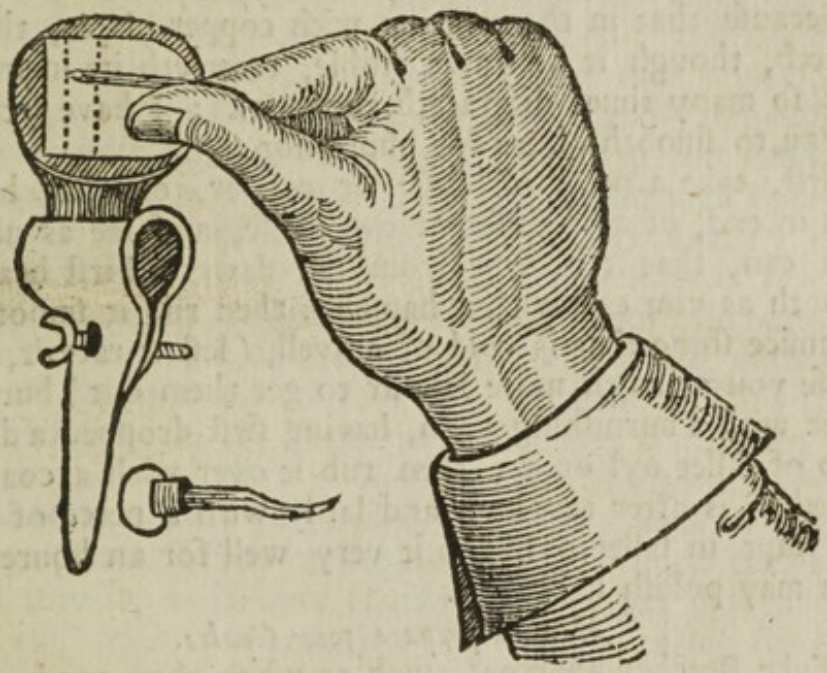
There are two principal ſorts of Gravers, the long and the ſhort: the long are ſtraight, and for to engrave plates withall, eſpecially the greater; and theſe are to be held as the figure following doth expreſs; where you may note that the pummel of



the

the Graver reſteth againſt the ball of the thumb, and the point is guided with the fore-finger. And there ought to be a little bag of ſand under your plate, to the end that you might turn your plate upon it, as your work doth require.

The ſecond ſort is a ſhort Graver, and turneth up ſomewhat at the end, and that is to engrave Letters and Scutcheons in plate-ſeals, and ſmaller plate, being faſtned in ſome convenient



inſtrument: this muſt be held likewiſe according unto the expreſſion of the figure foregoing; where it is to be noted, that the pummel of the Graver is ſtaid againſt the farther part of the hand, and is guided by the inner ſide of the thumb. It were needfull that there were a piece of Leather like a Tailors thimble, about the end of the thumb, waxed or gleued, whereby to guide the Graver more ſteaddily, and ſtay it upon occaſion.

How to make Gravers.

Provide ſome good Croſs-bowe ſteel, and cauſe it to be beaten out into ſmall Rods, and ſoftened: then with a good file you may ſhape them at your pleaſure; when you have done, heat them red hot, and dip them ſtraight down into Soap, and by ſo doing, they will be hard indeed. Note, that if in dipping of them into the Soap, you turn your hand never ſo little awry,

the Graver will be crooked. These Gravers made and hardned after this manner, do far exceed all the other Gravers.

If your Gravers be too hard, heat them a little, and thrust them into tallow, and they will be tougher.

The oyl stone is to whet your Gravers on; drop one or two drops of sallet oyl upon it, and whet your Graver thereon, and it will have an edge presently.

How to smooth and polliſh Copper plates.

Becauſe that in the printing with copper plates, the leaſt ſcratch, though it he ſcarce viſible, receiveth its impreſſion, and ſo many times diſgraceth the work : I have ſet down a way to ſmooth plates for impreſſion.

Firſt, take a peece of braſſe or copper, of what bigneſſe you intend, of an indifferent thickneſſe, and ſee as neere as you can, that it be free from fier flawes : Firſt beat it as ſmooth as you can with a hammer, then rub it ſmooth with a pumice ſtone that is void of gravell, (leſt it race it, and ſo cauſe you as much more labour to get them out) burniſh it after with a burniſhing yron, having firſt dropped a drop or two of ſallet oyl on it ; then rub it over with a coal, prepared as is after taught ; and laſtly with a peece of Beaver hat dipt in ſallet oyl, rub it very well for an houre : thus you may polliſh it exactly.

How to prepare your Coales.

Take Beechen charcoal, ſuch as when they are broke, do ſhine, ſuch as are void of clifts, and ſuch as break off even : burn them again, and as ſoone as they are all through on fier, quench them in chamber ly ; after take them out, and put them in fayr water, and reſerve them for your uſe.

Having prepared all things in a readineſſe, you muſt have a draught of that you intend to cut or engrave.

Take the plate then, and wax it lightly over, and then either pounce the picture upon it, or trace it, or by drawing over the lines of the picture with ungummed inke, reprint it upon the plate ; then work upon it, obſerving the ſhadow, ſo that being printed, it may ſtand right, for it will be backward upon your plate ; when you have cut one ſtroke, drop a little ſallet oyl upon your peece of Beaver, and rub over the ſaid ſtroke, for by this meanes you ſhall better ſee the

ſtroke

ſtroke, and how to cut the next equall unto it, and ſo the reſt proporcionally diſtant one from another ; but to work by a candle, you muſt place a glaſſe of fayr water between the candle, and a paper between that and the plate, (which caſteth a true light) or you will never be able to work truly and aright.

Of Etching.

ETching is an imitacion of Engraving, but more ſpeedily performed. Things may bee expreſſed to the life thereby, but not ſo ſweetly as by the Graver. It is thus performed ; the plate you are to etch upon, muſt firſt exactly be poliſhed, afterwards overlaid, but very lightly, wtih a ground made for the purpoſe, (of which anon) and thereupon muſt be pounced, drawn, or traced, the thing chat you are to etch ; then the ſaid ground is to bee pierced with divers ſtiles of ſeverall bigneſſe, according as the ſhadowes of the picture do require ; afterwards the edges of the plate are to be raiſed with ſoft wax, and ſtrong water (for ſo they terme it :) (it is to be had at the ſigne of the Legge in Foſter lane a Diſtillers) is to be put upon it, which in thoſe places where the ſtrokes are required to be lightly performed, is to bee abated or alayed with fayr water, which having dured awhile upon the plate, will eat into it, as it were engraven, then put it into cold water, and waſh it about, and it will leave eating further, and then take off the ground, and it is done.

A red ground for Etching.

Take red Lead, grinde it very well, and temper it with Verniſh.

A white ground.

Take one ounce of Wax, and two ounces of Roſin, melt them together, and add thereto a quarter of an ounce of *Venice* ceruſe ground fine, lay it on while it is hot.

A black ground.

Take Aſphaltum two parts, Bees wax one part ; melt them together, and being warm, lay it on very thinly with a fine lawn rag. If it ſeeme ſomewhat red in any one part, hold it over the ſmoak of a link or wax candle, and it will be amended. Note, that it is a principall thing in this Art to lay the ground on aright.

Another way how to Engrave with water.

Take Verdigreaſe, Mercury ſublimated, Vitreoll, and Allum, a like quantity, beat all to pouder, put them into a glaſſe, and let it ſtand ſo halfe a day, and ſtirre it often, then lay on the plate wax mingled with Linſeed oyl, or red Lead with Linſeed oyl, and write in it that you mean to grave, then put the water on it, and let it ſo remain halfe a day, if you will have it very deep, let it lie longer. If you will engrave Images, *&c.* lay the wax on the yron or ſteele, thin, and draw what you will thereon, that it may touch the metall, then put the water into the ſtrokes, and it will be engraven.

How to engrave on a Flint ſtone.

Take a Flint, and write on it what you will, with the Fat or Tallow of an Ox, afterward lay the Flint in Vineger four dayes.

The manner of engraving in Wood.

The Figures that are to be carved or graven in Wood, muſt firſt be drawn, traced, or paſted upon the Wood, and afterwards all the other ſtanding of the Wood, except the Figure, muſt be cut away with little narrow pointed Knifes made for the purpoſe.

The working is far more tedious and difficult than the working in Braſſe: firſt, becauſe you muſt cut twice or thrice to take out one ſtroak, and when you have cut it ſo that it may be pickt out, yet if you have not a great care in picking it out, you may break out a part of your work, which may deface it: Secondly, becauſe that in croſſe Hatches you muſt ſtand picking, ſo that it would weary one to ſee ones work go ſo ſlowly on; yet a good reſolucion may in time overcome theſe and other difficulties that attend thereupon; and for thoſe inconveniences an Artiſt may finde in the practiſe thereof, this is one Commodity he ſhall gain; he ſhall be private in his deſignes, for he himſelf may print them when they are cut; nor ſhall they be expoſed to the veiu of every Stacioner that frequent upon all occaſions the houſen of common workmen, whereby one receiveth much injury and vexacion.

Of the Choice of Wood to cut in:

Box is the beſt; but Walnut Tree, Beech Maple, or any hard, cloſe, and well ſeaſoned Wood may ſerve: let it be cut out and plained inch thick, and in peices according as the bigneſſe of your Figures do require.

Of

Of drawing your figures upon the Wood.

First grinde some white Lead very fine, and temper it with fair water, and then dip a cloth in this misture, and rub over one side of your Wood, and let it dry thorowly; this keepeth the Ink (if you draw on it therewith) that it run not about, nor sink; if you draw with Pastils, it maketh your strokes appear more plainly and brightly.

Of tracing your figures upon wood.

Having whited one side of your Wood, as before, black or red the blank side of your figure, as I have taught in the Art of Painting, and with a little stick or Swallows quill trace or draw over the strokes of your figure.

Of pasting your figures upon wood.

Note, that you must not white over the Wood when you intend to paste the figures, for that will make that your figure shall pill off, onely see the Wood be well plained, then wipe over the drawn or printed side of your figure with Gum-tragant dissolved in fair water, and clap it even and smooth upon your Wood, and let it dry throughly; then wet it a little all over, and fret off the Paper gently, untill you can see perfectly every stroke of your figure; then let it dry again, and when it is throughly dried, fall to cutting or carving it; beware you fret not the figure away in any part when you are fretting it.

The manner of printing your wooden Pieces.

In the following Part of *Extravagants*, I have taught how to make printing Ink of sundry colours, to which I refer you; you must have also some Wooll bound up in a piece of sheeps leather, also a Rouler, smooth and even, which must have a piece of Cotton-bays rouled hard twice about it; first wet the Paper you would print upon, with a Sponge wet with Allum-water, then take some of the kindes of Ink, and put it upon the Leather, and lightly clap it all over the Print, then put the Paper that you wet, upon it, and roul it hard on with the Rouler, and it is done.

FINIS.

Of drawing your figure upon the Wood.

Having whited one side of your Wood, as before, black or red the blank side of your figure, as I have taught in the Art of Painting, and with a little stick or Swallows quill trace or draw over the strokes of your figure.

Of pasting your figure upon wood.

Note, that you must not wipe over the Wood when you intend to paste the figures, for that will make that your figure shall pill off, onely lee the Wood be well planed, then wipe over the drawn or printed side of your figure with Gum-dragant dissolved in fair water, and clap it even and smooth upon your Wood, and let it dry throughly; then wet it a little all over, and fret off the Paper gently, until you can see perfectly every stroke of your figure; then let it dry again, and when it is throughly dried, fall to cutting or carving it; beware you fret not the figure away in any part when you are fretting it.

The manner of printing your woodden Pieces.

In the following Part of Experiments, I have taught how to make printing ink of sundry colours, to which I refer you; you must have also some Woolen bound up in a piece of sheeps leather, also a Rouler, smooth and even, which must have a piece of Cotton-bays rouled hard twice about; first wet the paper you would print upon, with a Sponge wet with Allum-water, then take some of the kindes of Ink, and put it upon the Leather, and lightly clap it all over the Print, then put the Paper that you wet, upon it, and roul it hard on with the Rouler, and it is done.

EXTRAVAGANTS

Wherein (amongst others) is principally contained divers excellent and approved

Medicines for severall *Malladies.*

By JOHN BATE.

LONDON,
Printed by *R: Bishop* for *Andrew Crook*, at the Green Dragon in Pauls Churchyard. 1654

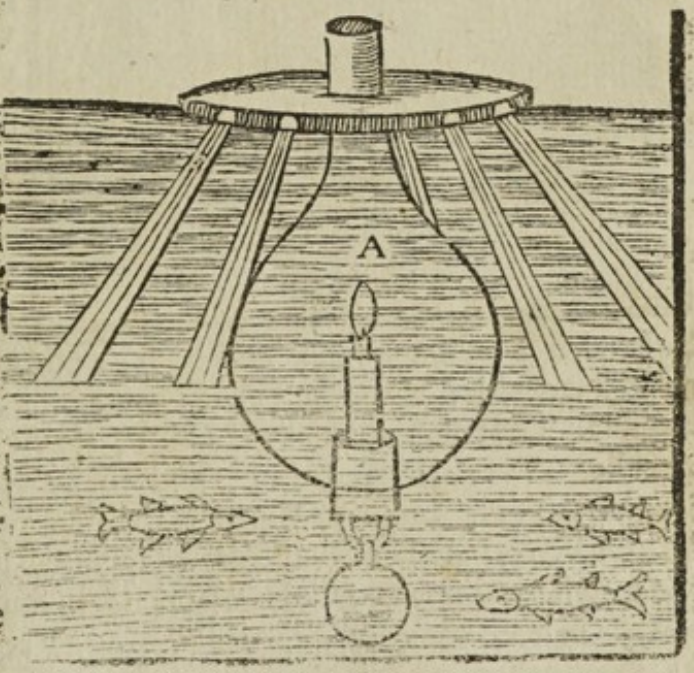
To the Reader.

COurteous Reader, forasmuch as there were divers Experiments, that I could not conveniently, or rather my Occasions would not permit me to dispose in such order as I would have done, I thought it would not be amiss to call them by the names of Extravagants, and so to set them down as I found them, either inserted amongst other my Notes, as I put them in practise, or as they came into remembrance. I would have been more curious in Chirurgical Experiments, because I have always much delighted therein, and have both seen and made much experience thereof; but having considered with my self, that those things would best suit with themselves, and be acceptable unto every one, I have purposely made a reservation of some, which accordingly as I shall perceive these to be affected, I shall, if God permit, present you with in a peculiar Tract hereafter.

Extravagants.

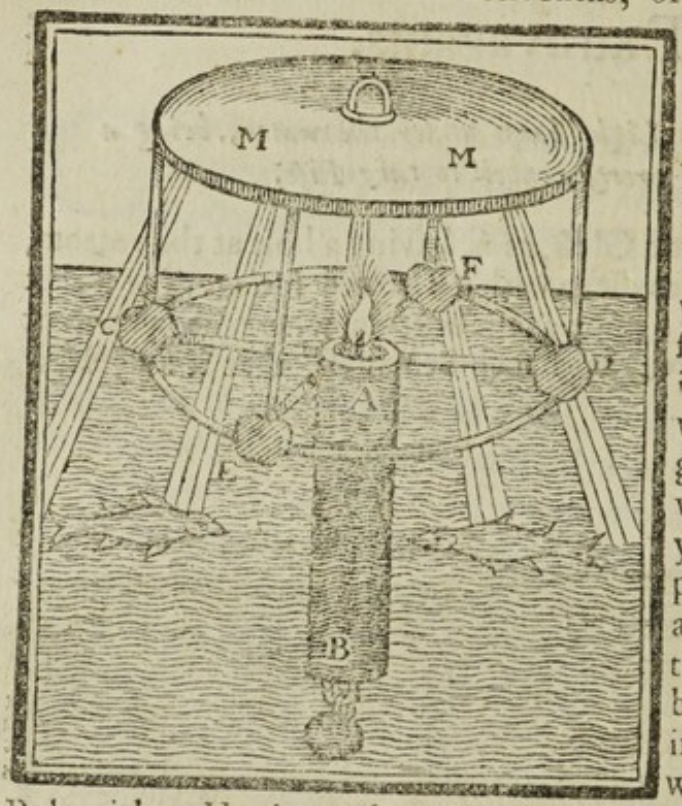
How to make a Light burn under the water, being a very pretty conceit to take Fish.

LEt there be a Glass, as A, having a hole at the bottom, to put a Candle in with a screwed socket. The socket must have a Loop at the bottom, whereunto you must hang a weight of such heaviness, that it may draw the body of the Glass under water. The neck of this Glass must be open, and stand above the water; also about the neck must be fastned a good broad piece of Wood; and round about which (but on that side of it which is next unto the water) must be placed divers pieces of Looking-glasses; so the light of the Candle in the glass body will be multiplied according to the number of them. All the fishes near unto it will resort about it, as amazed at so glorious a sight, and so you may take them with a cast-net or other.



Another pretty Conceit for the same purpose, but more easie to be made, and with less cost.

Provide a piece of Wood turned hollow like unto a Poking or steel-stick, as A B, in the top of this Wood at the sides of it let there be fastened four little sticks, or rather pieces of Wyer, which may pass thorou four pieces of Kork, as C D E F, and so turn up, and be fastned again in a thin light piece of board, as M M, in which board must be fastned a great Looking-glass, if you would make one great Light; but divers little pieces, if you desire a multiplication of Lights, and upon the top of this board let there be fastned a loop of iron to let it into the water by means of a Pole with a Hook at the end of it, and at the bottom of the turned wood let there be tyed a waight or stone of sufficient bigness. Thorou the Korks C D E F, there ought to be drawn another Wyer quite round, and to be bound fast unto the former Wyers, and it is finished. When you would occupy it, fill the Wood A B almost full of water, light a Kandle and put into it, and it will swim in it, and so burn leisurely; then place it in a Pond or River, with a Hook, and the Light will be dispersed in a great compass about the water.



How to make an Image hang in the middle of a Glass.

Make the lower part of the Image of hard Wax, and the upper part of it of Wood, and over-lay it with Oyl Colours; then put it into a Globe-glass filled with fair water, and which way

way ſoever you turn the Glaſs, the Image will ſtill hang in the middle, and ſtand as it were upright; which, to my knowledg, hath been a thing cauſing no ſmall admiration among divers that have not underſtood the cauſe of it.

How to make five or ſix Dice of the ordinary bigneſs of Dice, ſuch as you may game withall, and ſuch as would be taken by their looks to be ordinary Dice, and yet all of them to weigh not above one Grain.

Take a piece of Eldern and pith it, lay the Pith to dry, and then make thereof with a ſharp knife five or ſix Dice, and you ſhall finde it true that I have ſaid.

How to lay Gold on any thing.

Take red Lead ground firſt very fine, temper it with Linſeed-oyl; write with it, and lay Leaf-gold on it, let it dry, and polliſh it.

To lay Gold on Glaſs.

Grinde Clalk and red Lead, of each a like quantity, together, temper them with Linſeed-oyl, lay it on; when it is almoſt dry, lay your Leaf-gold on it, when it is quite dry polliſh it.

How to make Iron or Steel exceeding hard.

Quench your Inſtrument ſeven times in the blood of a male-Hog, mixed with Gooſ-greaſe, and at each time dry it at the fier before you wet it, and it will become exceeding hard, and not brittle: approved.

To make yron as ſoft as Lead.

Take black flints, pouder them very finely; theu put the pouder in an yron pan, and make it red hot, then caſt it on a marble ſtone, till it be almoſt cold, then make it red hot againe, and let it coole, and grinde it ſo long till it cleave to the ſtone, and grinde as it were clay; then put that in a glaſſe, and ſet it under the Eaves of a houſe, where the Sunne commeth not nigh in the day, then the night after take out the water that you ſhall finde in the glaſſe above the pouder, then take that pouder and grinde it with the water, and put it in a ſtillatory, and let it ſtill out the halfe; afterward poure the water againe on the ſaid pouder, and ſtill it againe with a ſoft fier; then take and ſeethe that water till the halfe be

waſted,

wasted, then take some iron blade of a knife that is new broke, and put it together, and hold it so a little while ; then take of the water which was sod to the halfe, and with a feather lay it first to the one side of the blade, and when the water is cold, lay it on the other side, and it will soder fast with this water ; and with this water you may make steel as soft as Lead. It is likewise a sovereign water to help the Gout, being anoynted where the griefe is, for it giveth ease very speedily.

To colour Tyn, or Copper, &c. of a golden colour.

Take Linseed oyl, set it on the fier, scum it clean, then put therein of Amber, and Aloe Hepaticum, a like quantity, then beat and stirre all well together with the oyl till it wax thick ; then take it off, and cover it close, and set it in the earth three dayes : when you would use it, strike your metall all over therewith, and so let it dry, and it will be of a golden colour.

To gild Iron with a water.

Take running water 3 pound, Roch-allum 3 pound, and Roman Vitreol one ounce, of Verdigrease one penny weight, Saltgem three ounces, Orpiment one ounce, boyle all these together, and when it begins to boyle, put in Lees of Tartar and Bay-salt, of each halfe an ounce, make it seethe, and being sod a pretty while, take it from the fier, and strike the Iron over therewith, then let it dry against the fier, and then burnish it.

To soder on Iron.

Set your joynt of Iron as close as you can, then lay them so in a glowing fier ; then take of Venice-glasse in fine pouder, and the Iron being red hot, cast the pouder thereon, and it shall soder of it selfe. If you clap it in clay, it will be the surer way.

To gild on Iron or Steele.

Take one ounce of Argall, three drammes of Vermilion, and two drammes of Bole-armoniack, with as much Aqua-vitæ, then work and grinde them all together on a stone, with Linseed-oyl ; having so done, put thereto *Lapis Calaminaris* as big as a Hazel-nut, and grinde therewith in the end three or foure drops of Vernish ; take it off the stone, and

and ſtrain it thorow a linnen cloth into a ſtone pot, (for it muſt be as thick as honey) then ſtrike over your iron therewith, and let it dry, and then lay your gold or ſilver on, as you would do upon the Verniſh.

A verniſh like gold, for tyn, ſilver, or copper.

Take ſmall pots well leaded, then put therein ſix ounces of Linſeed-oyl, one ounce of Maſtick, one ounce of Aloes Epaticum; make them altogether in fine pouder, and then put it into your ſaid pot, and cover it with ſuch another; yet in the bottom of the uppermoſt pot make a ſmall hole, wherein put a ſmall ſtick with a broad end beneath, to ſtir the other pot withall, and when the pots are ſet juſt together, cloſe them all about with good clay, and cover them all over alſo, leaving the hole open above to ſtir the other pot with the ſtick; ſet it over the fier, and ſtir it as often as it ſeetheth, and when you will gild, polliſh your Metall over firſt, and then ſtrike this over the Metall, and let it dry in the Sun.

How to melt Metall very quickly, yea in a ſhell upon the fier.

Firſt make a bed or laying of Metall, and upon it make another bed with pouder of Brimſton, Saltpeter, and Sawduſt, a like quantity of either, then put fier to the ſaid pouder with a burning charcoal, and you ſhall ſee that the Metall will diſſolve incontinent, and bee in a maſſe: approved.

How to colour polliſhed iron of a fine Reddiſh, Bleuiſh, or Blackiſh Colour.

Take your iron after that you have polliſhed it, and heat it a little, and then rub it over with ſome Dragons blood purified, and it will be of a fine tranſparant colour: a bleu colour may bee brought upon iron or ſteel burniſhed, by laying it upon quick charcoal, blowing them lightly untill you ſee the colour come upon your iron, then take it out preſently; or by heating your iron firſt, and then rubbing it over with a woollen cloth dipt in Endego ground and tempered with Sallet oyl; this bleu is proper for Coſtlets, Muskets, and ſuch like, the former for ſmaller work. If you would have a black colour on iron, firſt make it clean, then heat it, and rub it over while it is hot with an old ſtocken a little wet in Sallet oyl.

To lay Gold on iron or other Metall.

Take liquid Verniſh one pound, Turpentine, and oyl of Linſeed, of each an ounce, mix them well together ; with this ground you may gild on any Metall, firſt ſtriking it upon the Metall, and afterward lay on the gold or ſilver : when it is dry, polliſh it.

To make ice that will melt in fier, but not diſſolve in water.

Take ſtrong-water made with Saltpeter, Allum, and oyl of Tartar, of each one pound ; infuſe them together, then put into them a little *aqua ardens*, and it will preſently coagulate them, and turn them into Ice.

A Cement as hard as ſtone.

Take Pouder of Loadſton, and of Flints, a like quantity of either, and with whites of Eggs and Gum-dragant make Paſte, and in a few dayes it will grow as hard as a ſtone.

To make Paper waved like unto Marble.

Take divers oyled colours, put them ſeverally in drops upon water, and ſtir the water lightly, and then wet the Paper (being of ſome thickneſs) with it, and it will be waved like Marble; dry them in the Sun.

To make Copper or Braſs have the colour of Silver.

Take Sal-armoniack, Allum, and Salt, of each a like quantity, and with a little filings of Silver, let all be mixt together, then put them into the fier, that they may be hot, and when they ſhall ceaſe to ſmoke, then with the ſame poudered and moiſtened with ſpittle, rub your Copper or Braſs.

How to make Gleu to hold things together as faſt as ſtone.

Take of the pouder of Tile-ſheard two pound, unſlaked Lime four pound, Oyl of Linſeed a ſufficient quantity to temper the whole mixture ; this is marvellous ſtrong.

To make a thin Gleu.

Take *Gluten Piſcis*, beat the ſame ſtrongly on an Anvil till it be thin ; after lay it to ſoke in water, untill it become very ſoft and tender ; then work it like Paſte, to make ſmall rouls thereof, which draw out very thin, and when you will work with it, put ſome of it in an earthen pot, with a little water, over the embers, and ſcum the ſame very clean, and let it ſeethe a little while, then work with the ſame, keeping it ſtill over the fier. With this Gleu you may faſten pieces of Glaſs together.

How

How to make Mouth-gleu.

Take Iſing-glaſs, and ſteep it in water untill ſuch time as you may eaſily pull it to pieces, after you have pulled it to pieces, put it into a Glaſs or Pot well leaded, and ſet it *in balneo*, that is, in a pot of water on the fier, there let it remain untill all or the moſt part of it be diſſolved, then ſtrain it thorow a wide hayr-ſieve, while it is hot, upon another courſe and cloſe hayr-ſieve, and when it is cold, it will be like a thick gelly, then you muſt cut it into long handſom pieces, and put all theſe pieces ſo cut, on a ſtring, ſo that they touch not one another, and hang them in the Sun untill they are through dry, and it is made. If you would have it of a dainty ſmell, and aromatical taſte, put into it a little Cynamon bruiſed, and a little Marjerom, and Roſemary flowers, while it is diſſolving, and if you pleaſe, a ſmall quantity of brown Sugar-candy, to give it a ſweetiſh ſmatch.

To make Iron have the colour of Braſs.

Firſt polliſh it well, rub it after with *aqua fortis*, wherein the filings of Braſs are diſſolved: the like may be done with Roman Vitreol diſſolved in Vineger and fair water, of each a like quantity, but it will not continue long.

To make Wood or Bone red for ever.

Take the pouder of Brazil, mingle it well with Milk, but ſo, that it be very red, and put therein either Wood or Bone, letting it ly in eight days, and it will look red for ever.

How with one Candle to make as great a light, as otherwiſe of two or three of the ſame bigneſs.

Cauſe a round and double Glaſs to be made, of a large ſize, and in faſhion like a Globe, but with a great round hole in the top, and in the concave part of the uppermoſt Glaſs, place a Candle in a looſe ſocket, and at the ſame hole or pipe which muſt be made at the ſide thereof, fill the ſame with Spirit of Wine, or ſome other clear diſtilled water that will not putrifie, and this one Candle will give a great and wonderfull light, ſomwhat reſembling the Sun-beams.

A Cement for broken Glaſſes.

Beat the whiteſt fiſh-gleu with a hammer, till it begin to wax clear, then cut the ſame into very ſmall pieces, ſuffering the ſame to diſſolve on a gentle fier, in a leaded pan, with a few drops of

Aqua vitæ, then let some other that standeth by, hold both the pieces that are to be cemented, over a chafing-dish of coals, till they be warm; and during their heat, lay on the dissolved Gleu with a fine pensil; then binde the Glass with wyer or thred, and let it rest till it be cold.

An admirable Secret of representing the very form of Plants, by their ashes, philosophically prepared, spoken of by Quertitanus *and* Angelus Salæ.

Take (say they) the Salt both the fixed and the volatil also. Take the very Spirit, and the phlegm of any herb, but let them all be rightly prepared; dissolve them, and coagulate them, upon which if you put the water stilled from May-dew, or else the proper water of the herb you would have appear, close them all very well in a Glass for the purpose, and by the heat of the embers, or the natural heat of ones body, at the bottom of the Glass, the very form and Idæa thereof will be represented; which will suddenly vanish away, the heat being withdrawn from the bottom of the Glass. As I will not argue the impossibility of this Experiment, so I would be loth to employ my endeavours, untill I were expert therein.

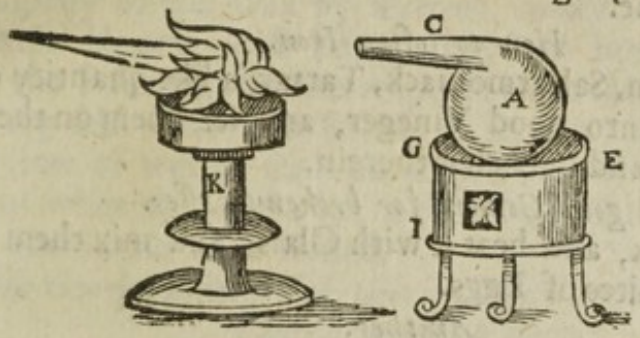
A device how to make Plants to grow in a place which Herbs cannot be transported to be planted, by reason of the distance of the place.

Take what Herb you please, burn it, and take the ashes and put them into a melting-pot, and binde another pot upon it, and lute them well together, and burn them in the fier for the space of two hours, then take out the ashes and pour hot water upon them, and let them stand two or three hours; then drain that water from them, which will be of a saltish taste, then put more warm water unto the same ashes, and after that hath stood a while, let that also drain away, then put both these waters together, and boyl them gently on the fier, untill it be consumed, and in the bottom of the vessel you shall have a kinde of Salt, which take and sow in good ground well prepared, and you shall have your desire. Note also, that the *Lixivium* or Ly made with water and the ashes of any Vegetable, yea Mineral, or Animal, if it freez in Winter unto Ice, exactly represents the real *species* whence you made the ashes; which testifies that the form of any thing continues in the Salt after the dissolution of the Creature.

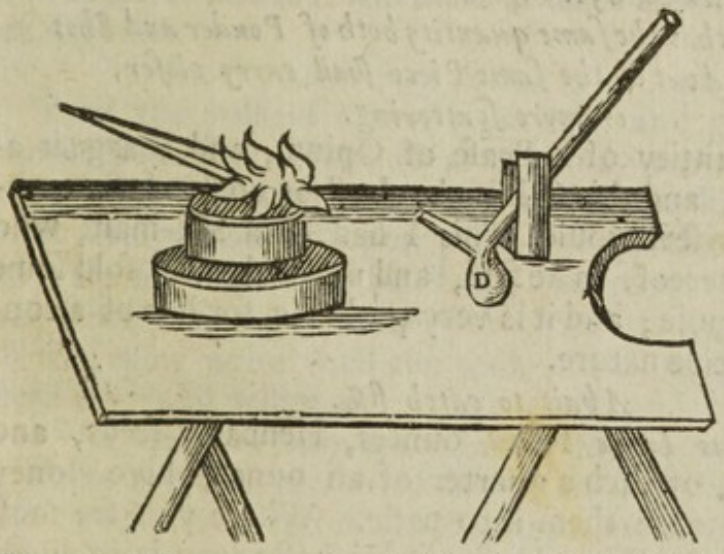
A de-

A device to bend Glaſs-kanes, or make any ſmall work in Glaſs.

Let there be a veſſel of Copper about the bigneſs of a common Foot-ball, as A, let it have a long Pipe at the top, as C,



which muſt be made ſo, that you may upon occaſion ſcrew on leſſer or bigger vents made for the purpoſe. Fill this one third part with water, and ſet it over a Fornace of coals, as E G I, and when the water begineth to heat, there will come a ſtrong breath out of the noſe of the Veſſel that will force the flame of a Lamp placed at a convenient diſtance, as K; if you hold your Glaſs in the extention of the flame, it will melt ſuddenly; ſo you may work what you will thereof. There are that inſtead of this Globe make uſe of a Pipe, as D, faſtned in a ſtick, of which I have made uſe, but hold it not ſo convenient for thoſe that are not accuſtomed thereunto.



An excellent water for any Morphew, or ſcurvineſs in the face.

Take an ounce of quick Sulphur, two ounces of black Sope, the rankeſt and ill-favoured'ſt that can be got: binde them up in a cloth, and hang them in a pint of the ſtrongeſt wine-vineger for the ſpace of nine days; herewith waſh the Morphew in

the face or elſewhere, and let it dry in of it ſelf. This water will for the preſent ſtain the face with a yellow colour, which will wear away in time.

How to ſoften Iron.

Take of Allum, Sal-armoniack, Tartar, a like quantity of either, put them into good Vineger, and ſet them on the fier; heat your Iron, and quench it therein.

A good Cement for broken Glaſſes.

Take raw Silk, and beat it with Glaſs, and mix them together with the whites of Eggs.

Another.

Take of calcined Flints, quick Lime, and common Salt, of each a like quantity; mingle them all together with the whites of Eggs; then take a Linnen-cloth and ſpread it over with this mixture, and put it upon the fracture, and let it dry; afterwards anoint it with Linſeed-oyl.

How to cauſe that the ſame quantity both of Pouder and Shot diſcharged out of the ſame Piece ſhall carry cloſer, or more ſcattering.

Take the quantity of a Peaſe of Opium, and charge it amongſt the ſhot, and this will make the ſhot to fly cloſer together than otherwiſe it would. This I had of a Sea-man, who had made tryal hereof, as he ſaid, and unto whom I ſold ſome for the ſame purpoſe; and it is very probable, for it is of a congealing and fixative nature.

A bait to catch fiſh.

Take *Cocculus Indiæ* fouer ounces, Henbane ſeeds, and wheaten flower, of each a quarter of an ounce, hive Honey as much as wil make them into paſte. Where you ſee moſt ſtore of Fiſh in the River, caſt of this paſte into it in divers little bals about the bigneſs of Barley-corns, and anon you ſhal ſee the Fiſh ſwim on the top of the water, ſome reeling to and fro as drunken, others with their belleys upwards, as if they were nigh dead; ſo that you may take them either with your hands, or a ſmall Net at the end of a ſtick made for the ſame uſe. Note here, that if you put the fiſh that you thus take, into a Bucket of fair and freſh water, or if it rain after that you have caſt this your bait into the water, they will revive and come to themſelves to your admiration; and this was told me

me by a Gentleman of good credit, that hath often made use thereof.

I have heard that the stinking oyl drawn out of the roots of polipody of the Oak by a retort, mixed with Turpentine, and hive Honey, and being anoynted upon the bait will draw the Fish mightly thereto, and make them bite the faster: and I my selfe have seen Fishes, as Roches, and taken in the dead time of winter with an angle, bayted only with paste made of wheaten flouer, but it bath been in the morning, and when the Sunne hath shined.

How to write without Ink, that it may not be seen, unless the Paper be wet with water.

Take Vitreol, and pouder it finely, and temper it with fayr water in any thing that is clean, when it is dissolved, you may write whatsoever you will with it, and it cannot be read, except you draw it thorow water wherein some pouder of Gals hath been infused, and so it will shew as black as if it had been written with Ink.

How to make white letters in a black field.

Take the yolk of a new-layd Egg, and grinde it upon a Marble with fayr water, so as you may write with it: having ground it on this wise, then with a pen dipt into it, draw what letters you wil upon paper, or parchment, and when they are through dry, black all the paper over with ink; and when it is dry, you may with a knife scrape al the letters off that you write with the yolk of the Egg, and they will shew fayr and white.

How to soder upon Silver, Brasse, or Iron.

There are two kindes of Soder, to weet, hard Soder, and soft Soder. The soft Soder runneth sooner than the hard; wherefore if a thing be to be sodered in two places, which cannot at one time wel bee performed, then the first must be sodered with hard Soder, and the second with soft; for if the first be done with soft, it will unsoder again before the other be sodered. Note, that if you would not have your Soder to run over any one part of the piece to be sodered, you must rub over that part with chalk that you would not have it run upon.

Note likewise, that your Soder must be beaten thin, and then layd over the place to be sodered, which must be first fitted together,

gether, and bound with wyer as occasion shal require. Then take Burras, pouder it, and temper it with water like pap, and lay it upon the Soder, and let it dry upon it by the fier : afterwards cover it with quik coales, and blow them up, and you shall see your Soder run immediatly : then presently take it out of the fier, and it is done.

Hard Soder is thus made.

Take a quarter of an ounce of silver, and a three penny weight of copper, melt them together, and it is done.

Soft Soder is thus made.

Take a quarter of an ounce of silver, and a three penny weight of brasse, melt them together, and it is done.

How to gild Silver, or Brasse, with gold-water.

First take about two ounces of quicksilver, put it into a little melting pot, and set it over the fier, and when it beginneth to smoak, put into it an angel of fine gold ; then take it off presently, for the gold wil presently be dissolved in the quicksilver, which if it be too thin, you may thorow a peece of fustian strain a part of the quicksilver from it. Note likewise, that your silver or brasse, before you go about to gild it, must bee boyled in Argall, and Beere, or water, and afterwards scratcht with a wyer brush ; then rub the gold and the quicksilver upon it, and it wil cleave unto it, then put your silver or brasse upon quick coales untill it begin to smoak : then take it from the fier, and scratch it with your wyer brush : do this so often till you have rubd the quicksilver as clean off as you can, then shall you perceive the gold to appeare of a faint yellow colour, which you may make to appeare fayr with Sal-armoniack, Bole-armoniack, and Verdigrease ground together, and tempered with water.

How to take the smoak of Tobacco thorow a glasse of wate'.

First fil a pint glasse with a wide mouth, almost ful of fayr water ; fil also a pipe of Tobacco, and put the pipe upright into the glasse of water, so that the end of the pipe may almost touch the bottom of the glasse ; then take another crooked pipe, and put it into the glasse, but let the end thereof not touch the water ; wax then the mouth of the glasse, that no ayer may come in nor out, but at the pipes : then put fier

fier unto the Tobacco, and ſuck with your mouth at the end of the crooked pipe, and you ſhal ſee the ſmoak of the Tobacco penetrate the water, and break out of a bubble, and ſo come into your mouth.

How to colour wood of a fine brown colour.

Firſt take a bruſh made of hogs briſtles, and dip it into common *aqua fortis*, and therewith wet the wood all over, then dry it gently before the fier, and when the wood begins to change colour, rub it over with Linſeed oyl, and then dry it in the Sunn, and it wil be of a dainty fine brown colour, as brown as a berry.

To colour Ivory or any other bones, of an excellent green colour.

Take *aqua fortis*, wherein diſſolve as much Copper as the ſaid water is able, then let the bones that you would have coloured, ly in the ſame all night, and they will be like a Smaragdin-colour: *Mizaldus.*

How to make Birds drunk, ſo that you may take them with your hands.

Take ſuch meat as they love, as Wheat, Barley, and lay the ſame to ſteep in the Lees of Wine, or elſe in the juyce of Hemlock, and ſprinkle the ſame in places where Birds uſe to haunt.

A way to catch Crows.

Take the Liver of a Beaſt, and cut it in divers pieces, put then into each piece, ſome of the pouder of *Nux vomica*, and lay theſe pieces of Liver in places where Crows and Ravens haunt. Anon after they have eaten them, you may take them with your hands, for they cannot fly away.

How to take Crows or Pigeons.

Take white Peaſen, and ſteep them eight or nine days in the Gall of an Ox; then caſt the ſame where they uſe to haunt.

You may make Partridges, Ducks, and other Birds drunk, ſo that you may take them with your hand, if you ſet black Wine for them to drink, in thoſe places whereunto they reſort.

Another.

Take Tormentil, and boyl it in good Wine; put into it Barley or other grain: ſprinkle it in thoſe places you have appointed to take Birds in, and the Birds will eat the pieces amongſt the

Grain, which will make them so drunk, that they cannot fly away. This should be done in Winter, and when it is a deep snow.

Another way to take Birds.

Make a Paste of Barley-meal, Onion-blades, and Henbane-seeds; set the same upon several little Boards, or pieces of Tyles, or such like, for the Birds to eat of it.

How to make Brass White for ever.

Take Egg-shels, and burn them in a melting-pot, then poude[r] them, and temper them with the whites of Eggs, let it stand so three weeks, heat your Brass red-hot, and put this upon it.

A device to scour Brass.

Take common *Aqua fortis*, and fair water, of each a like quantity, shake them together, dip a woollen-rag in this water, and therewith rub your rusty Brass, and it will fetch off the rust immediatly; then presently rub it off with an oyly-cloth: lastly, with a dry woollen-cloth dipt in the Pouder *Lapis Calaminaris*, (which you may have at the Apothecaries) rub it over hard, and it will be as clear and bright as it was when it came new out of the shop.

How to make the Apparicions of Towers and Castles to appear in a Glass of water.

Take a Urinal, and fill it almost full with fair water, and take a little Saffron and ty it up in a fine Linnen-cloth, and steep it in the said water, and let it remain untill it have turned the colour of the water, then take the white of an Egg and break or squeeze it between your fingers seven or eight times together, then put it into the water, and shake it together, and you shall see such Apparicions as I have said. *Cardanus* and *Falopius*.

How to make the Philosophers Tree.

Take two ounces of *Aqua fortis*, and put into it half an ounce of fine Silver refined, then take an ounce of *Aqua fortis*, and two drams of Quicksilver, mix them together; mix both these mistures or dissolutions together; then put it into a Glass, with half a pint of water, and stop it up close with Brimston, and you shall day after day see the likeness of a Tree to grow by little and little very pleasant to behold.

How

How to keep Wine fresh all the year, though it be carried from place to place, and exposed to the heat of the Sun all day.

Put your Wine in a glass-bottle, and put the bottle in a box of Wood or Leather, and about the glass-bottle put Saltpeter, and it will preserve and keep it very fresh. If you put some little quantity of Saltpeter in the Summer-time when the weather is very hot, the Saltpeter will make the Wine so extreme cold, that it will even make the teeth of him chatter that holdeth it in his mouth.

How to make Marble.

Take six ounces of quick Lime, put it into a Pot, and pour upon it one pint of good Wine; let it stand five or six days, stirring it once or twice a day; then pour off the clear, and therewith temper Flint-stones calcined, and made into fine pouder, then colour it, and make of it what you please, and let them dry.

How to whiten Copper.

Take a thin Plate of Copper, heat it red-hot divers times, and extinguish it in common Oyl of Tartar, and it will be white.

To make Saltpeter.

Take quick Lime, and pour warm water upon it, and let it stand six days, stirring it once or twice a day; take the clear of this, and set it in the Sun untill it be wasted, and the Saltpeter will remain in the bottom.

How to make Corall.

Take of red Lead ground one ounce, Vermilion finely ground half an ounce, unquenched Lime and pouder of calcined Flints of each six ounces, these pouders must be tempered with a *Lixivium* that is made with quick Lime and Wine: add unto the whole a little Salt; then make thereof what you list; then boyl them in Linseed-oyl.

How to make Pearls.

Take some Chalk, and put it into the fier; there let it ly untill it break: temper it then with the whites of Eggs. Then make of it divers fashions of Pearls, both great and small; wet them being dryed, and cover them with leaf-gold, and they are done.

A precious Oyl for a ſudden Ach cauſed through cold.

Take three pound of May-butter unſalted, of Bay-leaves three hand-fuls, of Chamomil, Featherfew, Wormwood, and Rew, of each two handfuls; ſhred all theſe finely into a Pipkin cloſely ſtopped; let them boyl gently the ſpace of an hour, then put into them eighteen ſpoon-fuls of Sallet-oyl, and let them boyl an hour more; then add two and twenty ſpoon-fuls of *Aqua vitæ*, and then let them infuſe a quarter of an hour more, then ſtrain it, and it is done: when you uſe it, warm it, and anoint the grieved place therewith. Dayly experience doth teſtifie the excellency of this Medicine.

Againſt ſetling of cold about the Head and Stomack.

Take of the beſt Engliſh Saffron the waight of one ſhilling ſix pence, of Licoris half an ounce, Angelica-roots half an ounce, Aniſeeds one ounce, Elecampane-roots a quarter of an ounce, one Nutmeg ſliced, two branches of Roſemary ſtripped; ſteep them all in a pint and a half of the ſtrongeſt *Aqua vitæ*, in a Glaſs ſtopped very cloſe, nine days together. Then let the ſick take two ſpoon-fuls in the morning faſting, and as much at bed-time.

An approved and excellent Plaiſter for the Sciatica, for Ach in the Reins of the back, or in any other part whatſoever.

Take one pound of black Sope, and four ounces of Frankincenſe, and a pint of white-wine-vineger; boyl all together upon a gentle fier untill it be thick, ſpread it then upon a Leather, and apply it unto the grieved place. If the Ach be very great and fervent, then add unto it a little *Aqua vitæ*, and it will be much better.

An excellent Ointment for the Shingles, Morphew, Tetters, and Ring-worms.

Take a quarter of a pound of Sope, and mingle with it two drams of the pouder of black Ellebor, Litharge of Silver in fine pouder two ounces, Verdigreaſe half an ounce, and a quarter of an ounce of Glaſs in pouder, and as much Quick-ſilver, make them all into an Oyntment by ſtirring them well together; wherewith anoynt the grieved parts. This is approved and true.

An excellent Balm, or Water for grievous ſore Eys, which cometh either of outward accident, or of any inward cauſe.

Take two ſpoon-fuls of the juyce of Fennel, and one ſpoonfull and a half of the juyce of Celandine, and twice as much Honey as them both; then boyl them a little upon a chafing-diſh of coals, and ſcum away the dregs which will aſcend, but firſt let it cool ſomwhat, and then let it run through a fayr clean cloth; then put it into a Viol of glaſs, and ſtop it cloſe. Put a little quantity of this into the Eye. This Medicine is approved, and more precious than Gold.

A ſpeedy Way to aſſwage the pain of any Scald or Burn, though never ſo great, and to take the Fier out of it.

Take old Lawn-rags, dip them in Runnet, for want of it dip them in Verjuyce, and apply them cold unto the grieved place, ſhifting them for half an hour together, as oft as they dry. This I have known to give eaſe in an inſtant, and quickly to take out the Fier.

An approved Oyl for to heal any Burn or Scald.

Take of Houſleek one hand-full, and of Brooklime as much, boyl them in a quart of Cream untill it turn unto an Oyl; boyl it very gently: with this Oyl a little warmed, anoynt the grieved place twice a day, and it will ſoon make it well. Approved.

An Oyntment very excellent, and often proved, for the ſame.

Tak a good quantity of Moſs ſcraped from off a ſtone-wall, fry it in a frying-pan with a Call of Mutton-ſuet a good while, then ſtrain it, and it is done. Dreſs the grieved part therewith once or twice a day, as you ſhall ſee fitting.

Another Oyntment for a Burn.

Take one part of Sallet-oyl, and two parts of the whites of Eggs, beat them together exceeding well, untill they come to be a white Oyntment, wherein dip the feather of a black Hen, and anoynt the grieved place divers times every day, untill ſuch time as the ſcales fall off, uſing in the mean while neither clothes nor

any outward binding, for these will stick, and so together draw off the skin. This, saith *Minshet* the Authour, though it seem to be a thing of no estimation, yet was there never found any more effectual for a Burn than it is. Since I wrote this I received a Letter from an especial friend in the Countrey that hath often times made use of it, affirming the excellency and undoubtedness of it, saying also, that this very Medicine is of much value.

An excellent Oyntment for a green wound.

Take four hand-fuls of Clowns,and All-heal,bruise it,and put it into a Pan, and put to it four ounces of Barrows-grease, Sallet-oyl half a pound, Bees-wax a quarter of a pound; boyl them all untill the juyce be wasted; then strain it, and set it over the fier again, and put unto it two ounces of Turpentine, then boyl it a little while more, and it is done. Put hereof a little in a Saucer, and set it on the fier, dip a Tent in it, and lay it on the wound, but first lay another Plaister about the wound, made of *Diapalma*, mollified a little with Oyl of Roses. This cureth very speedily all green wounds, as saith Mr *Gerard*.

A Balsam of wonderfull efficacy.

Take Burgundy-pitch, Brimston, and white Frankincense, of each one ounce; make them into an Oyntment with the whites of Eggs: first draw the lips of the wound, or cut, as close as you can, then lay on some of this spread upon a cloth, and swathe it over afterwards.

An excellent healing Water, which will dry up any old Sore, or heal any green wound.

Take a quarter of a pound of Bolearmoniack, pouder it by it self, then take an ounce of Camphire, pouder it also by it self; also take four ounces of white Coppras in pouder; mix the Coppras and Camphire together, and put them into a melting-pot, and set them on the fier, untill they turn unto water; afterwards stir it untill it come to be as hard as a stone, then pouder it again, and mix it with the Bolearmoniack: keep this pouder close in a bladder, when you would use it, take one pint and a half of fair water, set it on the fier, and when it is even ready to boyl, put into it three spoon-fuls of the pouder,

der, then take it off from the fier, and put it into a Glaſs, and let it ſtand untill it be clear at the top, then take off the cleareſt, and waſh the Sore very warm therewith, and dip a Cloth four-double in the ſame Water, and binde it faſt about the Sore with a Rouler, and keep it warm: dreſs it thus twice a day.

A Water for a Fiſtula.

Take a pint of white-wine, one ounce of juyce of Sage, three penny weight of Borace in pouder, Camphire in pouder the weight of four pence; boyl them all a pretty while on a gentle fier, and it is done: waſh the Fiſtula with this Water, for it is certainly good, and approved to be true.

A Water for the Tooth-ach.

Take Ground-Ivy, Salt, and Spearmint, of each an hand-full; beat them very well together, then boyl them in a pint of Vineger, ſtrain it, and put a ſpoon-full of it into that ſide that aketh, and hold down your Cheek.

Another Water approved for the ſame.

Take red Roſe-leaves half a hand-full, Pomegranate-flowers as many, two Gauls ſliced thin; boyl them all in three quarters of a pint of red Wine, and half a pint of fayr water untill the third part be waſted; then ſtrain it, and hold a little of it in your mouth a good while, then ſpit it out, and take more. Alſo if there be any ſwelling on your Cheek, apply the ſtrainings between two Clothes as hot as may be ſuffered. This I have known to do good unto divers in this Citie, when as they have been extremely pained.

To make a Water for the Eys.

Take *Lapis Calaminaris,* and burn it in the fier nine times, and quench it in white Wine, and beat it into pouder, and when you uſe it, put it into Roſe-water, and drop the Water into the Eys.

For Deafneſs.

Take a good quantity of Camomil, and two hand-fuls of green Wormwood, and ſeethe them in a pot of running-water till they be very well ſodden, and put a funnel over it,

and

and let the ſteam go up into the eare, and then go to bed warm, and ſtop your eare with a little black wooll : and a grain of Civet : doe this morning and evening, and with Gods aſſiſtance you ſhall finde eaſe.

An excellent Electuary for the Cough, Cold, or againſt Flegm.

Take of Germander, Hyſop, Horehound, white Maidenhayr, Agrimony, Bettony, Liverwort, Lungwort, and Hartstongue, of each one handfull : put theſe to nine pintes of water, and let them boyl to three pints ; then let it coole and ſtrain it. To this juyce put of clarified Honey halfe a pound, fine pouder of Liquorice five ounces, fine pouder of Enulacampana root three ounces, boyl them to the thickneſſe of an Electuary. Take of this at any time, but ſpeciall in the morning faſting, as alſo at night when you goe to bed, or two houres after ſupper, the quantity of a Walnut or Nutmeg.

A very excellent Salve to heal, well approved, for any old ſore ; or new wound.

Take of Wax, Roſin, Sheepes ſuet, Turpentine, of each a like quantity, Sallet oyl alſo as much : mix them al together, and take the juce of Smallach, of Planten, of Orpin, of Bugloſſe, of Comfrey, of each a like quantity : let them boyl untill the juce of the Hearbes be conſumed ; and in the ſeething put a quantity of Roſe-water, and it will be a very good Salve.

A ſoveraign Water to heal a green wound : and to ſtench blood.

Take a pottle of runing water, and put thereto foure ounces of Allum, and one ounce of Copras, and let them ſeeth to a quart, and then ſtrain it, and keep it in a glaſſe, and waſh the wound, and wet a cloth, and lay to the Sore, and with Gods help it will ſoon be healed.

Againſt bleeding at the Noſe

Take the root of a Red Nettle, and hold it between the molary teeth of the ſame ſide : this is an excellent remedy : Alſo moſſe that groweth at the foot of an Aſh, is very good to be put up into the Noſe. Likewiſe the pouder of Toads. Alſo if you tye a live Toad in a Net, and hang it about the

Pacients

Patients neck, he will be in a ſudden fear, and ſo the blood will leave his former current, and have recourſe unto the heart. Or elſe a dryed Toad held in ones hand, or hanged about ones neck, though *inſcio patiente*, from the natural apprehenſion of a Venemous object, which whiles nature and the ſpirits ſeeking to avoyd, they run into the center of the body from the circumference.

For the biting of a mad Dogge.

Take brine, and bathe the wound: then burn Claret wine, and put in a little Mithridate, and ſo let the patient drink it; Then take two live Pigeons, cut them thorow the middle, and lay them hot to his hand if hee be bitten in the armes. If in his legges, to the ſoles of his feet.

An Oyl for any Ach.

Take a pound of unwaſhed Butter, and a handfull of red Mints, and a handfull of Camomill, a handfull of Reu, two ounces of oyl of Exeter: ſtamp the hearbes to a juyce, and boyle them with the Butter; ſtrain them in a cloth, and rub them out very well: this ſo done, take the Oyl of Exeter, and put to them, and ſtir them well together, and put them into a galley-pot, and where the ach is anoint the place againſt the fier, and lay a brown paper on it, and wrap a cloth about the place, and keep it warm: proved to be excellent.

To ſtench the bleeding of a cut.

Take a peece of a Felt-hat, and burn it to a coal; beat it to pouder, and put it in the cut, and it will ſtench the bleeding preſently. Or elſe apply linnen rags that in the ſpring of the year have beene often waſhed in the ſperm of Frogs, and afterward dryed in the Sunne.

For an Agu, to be layd to the wriſts.

Take a handfull of Soot, a ſpoonfull of Bay-ſalt, halfe a ſpoonfull of pepper; bruiſe them together, and temper them with two yelks of egges; ſpread it on a cloth, and lay it to the wriſts.

Almond Milk for the cough of the Lungs.

Take foure ſpoonfuls of French Barley well waſhed, and

boyl it in three wine pints of fayr water, unto a pinte and a halfe ; then take it from the fier, and let it cool, and settle ; then take the cleer liquor, and ſtrain therewith a quarter of a pound of ſweet Almonds blanched, and beaten ; then ſet it on the fier, and let it boyl a while til it begin to grow thick ; then beat two yelks of egges, and put them to it ; ſtirre them well together, and put to it as much fine Suger as will ſweeten it, and a ſpoonfull of Damask Roſe-waters, and ſo let it boyl a while longer, till it be as thick as good cream ; eat of it warm twice or thrice a day, but at breakfaſt eſpecially.

For a ſcald Head.

Take a pinte of running water, and as much Mercury as a good Walunt, three or foure branches of Roſemary ; boyl theſe all together till a third part be boyled away, or thereabout, and every morning and evening waſh the infected place with ſome of this water cold, and a quarter of an houre after or leſſe anoint the place with Lamp oyl, and every morning after the firſt dreſſing try to pul up ſome of the hayr as eaſily as you can : have care where you ſet this water, for it is poyſon. If you ſhave the head, and apply a plaiſter called *Emplaſtrum Cephalicum cum Euphorbio*, it is alſo excellent if you adde unto it in the making, a quantity of green Copras.

For to heal a Red Face that hath many pimples. Proved.

Take foure ounces of Barroues-greaſe, and as much oyl of Bayes, halfe an ounce of quickſilver killed with faſting ſpettle ; then take two ſpoonfuls of wilde Tanſy water, or Honey-ſuckle-watet, and let all be ground in a Morter three houres at the leaſt, untill you ſee nothing of the quickſilver, and ſo keep it cloſe in a glaſſe ; the older, the better ; and when you go to bed anoint the Face, and look you keep it from your eyes.

To waſh the Face if it be given to heat.

Take Snailes, beat them ſhels and bodies together : ſteep them a night in new milk ; then ſtill them with the flowers of white Lillies.

To make odoriferous Damask water.

Take new Ale with the graines in it, three gallons, Chamomil

momill three handfuls, Balm, Roſe leaves, of each foure handfuls ; Lavender and Southernwood, of each two handfuls; Marjerom ſix handfuls ; beat them all into groſſe pouder ; and then infuſe them in the Ale ten or twelve dayes, ſtirring it once or twice a day ; then put it into a Roſewater Still, and ſtrew upon it this following pouder, and diſtill it with a gentle fier.

The Pouder.

Take Cloves, Cipres roots, *Calamus aromaticus*, of each one ounce ; Mace an ounce and a halfe, Orris two ounces ; Storax, Benjamin, Labdanum, of each halfe an ounce ; make them into a pouder.

A damask water that may be made at any time of the year.

Take Lavender flowers, two ounces, Cloves ſix ounces ; Orris one pound, green Bay leaves two ounces, *Calamus aromaticus* foure ounces, Broom bark two ounces, Storax foure ounces, Cypres roots halfe a pound, Margerom two handfuls ; make them altogether into a groſſe pouder, and infuſe it in five gallons of fayr water three or foure dayes, in which time you muſt ſtirre it three or foure times a day and cover it cloſe : then diſtill it with a gentle fier, while it is ſtilling, open it now and then, and ſtir it that it may not ſtick to the bottom.

For a Cold, or for chapt hands.

Bathe your feet oftentimes in Beer wherein ſtore of Salt and Tartar hath been boyled, and dry it in by the fier : this is good for a Cold.

Bathe your hands alſo in like manner, if they be chapt, for it is an excellent and moſt approved Medicine.

Againſt the Murrain of Swine.

With an Aul bore a hole in the top of one of their Ears, and thruſt therein a little piece of the root of black Elebor ; it will cauſe their Ears to ſwell, and ſtore of water will iſſue out thereat, and it will certainly free them from the Murrain : approved.

A Secret for Travellers.

It is a ſlight, but, in my opinion, an excellent thing, and a thing that I have much ſet by ; let ſuch as uſe to travel, eſpeci-

ally in the Summer-time, have about them a piece of Roch-Allum, which they may now and then hold for a small time in their mouths, for when they are hot it will both cool them, and mightily refresh them, and will quench their thirst more than any Beer can: I confess, I have a better liking unto a stone that is made of Saltpeter, and the eighht part of Oriental and transparant Sulphur melted together, and cast into bullet-moulds; it is a stone that divers Mountebanks much esteem of, and it is called by them, A *Celestial* or *Miraculous* stone; and by addicion of certain colours, they make some red, some bleu, and some of a straw-colour; and they attribute divers virtues unto it, as for curing the Pin and Web in the Ey, for Inflammation of the Mouth and Gums, and for curing of aking Teeth; it is indeed nothing but the stone called of the Apothecaries *Lapis Prunella*, and which they ordinarily sell. I have made use of Allum when I could not come at this, and have found it for the aforesaid use not much differing.

To make Usquebah.

Take a Gallon of the smallest *Aqua vitæ* you can make, put it into a close vessel of stone; put thereto a quart of Canary-Sack, two pound of Raisins of the Sun stoned, but not washed, two ounces of Dates stoned, and the white skins of them pulled out, two ounces of Cinamon grosly bruised, four good Nut-megs bruised, four good Licoris-sticks sliced and bruised, ty up all your Spices in a fine Linnen-cloth, and put them into your *Aqua vitæ*, and ty up your Pot very close, and let this infuse a week, stirring it three times a day, then let it run through a Jelley-bag close covered; keep it in glass-bottles.

To make Almond butter.

Take two pound of Almonds and blanch them, and let them ly all night in cold water; then grinde them in a Mortar very small, and put in a blade of Mace or two; then strain it through a strong Cloth as near as you can, that the milk be not too thin, and let it seethe a pretty while, then put in a little Rose water, and a little Salt, when you take it off the fier, and stir it still; then take a big Cloth very clean, and let two hold it, then you must take the Milk and cast it round about the sides of the Cloth, that the Whey may come from it, then with a Saucer put it

it down from the ſides; then knit the Cloth, and hang it up until it have left dropping; then take it forth, and ſeaſon it with fine Sugar and Roſe-water.

To make Jelley for one that is in a Conſumption, or troubled with a Looſneſs.

Take the feet of a Calf, and when the hayr is clean ſcalded off, ſlit them in the middle, and cut away all the black veins, and the fat, and waſh them very clean, and ſo put them in Bucket of fair water, and let them ly four and twenty hours, and in that time the oftner you ſhift them in fair water, it will be the better; then ſet them on the fier in two gallons of water, or ſomwhat leſs, and let them boyl very ſoftly, continually taking off the ſcum and fat which riſeth; and when the Liquour is more than half-boyled away, put into it a pint and a half of white Wine, and as it boyleth there will come a foul ſcum upon it, take it off ſtill clean, and when the Jelley is boyled enough, you may know, for your fingers will ſtick to the ſpoon; then take it from the fier, and with a Cullender take out all the bones and fleſh, and when the Jelley is almoſt cold, beat the whites of ſix Eggs, and put into it, and ſet it on the fier again, and ſo let it boil till it be clear; then ſtrain it through a clean Cloth into a Bafon, and ſo let it ſtand all night long; the next morning put it into a Skellet, and put to it a pound of Sugar, half an ounce of Cinamon broken in pieces, one ounce of Nutmegs, an ounce of Ginger bruiſed, and a good quantity of large Mace; boyl all theſe together till it taſte of the Spices as much as you deſire; and when it is almoſt cold, take the whites of ſix Eggs, and beat them, and put into it, and ſet it on the fier, and when it riſeth weild it in half a pint of white Wine, then ſtrain it through a Jelly-bag.

To ſtay the Flux.

Take Date-ſtones, and beat them to fine pouder, and take the quantity of one of them, and drink it with Poſſet-drink, or Beer; uſe theſe two or three mornings together, and after as often as you finde occaſion; this is very good.

In the moneth of May gather of the reddeſt Oak-leaves you can get, and ſtill them, and when need requireth make Pap thereof, mingled with Milk, fine Flour, Sugar, and Cinamon, as oft as your ſtomack ſerveth to eat it.

How

How to make good writing Ink.

Take two hand-fuls of Gauls, cut each Gaul into three or four pieces, pour into them a pint of Beer or Wine, then let it ſtand eight hours; ſtrain it from the Gauls, and put Vitreol therein, and to the Vitreol a third part of Gum; ſet it on the fier to warm, but let it not ſeethe, and it will be good Ink: and of theſe Gauls you may make Ink four or five times more.

How to make Red Printing Ink.

Take a ſpoon-full of Vermilion, the quantity of a Hazel-nut of clean Turpentine, with a ſpoonfull and a half of Linſeed-oyl; grinde them altogether upon a Painters ſtone, and it is done.

How to make blew Printing Ink.

Take Bice or Smalt, and grinde them with Turpentine and Oyl, as you did the former.

How to make yellow Printing Ink.

Take refined Orpiment, and uſe it as you did the former.

How to make green Printing Ink.

Take Verdigreaſe or Spaniſh-green very clean, and without ſtalks, and grinde it as you did the former.

How to make black Printing Ink.

There is a black Earth which thoſe that print Maps uſe of, this being ground as the former, with Turpentine and Linſeed-oyl, you may make black Ink.

To make green Ink.

Take green Bice and grinde it with Gum-water, and if you will have it a ſadder green, put a little Saffron to the grinding.

To make White Ink.

Take fine Flour, and grinde it with a little Chalk, and Allum, and then put it in a Viol.

For an Ague.

Take a hand-full of Harts-tongue that groweth in the field, and a hand-full of Bay-ſalt, and beat them both together in a Morter, and lay this to both the wriſts.

A good

A good water againſt the Plague, or to be given after a Surfet.

Take red Sage, Celendin, Roſemary, Herbgrace, Wormwood, Mugwort, Pimpernell, Dragons, Scabious, Egrimony, *Roſa Solis* and Balm, of each a handfull, or like quanty by waight; waſh and ſhake them in a cloth, then ſhred and put them into a gallon of white wine, with a quarter of an ounce of Gentian roots, and as much of Angelico roots; let it ſtand two dayes and two nights cloſe covered, and then diſtill it at your pleaſure, and ſtop the glaſſe very cloſe in which you keep the ſame.

To avoyd urin that is ſtopped with the ſtone.

Take as much black Sope as a walnut, temper it with eight or ten leaves of Engliſh Saffron, ſpread it upon a round leather as big as the palm of your hand, and cover the navell of your belly therewithall, and it ſhall cauſe you to make water. And I have been informed by a kinde of Leach that liveth in the Country, that he by applying a plaſter of galbanum ſpread upon a peece of leather round about the *preputium*, cured one that could not avoyd his urin by reaſon of a ſtone, which within a few houres the plaſter brought away, ſo that the party recovered, and became perfectly well; who dying two or three yeeres after, rewarded this his Surgeon with a liberall reward.

For the Stone and ſtrangury.

Take the filmes that are within the mawes of Geeſe, and let them bee purely dryed, and then make pouder thereof, and drink it with ſtale Ale, and it will help him with Gods grace. Proved.

A good Medicine to avoyd the Stone and gravell.

In the morning faſting let the party ſwallow three or foure peeces of freſh Butter about the bigneſſe of Nutmegs, and drink immediatly after a glaſſe full of white Wine, and ſo faſt until dinner. It is a mean Medicin, but not to be contemned, for there are thoſe that I know can affirm the goodneſſe and effects thereof.

For ſcald-heads.

Take green Copperas, and mingle it with cream til it bee turned yellow, and let it ſtand three or foure dayes: then take Primroſe roots, leaves and all, with May-butter, and beat

beat the roots and leaves in the Butter, and boyl them together with a little Beer and Butter, and let it touch to Salt.

To cure an old ulcer.

Take a quart of the ſtrongeſt Ale that is to bee gotten, or breued, halfe a pint of raw Honey, two ounces of Roch-allum beaten, halfe a pinte of Sallet oyl, and the quantity of a Tennis-ball of common waſhing Sope, one ounce of Stone-pitch beaten, one ounce of Rozin beaten, two ounces of yellow wax : boyl al theſe together, and ſtrain them thorow a thin Linnen cloth ; and this wil cure any old Ulcer.

A water to cleanſe and mundifie old rotten ſores and ulcers,

Take a wine-pinte of water of Planten, as much white wine ; put therein two ounces of Roch-allum, a dram of Verdigreaſe, a dram of Mercury ſublimed : boyl al theſe together, and keep them in a thick glaſſe being ſtopped with wax very cloſe, that the ſtrength go not out ; this wil cleanſe and mundifie old ſores : It wil alſo heale a Fiſtula if you uſe a ſiringe, ſo that the water may be ſent to the bottom of the ſore.

The Medicine of Medicines proved for the Stone.

Take a quantity of Eg-ſhels, waſh them clean ; thoſe are the beſt whereout chickens are come ; dry them very dry in an Oven, or between two Tile ſtones ; then make pouder thereof, ſearce it, and mingle it with Sugar, or pouder of Licoras to give it a taſte, and let him uſe it as often as hee needeth, morning and evening, either with Rheniſh wine, white wine, or ſtale Ale, a ſpoonful of the pouder at a time, and uſe to make water in a clean baſon, and ſo you ſhall ſee the deliverance thereof.

For burning or ſcalding.

To take out the fier, beat Onyons very ſmall, and binde them to the place. To heale it, take halfe a pound of ſheeps ſuet, as much ſheeps dung, a quarter of a pound of the inner rinde of an Eldern-tree, and a little Houſleek : fry them together, and ſtrain it, and uſe it as a plaiſter, or make a ſear-cloth of it, and apply it to the grieved part.

For Burſtneſſe of old, or young.

Take nine red Snailes, lay them between two tyles of clay, ſo

ſo that they creep not nor ſlide a way, and bake them in the hot embers, or in an oven, til they may be poudered, then take the pouder of one of the Snailes, and put it in white wine, and let the patient drink it in the morning at his riſing, and faſt two houres after, and drink theſe nine Snailes in eighteene daies, that is, every other day one. And if the ſickneſſe be ſo old that it will not heal in eighteen daies, begin again, and drink other nine Snailes, and he ſhall bee whole: this conſidered, that he weare a Truſſe in the mean time, according to the manner of the rupture.

A Salve for all ſores.

Take a pound of ſheeps Tallow, and a pound of Turpentine, and a pound of Virgin-wax, a pinte of Sallet oyl, a quarter of a pound of Rozin: take alſo Bugle, Smallach, and Plantain halfe the quantity of the other, or ſo much as will make a pinte juſt: boyl al theſe together upon a ſoft fier of coales, alwayes ſtirring it til a third part be conſumed; then take it from the fier, and ſtrain it thorow a new canvas cloth into an earthen pot.

For dimneſſe of ſight.

Take the hearb called Eye bright, make it into fine pouder, and take it either with meate or drink, for it hath been approved to be moſt excellent for al impediments of the ſight.

How to make Eye-bright Wine, Ale, or Beere: By the uſe Whereof, divers that could not read without Spectacles, have miraculouſly recovered their ſights.

You muſt take two or three handfuls of the herb Eye-bright, and put it in a bag that is made of fine boulter, put alſo unto it a dram and a halfe of ſweet Fenil ſeeds, and if you pleaſe, a Clove or two, or a blade of whole Mace, and into the bag put alſo a ſtone to make it ſink, then hang it in a gallon of new Wine or wort; if it bee Wine ſtop it up cloſe preſently, if wort, ſtop it not untill it hath wrought. After it hath ſtood a weeke, you may drinke every morning a draught.

A precious water for the ſight.

Take Smallage, Fennel, Reu, Vervein, Egrimony, Daffadil,

fadil, Pimpernel, and Sage, and ſtil them with breaſt-milk, together with five drams of frankincenſe, and drop of it in your Eyes each night : often proved.

For to ſtay the Flux.

Take the yolk of an Egge, and beat it, then mix with it one grated Nutmeg, and lay it on an hot Tyle ſtone to bake, and eat thereof faſting, and before Supper, and after meales, and it will ſtay it. Often proved to be excellent.

A good Pouder for the Gout.

Take fine Ginger the waight of two groats, and Enula-campane roots dryed, the waight of foure groats, of Liquoriſh the waight of eight groats, of Sugar-candy three ounces ; beat all theſe into a pouder, ſearce them fine, and then mingle them together, and drink thereof morning and evening, and al times of the day. Apppoved.

A ſpecial Medicin for the Colliek.

Take Horehound halfe an handful, of Sage, and Hyſop of either as much, twelve leaves of Betony, of Centaury ſix crops, one Alexander-root, foure penny waight of Enula-campana roots poudered, Spikenard of Spaine one penny-worth ; ſeethe all theſe in three quarts of fine wort to a pottle, and draw it through a Linnen cloth, and take three ſpoonfuls at once morning and evening.

To take away redneſſe or burning of the Eyes.

Take the white of an Eg, and beat it very well with a ſpoon-full or two of red Roſe-water, then put thereto the Pap of a roſted Apple , mingle them well together, and ſpread it upon a little Flax ; ſo lay it on the Eye, binding it on with a linnen cloth.

A Water for the falling down of rheum in the Eyes.

Take the quantity of a large Hazle-Nut of white Copras, and diſſolve it in three quarters of a Pint of running water; with this water a little warmd bathe the Eye-lids divers times in a day. Approved.

For the Rheum in the Eyes.

Take the white of an Egg, and ſo much Bolearmoniack as will thicken

thicken it, and ſpread it on a round playſter of ſheeps-leather, and lay it on the temples on that ſide the Rheum is

The Oyntment for the ſame

Take *Lapis tutiæ* and burn it in a fire-ſhovell of quickcoales, quench it in a Poringer of womans milk, do ſo half a ſcore times, then grinde it in a clean morter till it be very fine pouder, then mingle it with freſh Barroues greaſe till it look ruſſet : anoint your Eyes with a littie of it when you go to bed

For Deafneſſe.

Take Reu, and rub it between the Palms of your hands untill it be ſo bruiſed, that you may make thereof a tent ; then dip it in ſweet ſallet Oyl, and put in each Eare one, ſo that you may pull them forth again. This doe for ſeven or eight dayes, and change the Tent every day.

Take a quarter of a pinte of Angelica water, of *Carduus Benedictus* water, & of white wine, of each a like quantity : mingle them together, dividing the ſame into two equal parts ; drink it in two ſeverall mornings : then the next night after the taking of the ſecond draught of water, take the fiſh of an Oyſter, and put it into a fayr linnen cloth, and ſtop the ſame into the Eare that is thickeſt of hearing, and lie on that ſide as long as you can : in the morning pick that Ear as clean as you can, and after that take a draught of the beſt Ale you can get, with a Toaſt of houſhold bread toaſted very dry, & a reaſonable quantity of Nutmeg ; uſe the ſame every morning for five or ſix dayes, faſting after the taking hereof two houres, every time you take it

For the Cough of the Lungs

Take two handfuls of Roſemary and ſtrip it off the ſtalk, one of Hyſop, and ſeethe them in a Pottle of running water, till it come to a quart, and then put a quarter of a pound of fine Sugar, and let it ſeeth a little, and ſcum it, drink it morning and evening..

A preſent Remedy for all manner of Aches, and Bruiſes in the Bones.

Take a good quantity of Walwort, and a certain quantity of Balm, and Smallach, and ſtamp them, and take a pound of May Butter, and temper them very well together, then make them into round Bals, and let them lie for the ſpace of eight dayes after, and then ſtamp them again as you did before : then take it

and fry it, and ſtrain it, and put it into an earthen pot: This will help the Bruiſe, be it never ſo black.

For Bleeding.

Take a black Toad in May, dry it between two Tyle-ſtones, and hang it in a Sarcenet about the parties neck.

To procure ſleep.

Take Betony, Roſe-leaves, Vineger, Nutmeg, and the crums of Rey-bread: put this in a Cloth warm to the poll of the Head.

For the Cough.

Two hand-fuls of laſt Savory, ſteep it five days in white-wine-vineger, put into the Vineger half an ounce of Pepper, at the five days end drain out the Vineger, and as ſoon as the Bread is drawn, ſet them in a Peuter-diſh into the Oven, and ſtop it up, and let them ſtand all night. In the morning take them out of the Oven and pouder them. Take of this pouder and drink it with Sack, ſo much of it as will ly on a three-pence.

A Gargil for the Uvula.

Take a pint of good ſtrong Ale, and as much Sack, and a good quantity of long Pepper, and bruiſe it groſly, and boyl it from a quart to a pint, and let the parties gargle their mouths and throats as warm as they may ſuffer it.

If the pallat of the mouth be down, it will fetch it up.

For Deafneſs very excellent.

Take the hoofs of a Neats-feet after they bee ſodden, and hold them in a Cloth ſo warm as may be to your ear, divers times together one after another; they will laſt to be warmed in the ſame they were ſodden in, ſome three or four days without ſowring.

How to deſtroy Vermin or Lice in ones Head or Clothes.

There is a Berry which you may bey at the Apothecaries, it is called *Cocculus Indiæ*; make it into fine pouder, and ſtrew it in the hayr of your Head, if the Lice be onely there, and binde the Head cloſe up, and it will for certain ſlay them all before the next morning: if they be about the Clothes and the Body alſo, then mix ſome of the pouder with ſome freſh Butter or Hogs-greaſe,

greaſe, and anoynt the ſeams of the parties Garments, eſpecially about the neck, waſte, and gatherings of the Garments, alſo boyl ſome of the Berries in a pint of fayr water, and the waight of ſix pence of Mercury ſublimate, then ſtrain it, and bathe the party with a Cloth dipt in this water, made bloud-warm, but eſpecially about his Joynts, and it will quit him, though he be never ſo full: approved.

How to make excellent Troſſes or Cakes to purifie the Ayer in the time of the Plague.

Take one ounce of Myrrhe poudered, alſo an ounce of the flour of Brimſton, as much Balſam of *Peru* as will make them into a ſtiff Paſte, then make it into little Cakes; you may in time of Peſtilence every or every other day put one or two of theſe upon a Chafingdiſh of quick coals, and betake your ſelf into ſome other place, untill the ſmoak ceaſe. *Minſhet.*

To provoke Sweat, and to cleanſe and clarifie the Bloud.

Give the party twenty Grains of the flour of Brimſton mingled with a little white-wine-vineger, or Oximel-ſimple; it will provoke to ſweat, and cleanſe the bloud mightily. *Idem.*

Brimſton mingled with Pitch, and ſo wrought upon Wood, will not ſuffer it to be taken with Worms, nor to putrifie with Winde or Weather. *Idem.*

The ſmoke of Brimſton conveyed with a convenient Inſtrument into a Veſſel of corrupt Salt, aud ſtinking water, it will in a ſhort time purifie the ſame, by ſending the dregs into the bottom. *Idem.*

For an old Sore: approved.

Take a pound of Oyl of Olives, two ounces of Honey, one ounce of Turpentine, two ounces of white Wax, Frankincenſe, and Olibanum, half an ounce of each, black Pitch half a pound; melt them altogether, and reſerve it for your uſe.

How to make white Jelley.

Take two pound of Almonds, and make Cream of them, then boyl three ounces of Iſinglaſs in a quart of fair water, to a pint, then mix it with your Cream, adding to them one pound and a quarter of refined Sugar, and a quarter of a pint of Roſe-water; boyl them all together a little while, and then ſtrain it, and it is done.

FINIS.

A Table of the Particulars contain'd in the whole Book.

For the Water-works.

The

The Table.

The

A Table for the Fier-works.

The

The Table for Drawing, Colouring, Limming, Paynting, Engraving, and Etching.

How

FINIS.

Courteous Reader,

These Books following are printed and sold by ANDREW CROOK at the *Green Dragon* in St *Pauls* Church-yard.

In folio.

A Large and compleat Concordance to the Bible, by *Samuel Newman.*
The Bible of a large Engliſh or black Letter, uſed in Churches.
The Bible of a large *Cambridg* Print.
The Bible of a fayr *London* Print.
The Bible in *Welch.*
Cambdens Brittania,
Cotgraves French Dictionary, with a Grammar,
Biſhop *Halls* Works,
Doctor *Willets Synopſis Papiſmi,* or a general view of Papiſtry,
Leviathan, or the Matter, Form, and Power of a Common-wealth Eccleſiaſtical and Civil, by *Thomas Hobbs,*
Ben: Johnſons Works in two Volumes,
The Hiſtory of *Don Quixote,*
Doctor *Kellet* of the Sacrament of our Lords Supper.
All *Homers* Works tranſlated by *George Chapman,*
Orlando Furioſo, by Sir *John Harrington.*
William Pemble, his Works.
Pſiche, or Loves Myſtery by *Io: Beaumont.*

In quarto.

Riders Dictionary corrected & augmented by *Francis Holy-Oak*.

Thomæ Thomatii Dictionarium.

Doctor *Gauden* his Defence by way Apology for the Ministery and Ministers of the Church of *England.*

——— his three Sermons upon several occasions.

——— his Case of Ministers maintenance by Tithes.

The Fables of *Esop* paraphrased in Verse, and adorn'd with Sculpture by *John Ogilby.*

Mr *Joseph Carill* his Exposition on *Job.*

Mr *Rutherford* his *Christ* dying, on *John* 12. *vers.*27,28,29,*&c.*

——— his Survey of the Spiritual *Antichrist*, discovering the Secrets of Familism and Antinomianism.

——— his free Disputation concerning pretended Liberty of Conscience.

——— *De providentia Dei.*

Doctor *Lightfoot* his Harmony on the four Evangelists.

——— his Commentary on the *Acts* of the *Apostles.*

——— his Description of the Temple.

——— his Description of the Service of the Temple.

Ten godly and fruitfull Sermons by *John Gore* late Minister at St *Peters* in *Cornhill.*

Doctor *Day* his Treatise of the Resurrection on 1 *Cor.*15.16.

Barton of Bowing at the Name of *Iesus.*

A plain Exposition on the ten Commandments.

The Church of *England* a true Church, by *John Bastwick*, D.D.

A Vindication of Childrens Right to Baptism, by *Thomas Cobbet* of *New-England*; published by Mr *Tho: Goodwin.*

Mr *Thomas Shepheard* of *New-England* his Treatise of Lyturgies, power of the Keys, and of the Catholick Visible Church, in answer to Mr *John Ball.*

Doctor *Twisse* of Predestination in answer to Mr *Cotton.*

Terence his Comedies in *English* and *Latine*, by *R: Barnard.*

An Exposition with Notes, on the first and second Epistles to the *Thessalonians*, by *William Slater*, D.D.

The *Swedish* Intelligencer containing the principal Passages and Actions done in the best parts of *Christendom.*

Virgil translated grammatically by *John Brimsley.*

A Phr-

A Philosophical and Chymical Treatise of Fier and Salt.
Clement (the blessed *Pauls* fellow-laborer in the Gospel) his Epistle to the *Corinthians*.
The History of the Destruction of *Troy*.
Doctor *Flood* his Answer to *Foster* concerning the Weapon-Salve.
The Protestants Kallendar.
Stanbridgii Vocabula.
The Mysteries of Art and Nature, in four Parts, the first of Water-works, the second of Fier-works, the third of Drawing, Colouring, Limming, Paynting, Engraving and Etching, the fourth of sundry Experiments by *John Bate*.
Johannis Buridani in Arist. Polit.
William Lithgow his Travels.
The History of *Palmerin* of *England*.
A Sermon preached at *Newport* in the Isle of *Wight Octob:* 1648. in the time of the Treaty on *Gal.* 5. *v.* 22, 23. by *Robert Sanderson* Doctor in Divinity, and Chaplayn to the late King.

In octavo.

Virgil translated by *John Ogilby*.
Shepheard his sound Believer.
Farnabies Grammar.
Bishop *Hall* his Contemplations on the Old Testament,
——— Christian Moderation.
——— Honor of the Married Clergy.
——— his Treatise of the old Religion.
——— Remedy against Profaneſs.
Grotii Poëmata.
Rivii Historia Navalis,
Fletcher of Urins.
Doctor *Brown* his *Religio Medici*.
Mr *Bridges* Catechism on the Sacrament.
The Ages of Mans Life, with the Original, Causes, Progress, and End thereof learnedly discussed.
An Hermetical Banquet drest by a Spagerical Cook, for the better preservation of the Microcosm.
Bishop *Corbet* his Poëms compleat, with Additions.

Mr *Norton* of *New-England* in answer to *Apolonius*.
Bishop *Chappels* Treatise of the right Use of the Scriptures.
Sententiæ Puerilis translated by Mr *Brinsley*.
Enchiridion duplex, Oratorium nempe & Poeticum, hoc ab Alexandro Rossæo illud à Theodorico Morello concinnatum; sed ab eodem Rossæo, recognitum & auctum ad Verborum copiam & elegantiam Phrasium Latini Sermonis comparandam in utraque facultate haud infrugiferum.
The Silver Watch-bell.
Georgii Ritchell Contemplationes Metaphysicæ.
The Charter of *Rumney-Marsh*.

In duodecimo.

Sir *Henry Blunt* his Voyage into the *Levant*, being a Relation of a Journey lately performed from *England* by the way of *Venice*, into *Dalmatia*, *Slavonia*, *Bosna*, *Hungaria*, *Macedonia*, *Thessaly*, *Thrace*, *Rhodes*, and *Egypt*, unto *Grand Cairo*: with particular Observations of the Modern Condition of the *Turks*, and other People under that Empire.

A Help to discourse, consisting of Witty, Philosophical, Grammatical, Physical, Astronomical Questions and Answers; as also Epigrams, Epitaphs, Riddles, Jests, Love-toys: together with the Countrey-mans Counsellor, and necessary Rules for Health.

Mr *Rouse* his Art of Happiness.
Greenwood his Works.
An excellent Treatise of the Interest of the Princes and States of *Christendom*.
Ovids Metamorphosis translated by Mr *George Sands*.
A Path-way to Piety, containing,
1. *Christs* Prayer expounded.
2. A Communicant instructed.
3. A Direction to live well.
4. A Direction to die well.

Doctor *Swadlin* his Manual of Devotions, suiting each day with Prayers and Meditations suitable to the Works of the Day, as also each mans Calling, the Noble-man, the Souldier, the Lawyer, the Tradesman, the sick man, the dying man.

A Brief

A Brief of the Bibles Hiſtory.

The *Engliſh* Dictionary, or an Interpreter of hard *Engliſh* words, enabling as well Ladies and Gentlewomen, young Scholars, Clerks, Merchants, as alſo ſtrangers of any Nation to the underſtanding of the moſt difficult Authours in our Language, and the more ſpeedy attaining of the *Engliſh* Tongue, both in reading, ſpeaking, and writing.

The Poor mans Reſt, founded upon Motives, Meditations, and Prayers, expreſſing the inward means of true Conſolation.

The Mothers Bleſſing, or the godly Counſels of a Gentle-woman not long ſince deceaſed, left behinde her for her Children, containing many good Exhortations and good Admonitions, profitable for all Parents to leave as a Legacy to their Children, by Mrs *Dorothy Leigh*.

Several Treatiſes of Mr *Perkins*,

1. How to live, and that well.
2. The right way of dying well.
3. The Government of the Tongue.
4. A Grain of Muſtard-ſeed.
5. The right Knowledg of *Chriſt* crucified.
6. The Nature and Practice of Repentance.
7. The Combate betwixt the Fleſh and Spirit.

A Grammar in *French* and *Engliſh*, being neceſſary Rules for a *Frenchman* to learn *Engliſh*, by *George Maſon* Marchant.

Four Plays in *Latin*, *viz:*

Loiola.
Stoicus Vapulans.
Cancer.
Paria.

Two Plays by *Thomas Kellegrew*, *viz:*

The Priſoners.
Claracilla.

Lots Little-one.

A warlike Treatiſe of the Pike.

A Manual of the Bible.

Latin Teſtament.
Engliſh Teſtament.
The third part of the Bible.

Plays.

Queen *Elizabeth*, firſt and ſecond Part.
The honeſt Whore, firſt and ſecond Part.
The Fleir.
The Night-walker.
The Opportunity.
The ſwaggering Damſel.
The Conſpiracy.
Loves Miſtris.
Loves Cruelty.
Lilly his Comedies.
The Tragedy of *Hoffman*.