Animadversions of warre; or a militarie magazine of the truest rules, and ablest instructions, for the managing of warre

Ward, Robert

London, 1639

Section XIIII.

A DESCRIPTION OF ENGINES, AND WARLIKE INSTRVMENTS.

SECT. XIIII.

CHAP. CCXLIII.

The description of such Engines, and Warlike Instruments, as are prevalent in the Warres; with the manner of using them, and how to make them.

IN regard the managing of Warlike affaires cannot bee well performed without the knowledge, and true use of all kind of Instruments that are, or may be invented, it is therefore very necessary to describe the fashion, and operation of such as have beene formerly, and now are at this present day invented, and also invent some that have not formerly beene knowne; by these a Commander in chiefe may defend his Army, and offend his Enemy; for by the use of such Stratagemicall Instruments, many times a Victory or Conquest hath beene easily obtained: and upon more certainer tearmes, then to trust only to the Valour and Potencie of an Army. For the Nature of Policie, and Politique Instruments, are to accomplish such things, that strength cannot performe; their operation being in a double respect, as the Commander that makes use of them shall order and dispose; so accordingly is their operation (*viz.*) making all difficulties Easie; and againe contrarily making all things easie difficult: And by this twofold Vertue, the wisedome and Ingenuity of an Enemie is often foyled. I have formerly spoken of the use of all kind of Artillery, as being the principall Engine, Here I will onely speake of the Nature and Condition of the Petard, by the force of which, all substantiall massie bodyes are dissolved and fittered in peeces; this Engine is of the fashion of a Leatherne Bucket, usually made of Brasse, the Verges even, that it may lye patte upon the Port you intend to blow-open. If the Port be accessible, then it is to be hung up by a Ring upon a peece of Iron skrewed into the Port with a Forke, to stay it close, and to keepe it from reversing; the manner of charging it, and the use of it, is more largely discoursed of in the Treatise of Artillerie, Page 113.114. But if the Port bee inaccessible, then it must be placed upon an Engine which will conduct it to the Port, as by the next Figure following you may see at *C*, the fashion of the Petard at the Letter *A*. the Forke at the Letter *B*.

The Petard to blow open Ports and Portcullisses.

CHAP.

Note the end of the Carriage of the Petard, is to have a Ballance, that it may lye even upō the wheeles, and being put home to the Port, the hindmoſt end is to bee ſtrongly barricadoed, that it may not reverſe.

CHAP. CCXLIIII.

The uſe of the Granadoes *how they are made, and charged with powder, and how they are to be diſcharged out of a Morter, or throwne by the hand.*

A *Granado* is one of the neceſſarieſt Engines belonging to the Warres, in regard it anoyes and ſpoyles the Enemie, when no other Weapon nor Engine can; there are two ſorts of them, one to ſhoote in a Morter-peece; the other ſort is to bee caſt by the hand amongſt the Enemies over their Walls and workes. Thoſe that are to bee ſhotte out of Morter-Peeces are to be caſt in Braſſe for the principall Service, or made of Glaſſe or Earth; and theſe are to batter downe Walls and Roofes of houſes, and to breake amongſt the Enemies Horſe or Foot-Troopes; there is another ſort made of Canvas, and that is uſed properly to ſet fire upon Houſes and Townes; of theſe I will diſcourſe in particular, and demonſtrate them by Figure.

Thoſe of Braſſe ought to bee of a foote-Diameter made ſomewhat long-wayes; in thickneſſe an inch, one end thereof is to have a Snowt like a Bottle; and at the other end a Hole, at the which it is to be charged, and the ſaid hole is to bee skrewed; then there is a ſtrong Skrew-Tappe to be made, to fill the skrew-hole, and that is hollow, wherein is put ſlow-burning-Powder, made of Cannon-Powder beaten fine, and moyſtned with the oyle of Peeter mingled with ſome Charcole; then it is corded over with Cord halfe an inch in diſtance one from th'other every way acroſſe to keepe it from ſplitting or breaking in the diſcharging it; the manner how to charge them is ſhewed in the Diſcourſe of the uſe of Artillery; This Figure following in the meane time will give you ſome light for your better underſtanding.

The knob or Snoute is in ſtead of a handle, to put the Granado in the Morter, the ſcrew-hole is to goe next the Powder for the better firing it.

In

Note ſome Granadoes are made of Canvaſſe with divers Piſtoll-barrels charged with powder and bullets, and covered over.

In this Precedent Figure, you ſee the parts of the *Granado*, and how it is to bee charged at *A*. the Skrew-faucet which is to bee filled with a Compoſition of ſlack-burning-Powder is at *B*. the manner of twilting the *Granado* is at *C*. You muſt likewiſe bee very circumſpect, whether the Priming-powder burnes quicke or ſlow, leſt it ſhould fire before it comes at the place aſſigned; thoſe *Granadoes* that are made of Glaſſe or Earth, are to be uſed after the ſame manner as the former is, not forgetting to anoint them all over with Tallow for feare of flawes and crackes.

There are of theſe kindes made of Earth and Glaſſe.

Now for thoſe *Granadoes* which are to be throwne by the hand, the ſubſtance they are made of is Braſſe three parts, and Tinne one; which being caſt in a Mould are made hollow, and about halfe an Inch thicke; the Braſſe muſt bee melted before the Tinne be put in; the faſhion is of a Pomgranat: the Concavitie is to bee filled halfe full of fine corne-powder, and the other halfe next the vent, is to be filled with Serpentine-Powder, mingled with Roſin beaten to powder, ſo that for three parts of Serpentine-powder, you take one of Roſin; then putting into the Snowt or hole of it a little fine Powder, which makes it fire the ſooner: being held in the Right-hand ready to caſt from you (at the ſame inſtant fire being given to it with a Match) it is toſt over into the Enemies Workes, where it breakes in divers peeces, deſtroying all neere it; the faſhion of them you may behold in the next Figure following. There is no way to prevent the force of theſe, but by extinguiſhing them with raw Hides, or tumbling them into water to choke the Powder before the Priming-powder bee burnt to the Corne-powder; wherefore divers Souldiers are to bee appointed with Skoopes, and others with Hides to quench them in the water, or to choake them for want of vent.

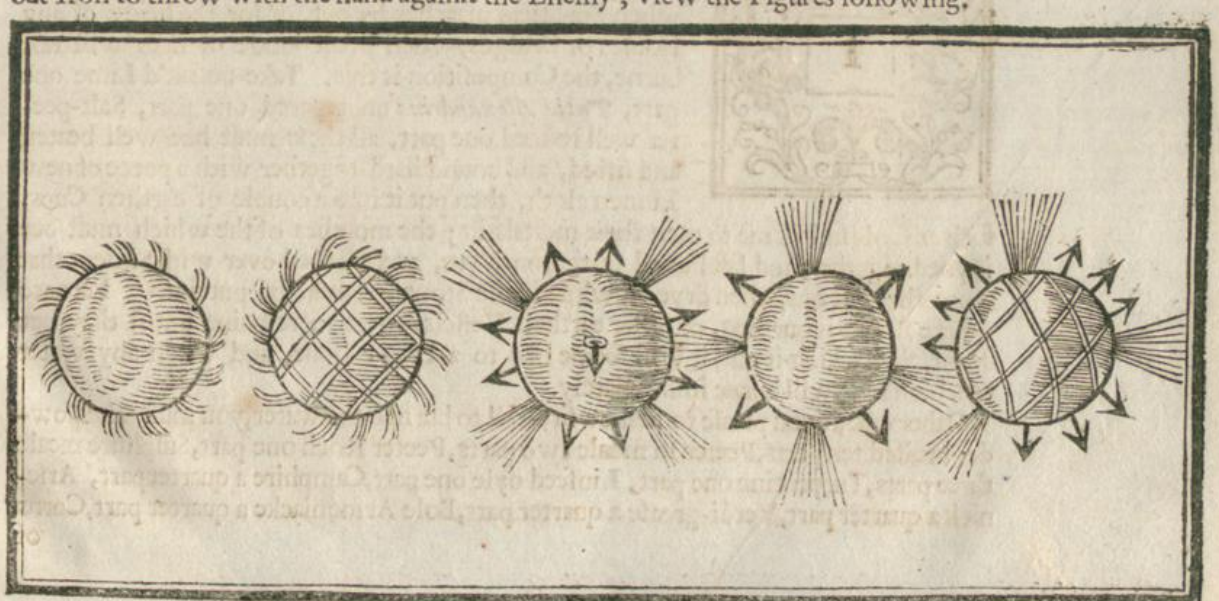
There are ſome *Granadoes* made without a ſnowte very round, only a vent-hole whereby it is filled with Powder, as you ſee at the Figure *B*, this being filled with fine powder, is to bee put into an Earthen-pot; ſo farre bigger, that it may hold it, and a quantity of Powder beſides; then divers threds of Cotton being folded together, and boyled in Salt-Peeter and Brimſtone to make it apt to hold fire, the ſaid Pot being covered at the mouth with a skinne cloſe tyed, then croſſing the Pot with a peece of Wyer, as you perceive at the figure *D*, divers peeces of this Match is tyed about it being well lighted; ſo that when the Pot is throwne and breakes with the fall, the Match fires the Powder, whereby the *Granado* is alſo fired; And this is the ſecureſt way to throw them: Note if the *Granado* be of Glaſſe, then the skrew-tappe that is to goe into the vent-hole to carry the Priming-powder muſt be of Wood, for the Glaſſe will breake ſo ſoone as the fire toucheth it; View the Figure.

CHAP.

CHAP. CCXLV.

The use of the Fire-ball, to fire Houses, Bridges or Ports, with the manner of framing them.

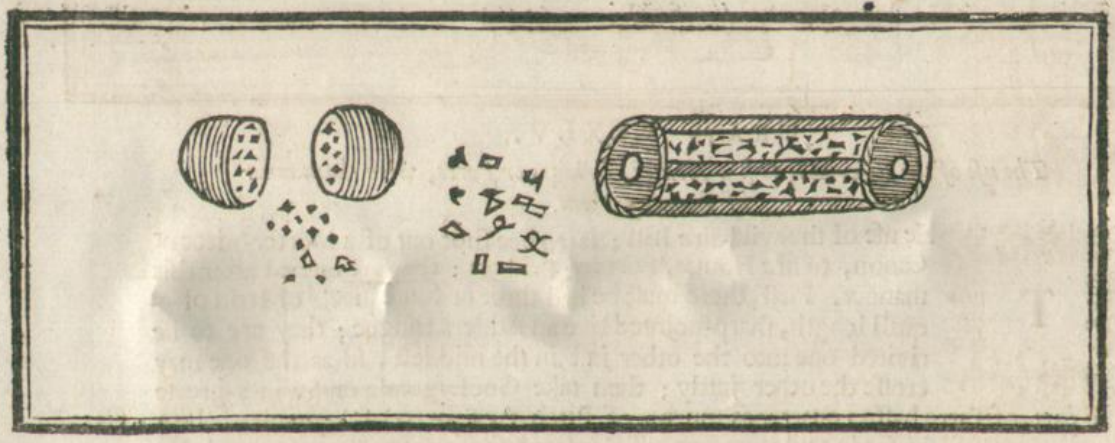
THe use of the wild-fire Ball; is to bee shot out of a Morter-piece or Canon, to fire Houses, Ports or Bridges; they are framed after this manner. First, there must be had three or foure pieces of Iron of equall length, sharp-pointed like an Adders tongue; they are to be rivited one into the other just in the middest, so as the one may crosse the other justly; then take Goose-grease or Swines-grease one part, of Tarre halfe a quarter as much, of Pitch two parts, of Aqua-vitæ halfe a quarter part, of Lin-seede Oyle one part, of Verdigrease a quarter part, of waxe halfe a quarter part, of Groome a quarter part, of Salt-peeter meale one part; these being mixed together over a slow fire, and in the liquid mixture dippe a good quantity of Tow and linnen raggs; then rub the same well in bruised Powder, the which being rowled hard about the afore-said Irons, and bound about very straight with wyer or pack-threed, not forgetting to bore two holes quite a-crosse the said Composition, which must be filled with good bruised Powder; they are to be put downe into the piece next the Powder, that the priming holes may take fire; and being shot out, whersoever they sticke they will fire it suddenly: the like balls may be made without Iron to throw with the hand against the Enemy; view the Figures following.



CHAP. CCXLVI.

The use of Lanthornes and hollow Plates filled with pibble Stones and Musquet Bullets for the defending of Breaches.

FOr the defending of a Breach and disabling the Enemy from making his forcible entry, it is necessary to have in store and readinesse divers hollow round plates, like halfe Bullets, the one is to shut over the other, like a Boxe lid, this is to be filled with pibble Stones or Musquet Bullets, or square peeces of iron, called Dice-shot; this being discharged out of a Murthering peece, will doe much hurt: also, your Lanthornes are made of soft Wood, after the fashion of our ordinary Lanthornes, these beeing filled with stones, and shot out of a Peece, will breake in peeces, and the stones will doe wonderfull execution against those that shall enter a Breach, a Bridge, or Port; *View the Figures following.*



CHAP. CCXLVII.

How to make a certaine Stone to burne in the Water, or to kindle fire in the greatest storme of Raine, being very usefull in the Warres.

THere is a certaine Stone to be made, which will kindle eyther by laying water on it, or by spitting upon it; it is very usefull in the Warres, in time of tempestuous raine, when Souldiers matches are out, or for the firing of any Houses or Bridges, when other kinde of fires will not burne, the Composition is this. Take unslak'd Lime one part, *Tutia Alexandrina* unprepared one part, Salt-peeter well refined one part, all these must bee well beaten and fifted, and bound hard together with a peece of new Linnen cloth, then put it into a couple of earthen Cups, such as Goldsmiths use to melt their mettals in; the mouthes of the which must bee joyned together, and fast bound with iron wyre, and dawbed over with Siment that it breathes not out, then dryed a while in the Stone, it must be put into a Furnace where Bricke is burning, or other earthen Vessels, there to remaine untill they bee burnt, then taking it out, it will seeme like to a Bricke stone, and when any water toucheth it, it will burne immediately.

Otherwise, if you please to make a fire-ball to burn in the water, you must take powder bruised ten parts, Peeter in meale two parts, Peeter Roch one part, Sulphure meale three parts, Turpentine one part, Linseed oyle one part, Camphire a quarter part, Arsenick a quarter part, Verdi-grease a quarter part, Bole Armoniacke a quarter part, Corns

of

of Bay ſalt ½. part, filings of iron ½. part, Quick ſilver ⅛. part, theſe things being well blended and mingled together with the hand, in ſome woodden Veſſell. Then taking a peece of Canvaſſe, and cut out a round peece as big as you pleaſe, which being ſowed together and filled with this Receit, then ſtrongly bound with packthread, and coted with moulten pitch, making therein but one vent of an inch deep, wherein muſt be put fine powder (to prime it) bruiſed very ſmall, this being fired with a match, after it hath burnt awhile ding it into any water, it will riſe and burne furiouſly upon the top; this is very proper to ſet fire upon the Enemies floates or Galleries that are built upon the water, there ſhall need no Figure to demonſtrate this.

CHAP. CCXLVIII.

Of certaine earthen Bottels filled with a kinde of mixture to be fired, which are thrown amongſt the Enemie.

THere are certaine Earthen Bottels to be made of a round faſhion, being not halfe burnt are beſt for this uſe; they are invented to diſorder the Enemies Rankes, or to aſtoniſh them, being whirld out of the Souldiers hands amongſt the Enemies will ſoone make them give ground, the device is this; having got as many of theſe Bottels as ſhall be thought requiſite, theſe muſt bee filled halfe full of Serpentine powder, or ſomewhat more, there is to be mixt with it a quantity of Hogges greaſe, Oyle of Stone, Brimſtone, Saltpeeter twice refined, Aqua vitæ, Pitch, theſe being ſtirred together over a ſoft fire in ſome earthen veſſell; this compoſition being put into the Bottell, with fine powder bruiſed to cauſe it to fire, ſuddainly the Bottell is to have a Cord to throw it by; this hath wrought ſtrange effects.

Alſo there is a kinde of Compoſition which is beſmeared about Ropes ends and Hoopes, which are to be throwne from a Wall upon the Enemy, which will burne and diſorder them wonderfully, eſpecially at the ſcaling of a Wall. The Compoſition is this; take Sulphre in meale ſixe parts, of Rozin in meale three parts; theſe being melted in a Pan, over a ſlow fire, then taking Stone-pitch one part, hard waxe one part, of Towe halfe a quarter part, of Aqua vitæ halfe a quarter part, of Camphire ⅛ parts, theſe being alſo melted together, there muſt bee ſtirred into it Saltpeeter-meale two parts, and when it is taken off the fire, there muſt be foure parts of bruiſed powder mixt with it; theſe being oynted upon Hoopes and Ropes and ſet on fire, whereſoever they light they cannot be quenched, but will burne the Enemy to death. *View the Figures following.*

Note, that Flaxe or Towe Hurds is beſt to dip into the Compoſition, and to winde about the Hoope or Ropeends.

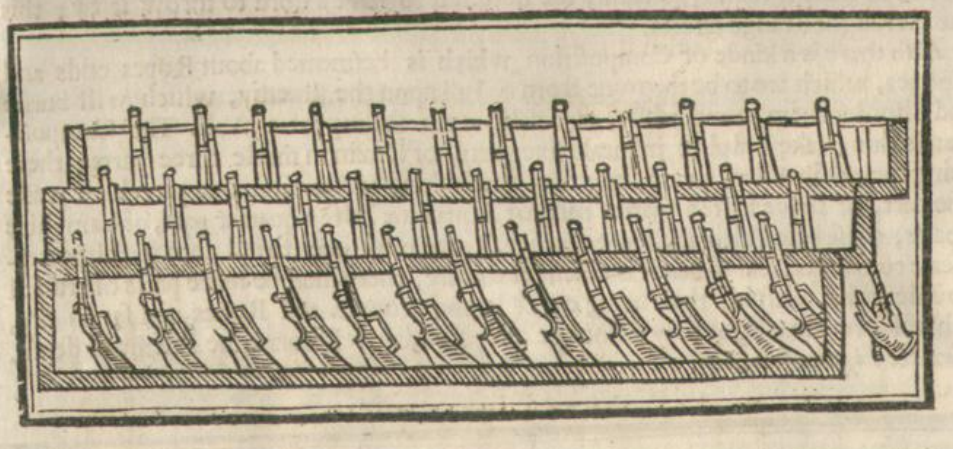
CHAP.

CHAP. CCXLIX.

How a frame of Musquets are to be made and ordered for the defence of a Breach, or for the flanking of a Battalia of Pikes.

THe use of this frame of Musquets is very excellent both in the defence of Breaches, Bridges, Ports, or to be plac'd before the Divisions of Pikes, or flanking the Pikes in Battell, whereby the Enemie will be wonderfully shaken, and by the helpe of a few men which are to remove them too and fro, and to give fire to the traines, strange exploits may be performed: The manner of it is thus; A Frame is made of Boordes or Planke three Stories high, one story halfe a foot above the other, and a foot or more behinde one the other, the lowermost tyre is to lye about three foot from the ground, the next halfe a foot above that, and so the third: there are certain quilles or small spouts of Brasse to goe from one touch-hole to the other, so that the traine being fired, they shall one discharge after another, beginning first with the uppermost tyre, as the Enemy enters the Breach, then the second, and the lowermost last; there is also a broad plate which shall be plac'd over the Breeches of the Musquets, that no sparkles may fall downe into the Pans of the second, nor the lowermost tyre, each tyre is to hold twelve Musquets a breast, one being plac'd a foot distance from the other; there are certaine Ringles on each side to remove it by: There is one in *Germany* that hath onely twelve Musquets, which may be discharged eight and forty times, according to the French new invention for Pistols: This was practised at *Ostend* when Duke *Albert* made his potent assault, by which he was wonderfully repulst'd. *View the Figure.*

This Frame may bee made onely with the Barrels of Musquets, without stockes to them, the manner how to order them any ingenuous wit will conceive of.



CHAP. CCL.

An Instrument called a Flaile, used in the defending of a Breach, or scaling of a Wall, or when the Enemy is at handy blowes.

THis instrument is used in the Warres to defend breaches, or when the Enemy is entered the streets of a Towne and are at close fight, then these are the onely weapons for dispatch, there being no defence for it; it is made much after the fashion of a Flayle, onely the Swingill is short and very thicke, having divers Iron Pikes in it upon all parts of it, that which way soever it falles it destroyes; divers souldiers are appointed to attend the Enemies assaulting the Breach, some standing at one end of the Breach, the residue at the other, and when the Enemy is come up at push of Pike, so close that the Pikemen can make no use of their Pikes, then these Flayles makes way through their Headpeeces and Armour. *View the Figure.*

CHAP.

CHAP. CCLI.

The use of the Turne-pike, and how it is framed, and of the excellent defence it makes, both against Horse and Foote upon all straights and passages.

THis Instrument is of great use to bee cast into straites, breaches, passages, or high-wayes; for which way soever it is rowled, there bee sharpe pikes towards the Enemy to hinder his approches; the manner of framing of it is after this manner; First there is a round Beame of light wood, as Firre or Sallow about twelve Inches in circumference, and ten or twelve foot long; at every halfe-footes length, or under, there must bee holes bored thorow every way a-crosse; then there must bee Staves fitted for those holes of good seasoned Ash, about a yard and a halfe long, somewhat tapering towards each end; the ends of these Staves must bee armed with Iron Pikes cheeked downe a good way, that they may not bee hackt off with their Swords, then being droven into the foresaid holes just halfe way of the Staffe, it will bee defensive which way soever it bee turned; the beame is to be so made, that one may be fastned to the other by hookes at each end, so that if need bee halfe a score of them may bee coupled together, or otherwise as the breach or passage is in breadth; the Musqueniers may shoot over them, and the Pikes may defend them so, that the Enemy shall not have the advantage to pull them asunder; and so long as they lye, neither Horse nor Foot can passe for them; when they are to be transported by waggon, then the Staves are to be knockt out, that they may lye in closer roome; View the Figure following.

The hole must be of a Mortice wimbles Bore.

CHAP. CCLII.

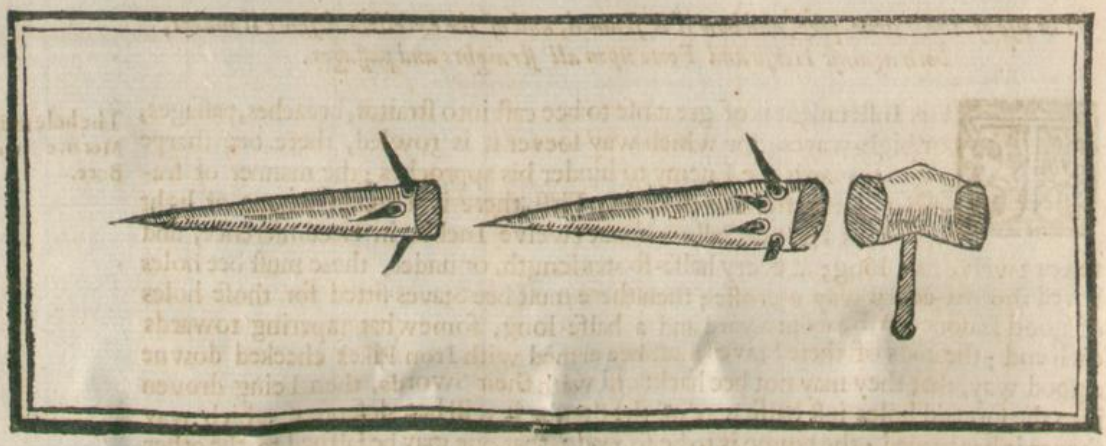
The use of the Pallizadoes *to prevent both Horse and Foote, from any sudden assault, and how they are framed.*

HIs Excellency the Prince of *Orange* had alwayes these Instruments carryed in his Army, either by Water, or by Land, for whereseoever hee did incampe his Army for any time, especially if the Enemy were quartered neere, he alwayes gave directions to have these *Pallizadoes* pitcht into the ground round the quarters; and upon all Passages and Bridges the Turne-Pikes were placed with a sufficient Guard to defend them; The manner of framing them is after this fashion, they take Furre-poles about twelve Inches in Circumfe-

rence

rence, and foure foote and and a halfe, and ſome five foot long and upwards, theſe are ſharpe at the nether end with a peece of Iron, that they may enter the Gravell or Stones, and ſome are not; within a handfull of the upper end there is two Iron Pikes of five or ſixe inches long driven in ſide-wayes one croſſing the other, then in the middeſt betwixt both is the third Pike placed right-forwards, theſe being driven into the earth about a foote and a halfe, and in diſtance a foote, or thereabouts aſunder, the Pikes will ſo anſwer one to the other, that nothing can paſſe but muſt receive hurt, when they intend to raiſe a Parapet of earth, then as they finiſh the worke, they pull up the *Pallizados*; There is another kind of *Palizado* made of peeces of Oake-heart ſharpt at one end, the other end is layed into the earth three quarters of a yard deepe neere the top of a Breaſt-worke, either of Skonce or Redout; View the Figure of the former *Palizado*.

Some *Pallizadoes* have two Pikes right forwards, and two ſlenting forward on each ſide.

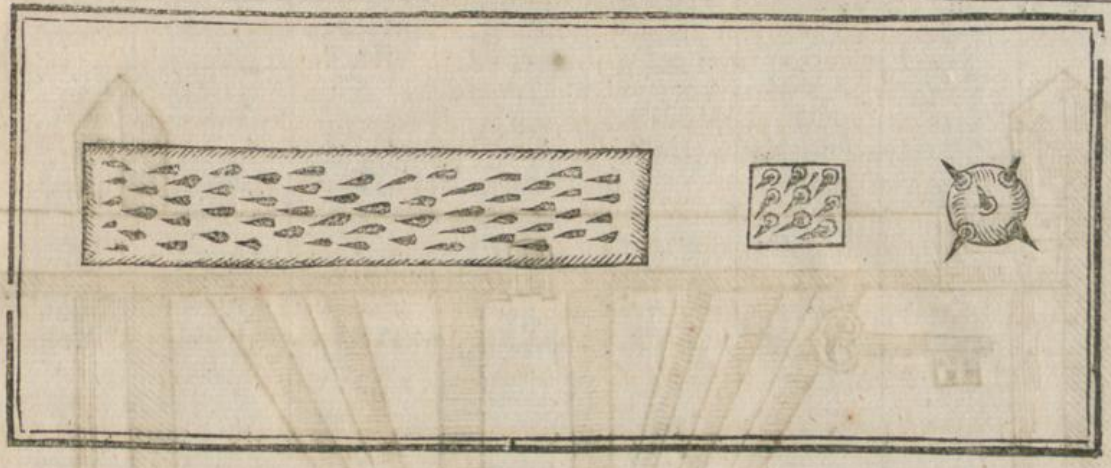


CHAP. CCLIII.

The uſe of the Calthrop, *and of the Spiked Planke to anoy both Horſe and Foote.*

THe *Calthrop* is an Inſtrument very offenſive to the Enemies Horſe, and by the uſe of them a few Souldiers may make an able reſiſtance, either in the ſtreetes of a Towne, or upon any paſſage, or in a Pitcht Battell; the lightneſſe of it being ſuch, that every Souldier may carry two or three of them at his Girdle, and as they advance towards the Enemy, throwing them downe, they will indanger any thing that ſhall tread upon them; They are framed in this wiſe; firſt they take a tough peece of Sallow, and making it rouud about the bigneſſe of an Apple, there is Iron pikes driven thorow, which points every way, ſo that which way ſoever it falls a pike will bee upwards to runne into the feet, either of Horſe or Man; there is another faſhion made of a peece of Bord as broad as a Trencher, which is driven full of nayles, and lyned with another thin Bord, to keepe the Nayles from ſlipping backe; theſe are very good to bee throwne upon paſſages in the night-time, when a feare of the Enemies approch is at hand.

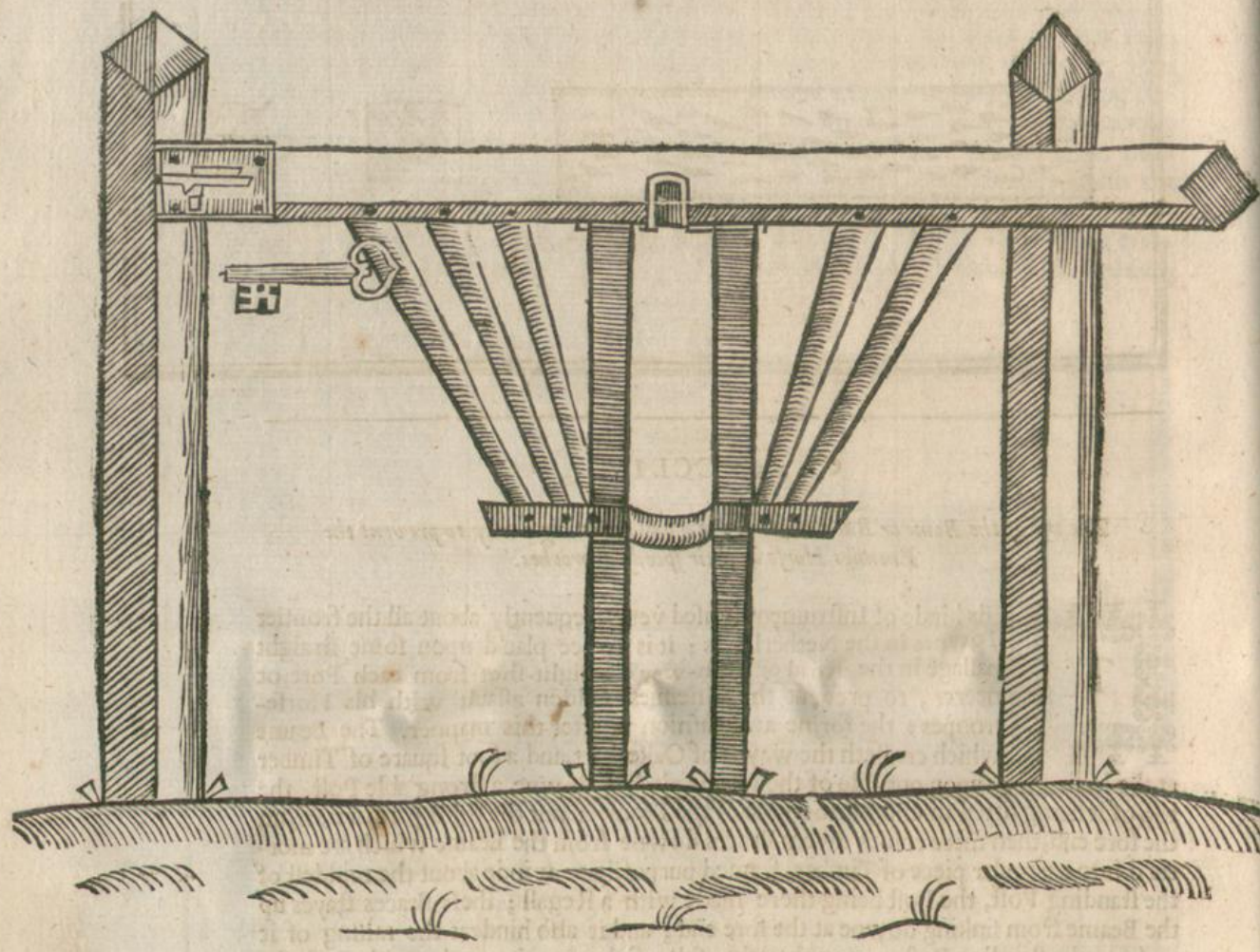
Alſo at the Siege of *Oſt-End* the Arch-Duke invented a device to defend himſelfe againſt ſudden Sallyes out of the Towne, wherefore hee cauſed to bee layed at the neereſt Retrenchments long Plankes driven full of long ſharpe ſpikes, the ſharpe points lying upwards to runne into their feet that ſhould aſſayle him; this is good to lay croſſe ſtreetes in a Towne in the night-time, when an Enemy hath entred the Ports; View the Figures following.



Chap. CCLIV.

The use of the Bome or Baricado to crosse a passage or high-way, to prevent the Enemies Horse in their speedy approches.

THis kinde of Instrument is used very frequently about all the frontier Townes in the Netherlands; it is to bee plac'd upon some straight passage in the Road or high-way, a flight-shot from each Port or neerer, to prevent the Enemies sudden assault with his Horse-troopes: the forme and fasnion is after this manner. The Beame which crosseth the way is of Oake-hart, and a foot square of Timber at the least; then upon one side of the way is pitch'd downe a strong able Post, the top of it being fitted to enter into a hole of the Beame about the third part of it, from the fore end, then there comes divers Braces downe from the Beame which are mortic'd into a circular piece of Timber, framed purposely to winde about the middest of the standing Post, the Post being there made with a Regall; these Braces stayes up the Beame from sinking downe at the fore end; and it also hinders the raising of it up from the standing Post: upon the other side of the way is another able Post for the end of the Beame to shut against; the said end of the Beame hath a very strong Spring-locke, which at the first pulling too locks into the Post: there is alwayes a Sentinell to garde at this Bome, to open and shut it to Passengers; if there bee any voyd place betwixt the Postes and the hedges, it must bee strongly railed: the Figure followes, which happily may better informe you.



CHAP. CCLV.

Of a ſecond kinde of Bome or Baricado to lay over Rivers to prevent the comming up of Boates, whereby the Enemy may ſurprize a Towne.

THis ſecond kinde of Bome was invented by the Netherlanders to prevent the Enemies deſignes, who had many times deceived them by rowing up their boates the Rivers, and unexpectedly have entred their Townes: the manner of framing it is after this faſhion. In the narroweſt place of the River or Haven they ſpile both the ſides next the bankes with long able ſpiles, mortiſſing the top of them into an over-way or beame of ſound Timber, onely in the middeſt of the ſtreame they leave a paſſage for ſuch veſſels or boates to paſſe, as are requiſite: then they take a peece of Timber, or ſome Maſt of a Ship, which being fitted in due length for the place, the one end of this Bome hath a Staple of ſtrong Iron which is joyned by a Ringle to a ſecond Staple that is droven into the inmoſt Spile; likewiſe upon the Spile of the other ſide is a ſtrong Staple, whereunto the fore-nd of the Bome is to bee faſtened either by a Mortice plated with Iron, or ſome Chaine faſtened unto it, and this is ſtrongly lockt: upon the top of this Bome, goes a thick barre of Iron from end to end, which hath large ſtrong pikes rivited into it three or foure inches one from the other.

Laſtly,

Laſtly, the iron plate or Barre is rivited to the Bome, ſo that it cannot poſſibly be cut in ſunder, neyther can they have their Boates over it by reaſon of the Pikes; this they may open and ſhut at pleaſure; Many times they uſe iron chaines, but they are more chargeable and not ſo good, in regard a Boat will runne over it. *View the Figure.*

CHAP. CCLVI.

Duke Alberts *Invention for the ſtaying of the Hollanders Shippes at* Oſtend, *that his Batteries might the eaſier diſcharge upon them.*

IN the Siege of *Oſtend*, Duke *Albertus* had planted divers Blockhouſes with Ordnance to impeach the Hollanders ſhipping which releeved the Towne: yet with a quicke tyde and faire Winde, they entred in deſpight of his Ordnance without any dammage; wherefore he bethought him to draw a mighty Cable over the Channell where the Shippes did uſually paſſe ſafely by the favour of the darke night: to divers parts of this Cable, he faſtned divers empty Caske, as Pipes and Hogſheads to beare it up ſtraite and even; alſo, there were certaine Anchors to ſtay the Pipes and Cable from floating away; hee having prepared his Batteries in readineſſe for the ſame purpoſe on eyther ſide of the ſhore, no ſooner were the Shippes ſtayed, but the Ordnance played upon them to their great detriment, many of them being ſuncke, and the reſt battered.

Some haue cauſed a Maſſie chaine to be conveyed over a Haven, or Channell, alſo long peeces of Timber linck'd together, hath beene a meanes to hinder ſhipping, for otherwiſe it is a difficult thing to offend the paſſage of ſhipping, or boates, eſpecially by night, as was probable at the ſame Siege; there being as *Grimſtone* recordeth, 70 ſhot made at one Fleet in that Channell, yet not one of them ſuncke, nor damnified. *View the Figure.*

CHAP. CCLVII.

The manner of making a Battery to floate upon the water, that the Ordnance may shoot the leveller, invented at Ostend *by Duke* Albertus.

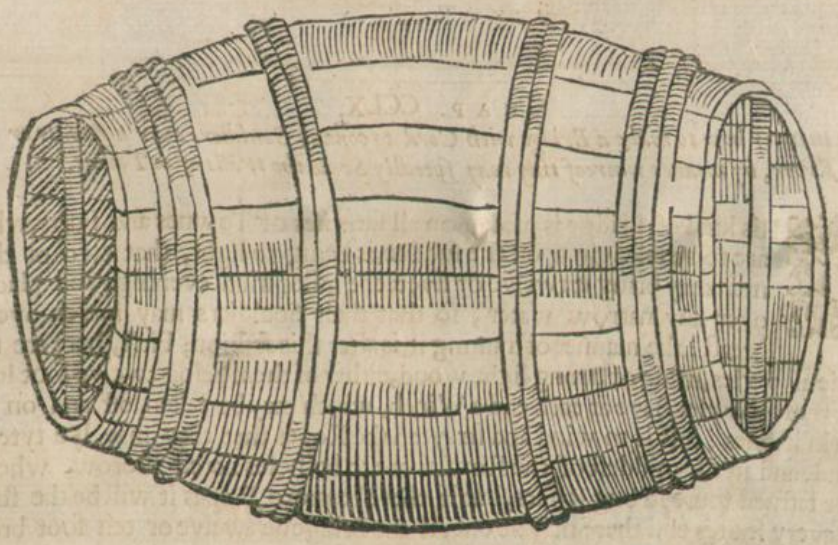
THis Floate was invented at *Ostend*, to plant their Ordnance on it, that they might strike the Vessels betweene Wind and water, as they came into the Haven; the manner of framing it, was on this wise: First, there were divers strong large Pipes or Hogsheads made purposely, upon the which divers Beames or Rafters were strongly fastned, crossing every way to hold the Pipes together; then there were divers Plankes fastned upon the toppe of the Rafters, after the fashion of a floore of a house, round the sides were wooll-packes, fixed to shelter the Enemies shot; this Floate lying thus levell with the water, gave the Ordnance fit opportunity to shoot at a better certainty; upon eyther side of the Haven was one of these Floates planted, not one right against the other, but a certain distance wide, so that if one mist his shoot, the other should indeavour to hit. *The figure of it followes.*

CHAP.

CHAP. CCLVIII.

The manner of framing the Engine called the Saulciſſe, *which is to be uſed againſt a beleaguered Towne to ſhelter both Horſe and Foote.*

THis Inſtrument was invented at *Oſt-end*, for the ſafegard both of Horſe and Foote; the manner of framing of it was after this manner; They tooke divers Bords or Plankes of Deale-wood, and framed them in manner of a Hogſhead or Pipe, but ſo great that a Horſeman might ride behinde it, and not be diſcovered; the Concavitie of it was filled with Dunge and ſand, it was hooped with broad Iron hoopes, it was twenty foot long; there were fiftie or ſixtie men to rowle it: this did the Arch-Duke wonderfull ſervice in preſerving his Souldiers, both from the Cannon and Muſquet; it being alwayes rowled before thoſe that went to Intrench themſelves, or to releeve ſuch Guards as were dangerous, and within ſhotte of the Walls of the Towne; by this deviſe they could goe as neere to the Enemies workes as they liſted: the Figure followes.



CHAP. CCLIX.

How to ſtop up the paſſage of Veſſels, and Boates in a Channell, or to mend a breach in an arme of the Sea.

THe beſt and preſenteſt way to ſtop, and damme up a Channell, or a breach, is to fill the Hulke of old caſt Ships, Hoighes, and Boates with earth, and ſo conveying them to the fitteſt place where the water is narroweſt and ſhalloweſt, and there to ſinke them; Likewiſe by filling old ſackes full of Earth or Sand, and caſting them into the water, will damme up a ſmall Haven, and will hinder the paſſage of all kind of Veſſels from releeving a beſieged Towne; and by this the breach of an arme of the Sea may bee ſtopped, but firſt it muſt be well pyled to ſtay the Veſſells and Earth from being waſhed away; wherefore they muſt take the opportunity of a low-water to worke in, and have ſufficient helpe to lay the foundation ſure, for feare of blowing up; Moreover, if you feare the water will decay ſome weake place of the banke, then there muſt be a ſtancke made to ſhelve off the force of the water; alſo if there be any Skonces or other Workes that the water beates againſt the Wall, and decayes it by daſhing againſt it; then for the preventing of it, there muſt bee Mattes made of Sedge and Bulruſhes, which muſt be ſtaked downe before the Earth, and Hurdles made with Oyſiers.

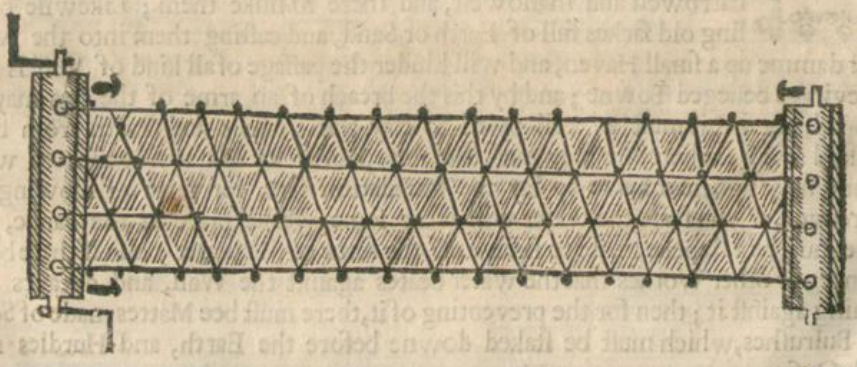
Alſo

Alſo for the Landing up of ſome ſhallow place, where the water runneth but in Winter time, or in great Stormes, the beſt way is to ſet it thicke of Oyſiers, which will ſpeedily grow, and keepe up the Sand and Rubbiſh from waſhing away, ſo that in a ſhort time it will be landed up; View the Figure following.

CHAP. CCLX.

The manner how to make a Bridge with Cord to convey Souldiers over a Moate or River, by meanes whereof they may ſpeedily Scale the Walls of a Towne.

THis kind of Bridge is uſed upon all ſurpriſes of Townes and Forts, which are to be taken in upon the ſudden, it being ſo light, that two or three men may bring it twelve or fiveteene miles in an evening, and place it over any narrow water, ſo that their Souldiers may march over abreaſt: the manner of framing it, is after this faſhion; Firſt, there are two woodden Rowles, made of ſtrong light wood, either of them being twelve foot long; one of theſe Rowles have at each end a Winch, which may be taken off and on like to a Grindſtones; this is to wind and ſtrayten the Ropes that they may lye tyte, at each end, and in the middeſt of the Rowles are to be holes bored thorow, wherein muſt be faſtned foure ſtrong Ropes, but if there be more Ropes it will be the ſtronger, at every footes end there may be one, if the Bridge be twelve or ten foot broad, then it is but boring ſo many holes, and drawing ſo many Ropes thorow: then you are to take Cord, and knit it with Maſhes, like the Maſhes of a Flue, ſo that a mans foot cannot ſlip thorow; this Cord being knit all the way faſt tothe Cordes, one end of this Bridge is to be tranſported, either by one or two that can ſwimme, or in a Leatherne Boate made for that purpoſe; the ends of the Rowles are to bee ſtaked downe ſtrongly, either with Iron ſtakes made for that purpoſe, or with woodden; Next it is to be ſtraitned out ſtraite with Winches, and made faſt, you are to note that over theſe Ropes and Maſhes, there is Canvaſſe ſtitched downe to make the Bridge firme, that they may not faulter with their feet in paſſing over; View the Figure following.



CHAP.

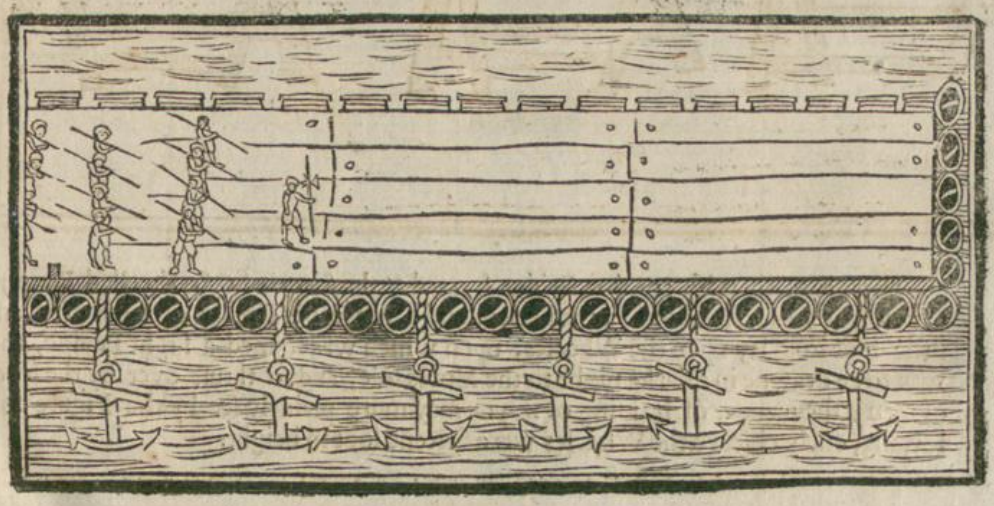
CHAP. CCLXI.

How to make a firme Bridge both for Horſe and Men to march over and to tranſport their Ordnance, over any River, although as broad as the Thames.

EArle *Charolois* in the warres of France, termed the Holy League, being to paſſe over the great River of Seine, he cauſed divers Casks to be made of very ſtrong bord or Clampall ſtrongly hooped, and of a great bigneſſe, upon which he faſtned Rafters, and Plancherd it over, placing divers ſtrong Anchors to ſtay the Bridge from the force of the ſtreame: over this Bridge (as *Commines* reports) marched a hundred thouſand men, with all their proviſion and Ordnance: The States of the Netherlands have a kinde of an open flat Boat which they terme Punts; theſe they convey by water to any place they intend to march over; but if they march to ſome remote place, ſo that they cannot paſſe by water, then they are tranſported upon Carriages, and drawne by Horſes, which doth them great ſervice to ſtow in them Powder, Match, Ammunition, Bread and ſuch like; they are made like to Horſe-boatee flat-bottom'd the ends open and riſing, ſo that when they are joyned together, the riſing ends meeting it is like an Arch, thorow which the water hath paſſage, foure men may march a breſt over them; and they are twenty or thirty foot long a peece; they are faſtned together with iron hookes; and their Maſts and Tacklings are fixed to the ſides of them, to ſtrengthen them; the riſing ends of theſe Punts have ledges nayled halfe a foot diſtance one from the other, to prevent the feet both of Men and Horſe from ſliding; they are ſtayed with Cables and Anchors from falling downe with the ſtreame. Theſe are the ſureſt and beſt Bridges that ever yet were invented; and very eaſie to bee conveyed either by land or by water; beſides many things belonging to the Warres may bee carryed in them.

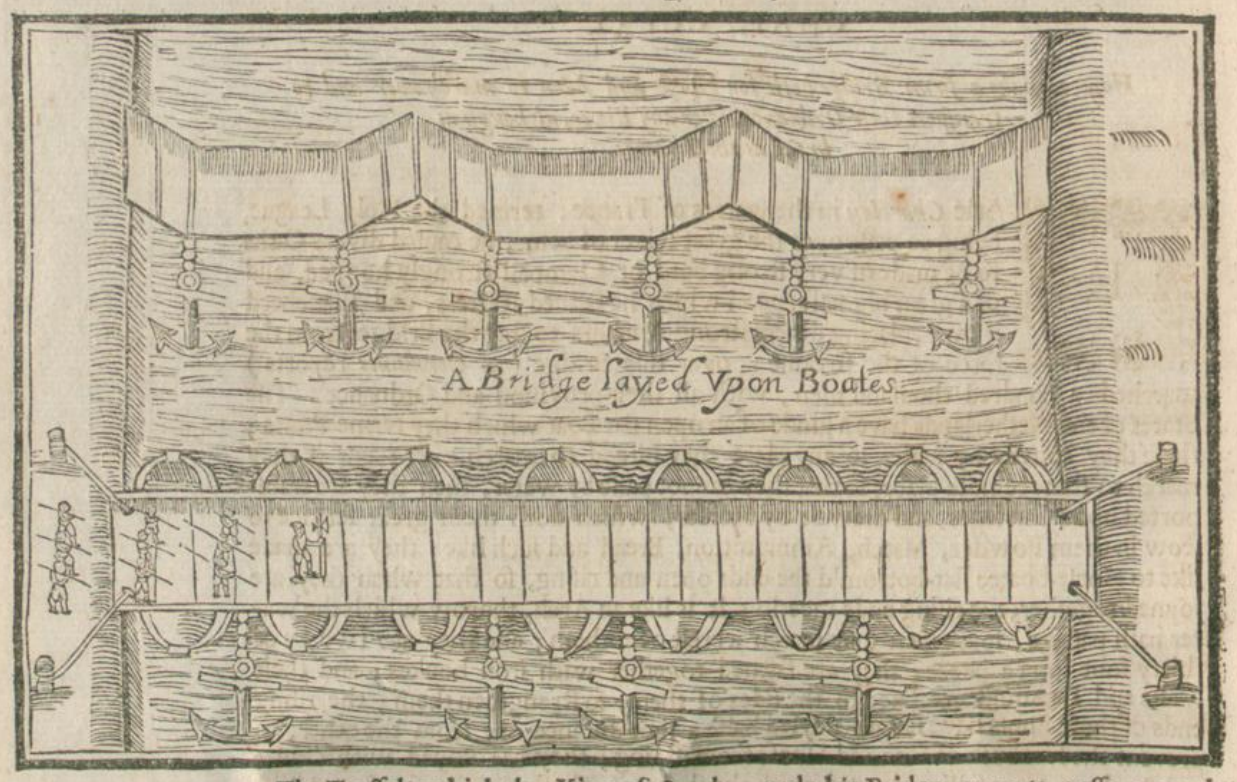
The Prince of *Orange* many times made Bridges with ſmall Veſſels, as Hoighs or the like; they were ſtayed by Anchors; their beake heads pointing againſt the ſtreame, there were Rafters plac'd from one Veſſell to another and plancher'd over. The Figures of theſe ſeverall Bridges follow.

A Bridge laid upon Caske.



The

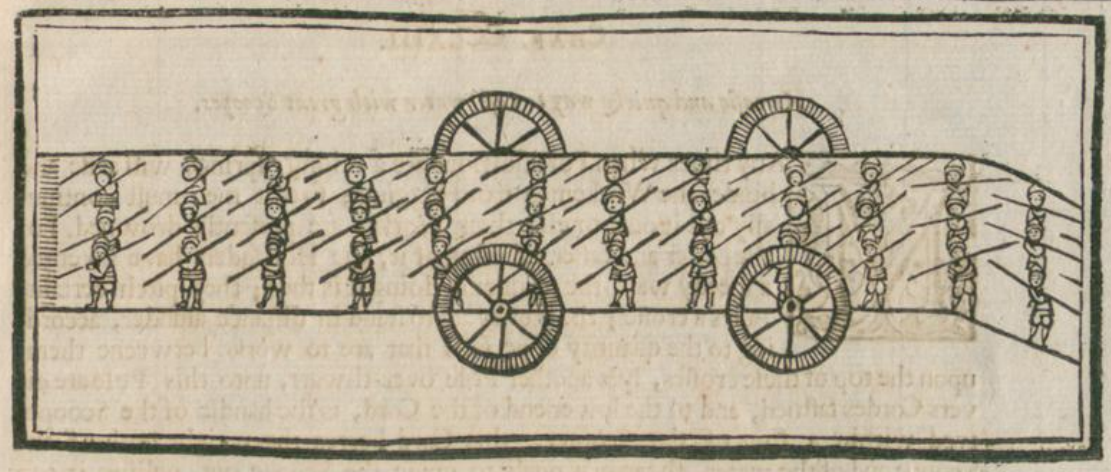
A Bridge made of Punts.



The Treſſels which the King of *Sweden* made his Bridge upon to paſſe over the *Lech* into *Bavaria*, the feet of the Treſſels had weights upon their Ledges to hold them downe in the water.

There was likewiſe another Bridge framed at the Siege of *Oſtend* called *Pompey's* Chariot, it was framed of foure wheeles, and a peece of Timber of a hundred and fiftie foot long lay upon the Wheeles, upon which was framed a ſlight Bridge, this was to be drawne in a darke night to the Motes ſide, and ſo thruſt over by the force of men; the manner of framing of it, you may more plainely ſee by the Figure following, onely obſerve the Wheeles were fifteene foot in height.

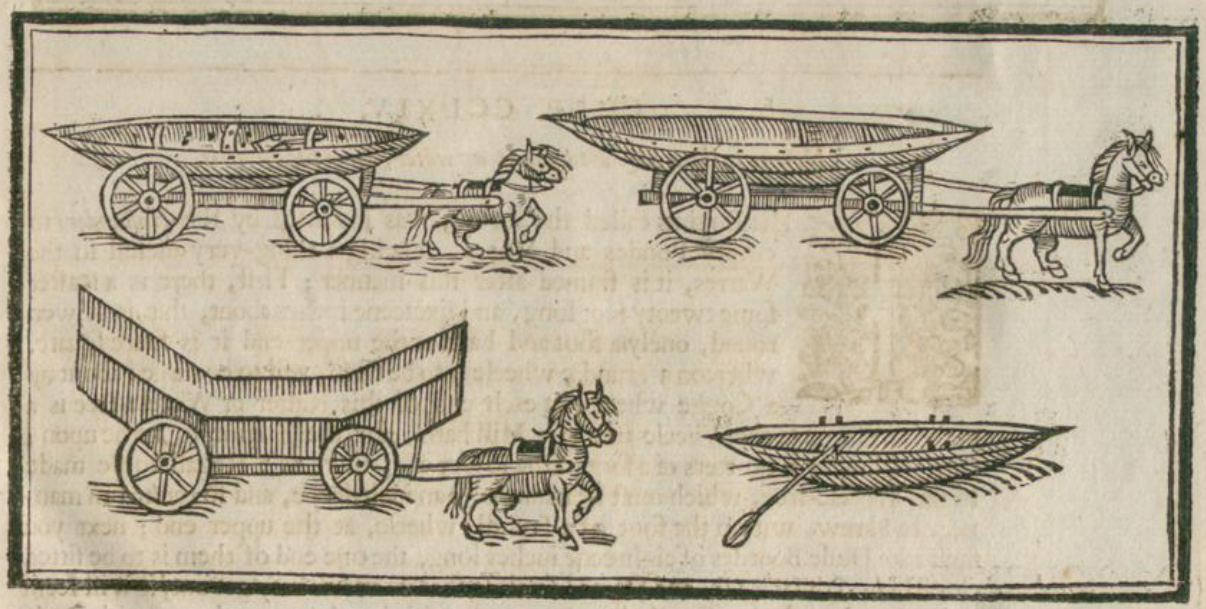
CHAP.



CHAP. CCLXII.

The use of the Leathren Boate, and how to make it.

THis kinde of Boate was invented for the lightneſſe of it, and to bee uſed to convey Souldiers over Motes and Rivers, whereby ſome ſuddaine and unexpected exploit may be done before the Enemy is aware of it: for a Souldier may carry one of theſe under his Arme twenty miles, without any great trouble: the manner of framing them, is after this manner; there muſt be the two ſides or Bellies of an Oxe hide well tanned, beaten out and made concave; this being cut faſhionable to the keele of a Boate, the two ſides are to bee ſowne ſtrongly together, ſo that no water may ſoake through, then taking a couple of ſtrong ſtaves to pend the ſides and the ends of the Leather from bending in, when the Souldiers are in it. The Hollanders carry their Skutes and Boates upon carriages, and in them they put their Ammunition and other neceſſaries, being well covered over with Tilts, or ſometimes one Boate covers the other; theſe Boates they can ſpeedily take off from the carriages, and upon all occaſions ſuddainly make uſe of them. *View the Figures of them.*



CHAP. CCLXIII.

An eaſie and quicke way to caſt water with great Scoopes.

MAny times when Fortifications are a raiſing, ſprings will ariſe and hinder the Workemen from digging; ſo that men muſt continually caſt it out, or elſe their Workes are preſently drowned. For the better and eaſier effecting of it, the Hollanders have invented a ſpeedy way, the manner of doing it is thus; they pitch certaine Poles a croſſe; the croſſes are to ſtand in diſtance aſunder, according to the quantity of perſons that are to worke betweene them; upon the top of theſe croſſes, lyes another Pole over-thwart, unto this Pole are divers Cordes faſtned, and to the lower end of the Cord, is the handle of the Scoopes tyed within a foot of the Scoope, this Cord beares the weight both of the Scoope and of the water, the man is onely to guide the Scoope out, pulling it too and fro, theſe Scoopes may be very great ones; many times they nayle on Steales unto great Trayes, having a peece of Leather faſtned over the end of the Tray by the Steale, to keepe the water from flying backwards; by this deviſe a man may caſt more water at eaſe in one houre, than otherwiſe they can doe in three; beſides, they wet not themſelves halfe ſo much. *View the Figure following.*

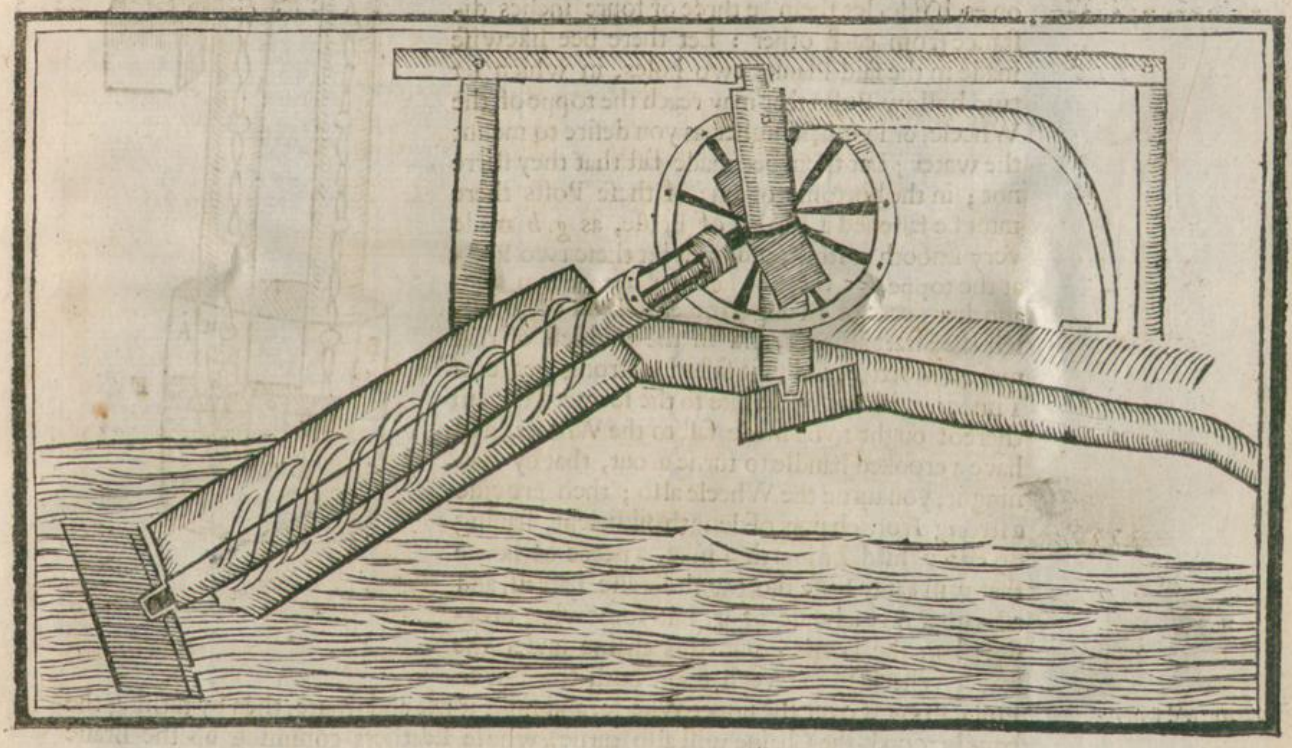
CHAP. CCLXIV.

How to make a Skrew to winde up water, with the uſe of it.

THis Engine called the Skrew, was invented by the *Hollanders* to empty Pondes and Motes, it being a thing very uſefull in the Warres, it is framed after this manner; Firſt, there is a Rafter ſome twenty foot long, and ſixeteene inches about, this is hewen round, onely a foot and halfe at the upper end it is foure ſquare, whereon a Trundle wheele is to be fixed, and to be turned about by a Cogge wheele, at each end of this Rafter or Wheele-tree is a gudgion of iron as the Wheele-tree of a Mill hath, for the Engine to turne upon; then within three quarters of a foot of the lower end, there is a Regall to be made in this Wheele-tree, which muſt be made halfe an inch deepe, and ſo carried in manner of a Skrew, within the foot of a Trundle wheele, at the upper end; next you muſt take Deale Boordes of eighteene inches long, the one end of them is to be fitted cleverly into the Regall, and joyned ſo cloſe that no water may get out, it will ſeem to be after the faſhoin of a winding Stare-caſe, this is to be covered over with Deale Boordes, and likewiſe to be reagold into them, that the ends of the ſhort Boordes may be faſtened into them, and hooped over with flat iron Hoopes, ſo that it will

ſeeme

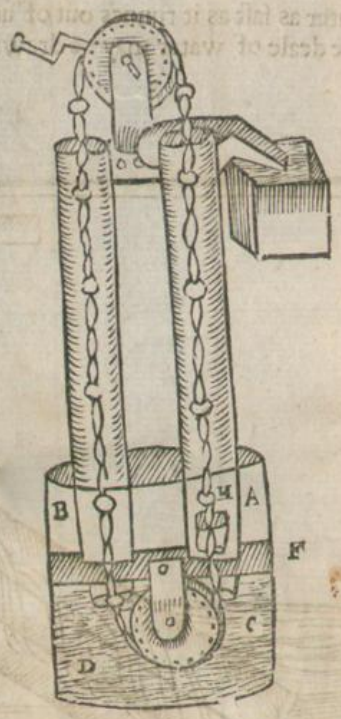
ſeene round like a Pype, or a great long Barrell. Next there is a Cogge-wheele to bee made to turne this Engine round; it is formed like a Cogge-wheele of a Horſe-mill, only the Cogges are to ſtand downwards, and it is drawne about with two or three Horſes, Plankes being placed for them to goe on; this Engine being placed in the water: the nether Gudgeon running in a peece of Timber placed for that purpoſe in the water, the Engine lying ſide-wayes; the upper Gudgeon is likewiſe placed in another peece of Timber very tryly, ſo that the Cogge-wheele may turne about the Engine; at the upper end of the Barrell of this Engine muſt be placed a Troffe to receive the water, and convey it away into ſome ditch; this Engine will ſcrew up water as faſt as it runnes out of an Overſhot-mill, whereby in a ſhort time an infinite deale of water may be drawne. *View the Figure.*



CHAP. CCLXV.

The Deſcription of an Engine whereby water may be drawne out of any place or depth, or mount any River: water to bee conveyed to any place within three or foure miles diſtance.

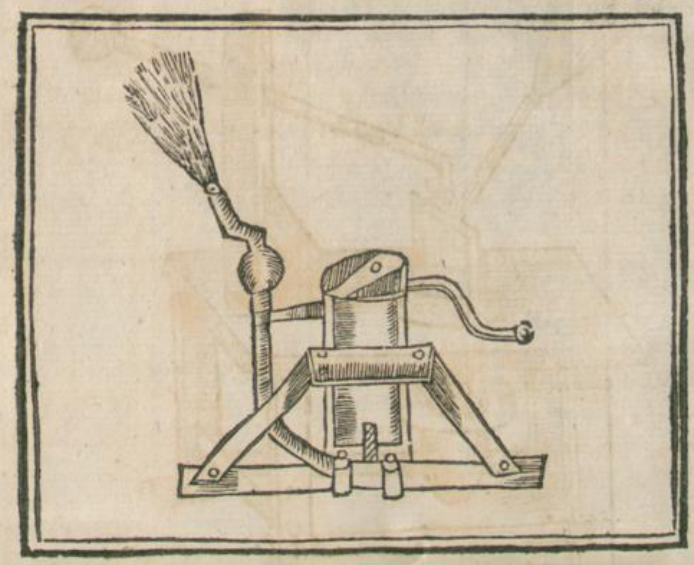
SVppoſe *A.B. C D.* to be a deepe Moate, River, Well, or Pond, and *EF* to be a ſtrong peece of Timber faſtened overthwart the ſame a good diſtance in the water, in this Planke let there bee faſtened a peece of Timber, with a ſtrong Wheele in it as *G* and *H.* having ſtrong Iron ſpikes drove athwart the Wheele within the crevice, and ſtrongly rivited on each ſide, let them be three or foure inches diſtance from each other: Let there bee likewiſe made in the ſaid Planke two holes, in which ſet two hollow Poſts that may reach the toppe of the Wheele, or ſo much higher, as you deſire to mount the water; Let them bee made faſt that they ſtirre not; in the bottome of one of theſe Poſts there muſt be faſtened a barrel of Braſſe, as *g. h* made very ſmooth within, and betwixt theſe two Poſts at the toppe, let there be 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 wheele like to the former; the pin thereof ought to be made faſt to the Wheele, and have a crooked handle to turne about, that by turning it, you turne the Wheele alſo; then provide a ſtrong Iron chaine of length ſufficient, having on every third or fourth Linke, a peece of horne that will eaſily paſſe thorow the braſſe Barrell, and a Leather on each ſide of it, but ſomewhat broader then the horne; put this chaine under the lower Wheele in the Well upon both the lower Poſts, draw it over the upper Wheele, and linke it faſt and ſtraite, then by turning the handle round, the Chaine will alſo turne, whoſe Leathers comming up the Braſſe Barrells will force up the Waters before them. Or after the ſame manner you may take two Plankes eighteene or twenty inches broad a-peece, and twenty or thirty foot long, or more; at the lower edges of theſe Plankes there is a bottome Planke of the ſame length and thickneſſe cloſely joyned and faſtened; alſo downe the middeſt is another joyned and fixed, theſe are to bee nine inches broad, and being thus framed, it makes a ſquare Boxe, as is uſually for Clocke-leads to goe downe in, the upper ſide is open like a Troffe; then there are divers ſquare peeces of Bordes fitted juſtly to goe up and downe the ſaid Concavities; theſe Bordes have foure flat Irons goes thorow them, to each corner goes one, theſe are keyed together, ſo as they may play to and fro; theſe ſquare peeces being thus chained together, drives up the water thorow the hollow of the ſaid Plankes; at the two ends of this Engine is a Wheele as the former hath, only they differ in faſhion, for they are made like a Millers Trundles, the uppermoſt hath a double Sweake, ſo that eight or tenne men may turne at it; the nether end of this Engine is placed in the water, the upper end is ſtayed with Crutchets or other proviſion; the open ſide lyes upwards, and in turning the Wheele, thoſe ſquare bordes comes downe the open ſide, and runnes up the Boxe, and forceth the water out.



CHAP.

Chap. CCLXVI.

The description of an Engine to force water up to a high place very usefull to quench fire amongst buildings in Townes and Garrisons, or Huttes in Campes or Leaguers.



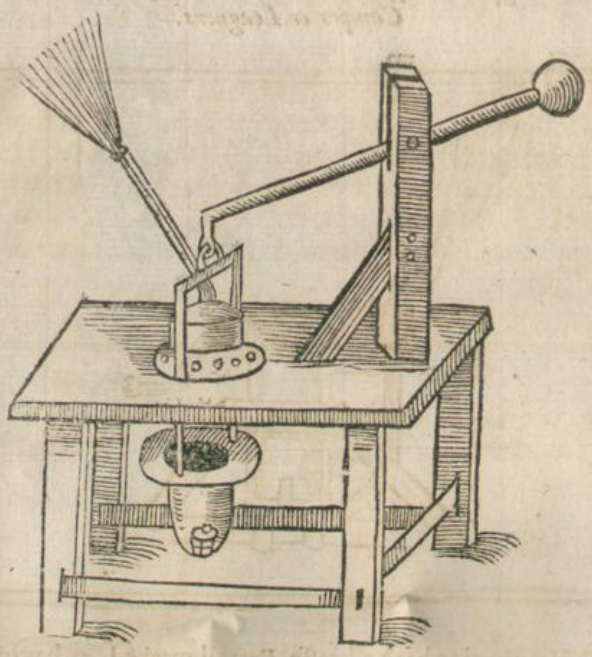
THis Engine hath a brasse Barrell marked *a.* having two suckers in the bottome of it marked *b.* also a large Pipe going upon one side of it marked c. with a Sucker nigh unto the top of it; and above all a hollow round Ball *d.* with a Pipe at the top of it made to skrew another Pipe upon it to direct the water to any place: then fit a Forcer unto the Barrell with a handle fastned unto the top, at the upper end of this Forcer drive a stong screw; and at the lower end a Skrew-nut; at the bottome of the Barrell fasten a Screw, and at the Barre that goeth crosse the top Barrell let there be another skrew-nut: put them all in order, and fasten the whole to a good strong frame marked *f.* that it may stand steady: when you use it; either you must place it in the water, or in the Channell of the streete; and drive the water up to it with broomes; and by moving the handle too, and fro, it will cast the water up with mighty force to any place you shall direct it: Note, there is no Engine for Water-workes of what sort soever (whether for service or pleasure) can bee made without the helpe of Suckers, Forcers or Clacks: a Sucker is a Boxe made of Brasse having no bottome; in the midst of which there is a small barre goeth crosse the same, having a hole in the middest of it; this Boxe hath a lid so exactly fitted unto it, that being put unto it, no Ayre nor Water can passe betweene the Crevisses; this Cover hath a little Button on the top, and a seame that goeth into the Boxe, and so thorow the hole of the aforesaid crosse Barre; and afterwards it hath a little Button rivited on it, so that it may with ease clap up and downe, but not be taken, or slip quite out, as this figure in the Margent demonstrates.

A Forcer is a plug of wood exactly turned and leathered about the end that goeth into the Barrell, is Semi-circularly concave, as this second Figure opposite sheweth.

A Clacke, is a piece of Leather nailed over any hole of a Pumpe, &c. having a peece of Lead to make it lye close, so that no Ayre nor Water may passe thereby, as the third Figure sheweth.

CHAP. CCLXVII.

The description of another kinde of Engine to cast up water with violence.



THere must bee prepared a strong Table of Planke three or foure inches thicke; with an Iron Sweepe fastened at the one end thereof to lift up and downe; unto the end of the Sweepe let there be linked a piece of Iron having two Rods of length sufficient; let there bee made a hole quite through the middest of this Table, whose diameter let be above five or sixe inches; then provide two peeces of Brasse in forme of Hattes; but let the brim of the uppermost be but one inch broad; and have divers little holes through it round about: also in the crowne of this must bee placed a large Sucker, and over it a halfe Globe; from top of which must proceed a hollow Trunke, about a yard long, and of a good and wide Bore: then take good liquored Leather two or three times double, and put betweene the bordes and the brims of this, and with divers little Skrewes (put through the holes of the brim) skrew it fast unto the top of the Table. Note, the Table must bee leathered also underneath the compasse of the brim of the lower brasse; also the lower brasse must bee of equall diameter in hollownesse unto the other; but it must bee more Spirall towards the end or bottome; and must have either a large Clocke 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 middest 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; through which holes put the two Rods of the Iron hanged to the Sweepe, and rivet them strongly into the holes of the lower brasse: place this Engine in water, and by moving the Sweepe up and downe, it will with great vigor cast the water on high.

CHAP. CCLXVIII.

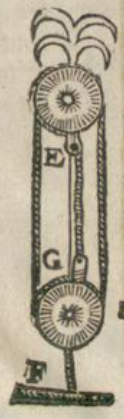
How to make water at the foot of a Mountaine, to aſcend to the top of it, and ſo to deſcend on the other ſide, for the furniſhing of Garriſons.

TO this there muſt be a Pipe of Leade, which may come from the Fountaine *A*, to the top of the Mountaine *B*, and ſo to deſcend on the other ſide a little lower than the fountaine as at *C*, then make a hole in the Pipe at the top of the Mountaine *B*, and ſtoppe the end of the Pipe at *A*, and *C*, and fill this Pipe at *B* with water, and cloſe it very carefully at *B*, that no ayre get in at the hole *B*, then unſtop the end at *A*, and at *C*, then will the water runne perpetually up the Hill, and deſcend on the otherſide; this is of great conſequence to furniſh Villages.

CHAP. CCLXIX.

How to make a Scaling Ladder of Cords, which may be carried in a Souldiers Pocket, by which a Wall, Caſtle, or Towne may be ſcaled.

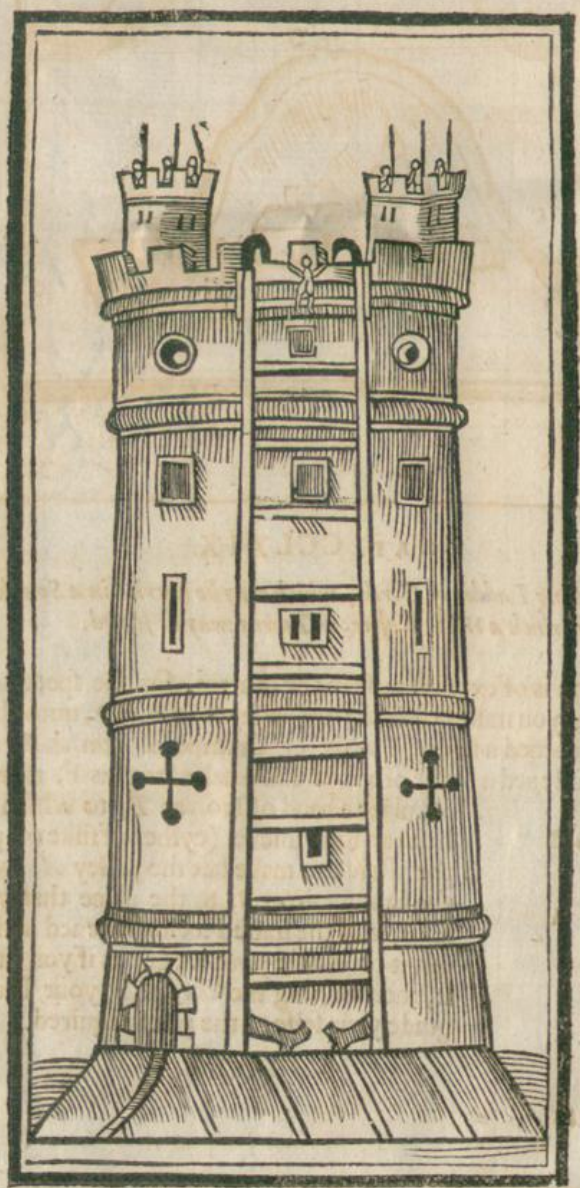
THis Engine is of excellent uſe in the Warres, for the ſpeedy ſurpriſing of Townes; you muſt firſt take two pulleyes *A* and *D*, unto that of *A* there muſt be faſtened a ſtrong Hooke or Crampe of iron as *B*, and at *D* let there be faſtened a Staffe of a foot and a halfe long as F, then at the pulley *A*, place a hand of Iron as *E*, to which tye a Cord of halfe an inch thicke (eyther of ſilke or pure hempe) then ſtrive to make faſt the pulley *A*, by the helpe of the Crampe-iron *B*, to the place that you intend to ſcale, and the ſtaffe *F* being faſtened at the pulley *D*, put it betweene your legges as if you would ſit upon it, then holding the Cord *G* in your hand, you may guide your ſelfe to the place required.



CHAP. CCLXX.

Of Scaling-Ladders framed of Wood, and how they are to be uſed in the Warres.

THis Inſtrument for the ſcaling of a Wall, is to be made of light Wood, and about nine or ten foot long, ſcaled like a Ladder, the upper end of the ſides, have Hookes faſtned unto them, to hang ſomewhat ſhelving, that the Souldiers may the eaſier aſcend, if the Wall be higher, then there may be two of theſe Ladders hooked together, ſome are made with joynts to open longer or ſhorter, as occaſion ſhall be; but for the moſt part, the Scaling-Ladders are made according to the height of the Walles that are to bee ſcaled; theſe are carried by Wagon or by Water, and are to be hung upon the Walles or Ports very ſecretly, for feare of diſcovery. *View the figure.*



CHAP.

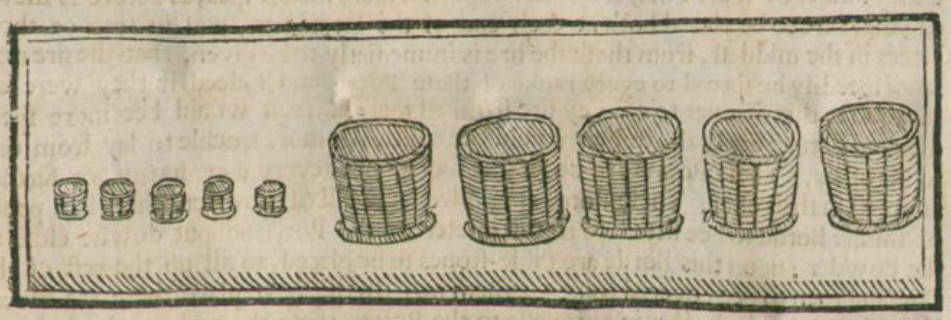
CHAP. CCLXXI.

The use of Gabions *and* Baskets, *for the defence of the Cannoniers and Musquetiers.*

THese kind of Instruments were invented for the securitie both of the Cannoniers, and also of the Musquetiers, the manner of framing them is common to all Basket-makers; the *Gabion* or great Basket is some foure foot Diameter, and made of course rodds of Osiers or water Sallowes, and foure or five foot high: They are to be first placed where they should be used as a Barricado against the great Shot, and then they must be filled with good earth well rammed; there is many times three or foure set one before the other to bury the shot of the Cannon; and likewise one a-top of another to shelter, both the Men and Artillery. The same small Baskets are likewise made of rods, and two foot, or two foot and a halfe Diameter, and about the same height; these are to be filled with good earth, and to bee placed upon the Parrapets and brest-workes one close by another for the Musquetiers to dischargebetweene them, and to shelter them from the Enemies Bullets, these are likewise many times set double; there must be a care no stones be amongst the earth; if Baskets should be wanting, then there must be Sacks filled, as before is shewed. *View the Figures.*

Many times some of these *Gabions* are sixe foot Diameter.

These small Baskets are used to carry up earth to the toppe of a worke upon Souldiers shoulders.



CHAP. CCLXXII.

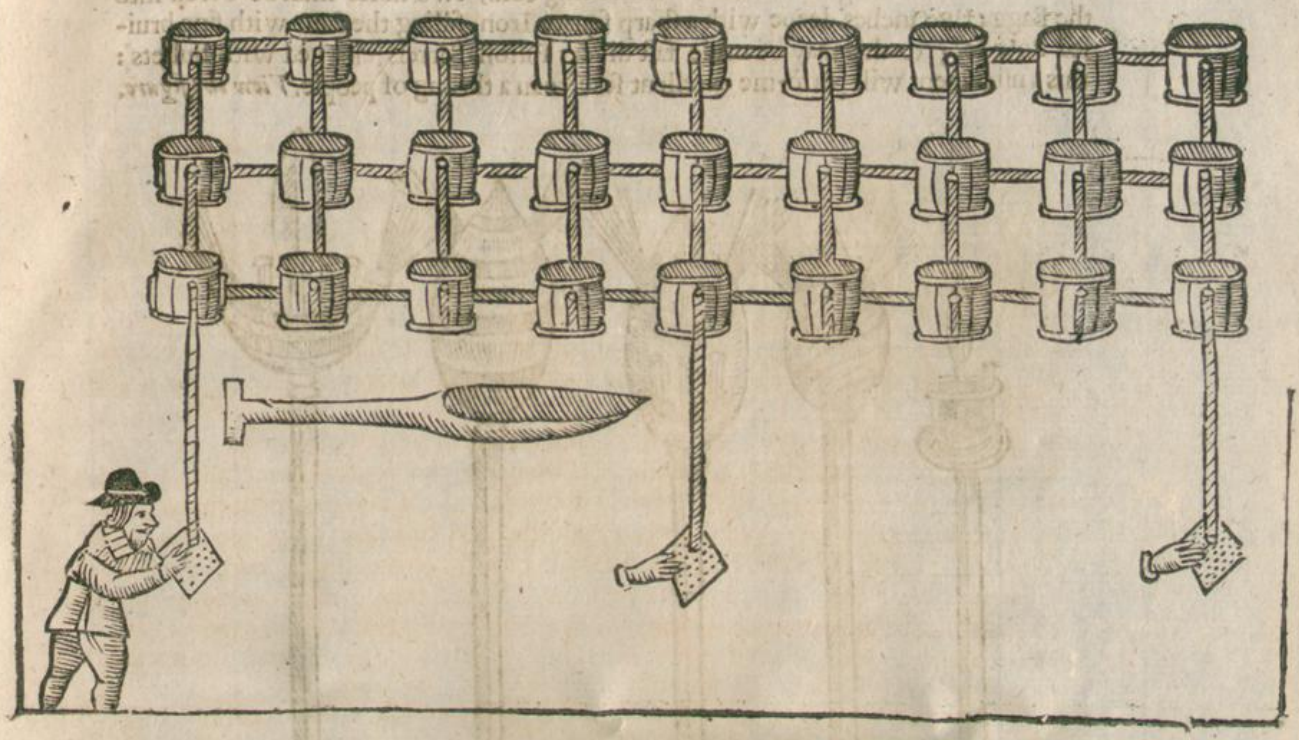
The use of Cru-wagons and small Carts, with the fashion of them.

THese Instruments were invented to convey Earth out of Moats, and to carry it upon workes; those Wheele-barrowes that are to be driven up by the strength of one man, are made very small and light; they are used chiefly in the foundation of a worke, before it growes too steepe for the Horse to clyme up: there are shelving places left for the Wagons to bee drivven up, and Bordes layd to keepe the wheeles from sinking into the eath. The Figure followes.

CHAP. CCLXXIII.

The uſe of the Powder-pots *in a pitcht Battell, to miſchiefe and breake the Enemies Rankes, with the Deſcription of the forme of them.*

THeſe *Engines* are of uſe to diſcomfit an Enemy in a pitcht Battell, the manner of framing them, is according to this following Deſcription: there muſt bee divers Pots prepared, either of Earth, or of tinned Lattin, the Mouths of them are to be foure inches Diameter, and the height of them ſixe, on either ſide of theſe is a hollow quill formed of Earth or ſodred of Lattin, about the bigneſſe of a Tobacco-pipe; theſe are to goe from the toppe of theſe Pottes juſt to the bottome to convey the the traine of Powder to the Touch-hole at the bottome; Vpon the toppe of this Quill is a round knob to bee plac'd hollow, about the bigneſſe of the halfe ſhell of a Walnut; this is to put the end of a Reed, or pipe made of Tinne, to convey the traines of Powder from one Pot to the other. Further, a certaine number of theſe Pots, are to have upon all foure ſides, Pipes, as before is ſhewed; theſe are to be placed both at each end of the Stratagem, and in two or three places in the middeſt, from theſe the fire is immediatly to be given, that the fire may more ſpeedily be ſpread to every ranke of theſe Pots; and indeed if they were all made after this manner to convey fire from all foure parts, it would bee more ſpeedier and better, onely the traines would bee a little the more trouble to lay from one to the other. Theſe Pots are to be ſet ſixe foot aſunder every way ſquare, or further as occaſion ſhall offer. Theſe Pots being filled halfe full of Powder, there is a peece of thinne Borde to bee fitted to the diameter of the Pot, and put downe cloſe to the Powder; upon this Borde are Pible-ſtones to be placed, to fill up the reſt of the Pot, and then to bee covered to keepe them in. In the next place there are divers Wimbles to be made of a juſt bigneſſe to the Pottes, theſe are to bore the holes in the earth to place the Pots in; note the holes are to bee bored ſomewhat aſlent, that the ſtones may flie ſide-wayes to diſorder the Rankes; if it be ſwardy ground, then only the top of the ſward is to be laid to cover the Pots, and the reſidue of the earth is to be caſt quite away towards your owne Troopes to avoide ſuſpition; then there are Regals cut from pot to pot, to lay the Pipes which are to convey the traines of Powder; theſe are alſo to be covered as the former: there may be alſo long traines made, both from the two ends, and alſo from ſome other places about the middeſt, theſe traines are to bee likewiſe conveyed in Pipes tenne or twenty rodde towards your owne Bataliaes, and when the Enemy is marcht full upon them, then thoſe appointed to attend theſe traynes are to give fire unto them; Note if the earth ſhould bee wet, then the Pots and Pipes that convay the Traines, muſt bee cloſed with Pitch or Tallow to prevent the moyſtning of the Powder. View the Figure following of all the parts of the Stratagem, which happily may cauſe you better to underſtand it.



CCLXXIV.

How to make Torches and Candles to burne in any weather: being a thing most necessary in the warres.

THese kinde of Torches are invented to keepe fire either in windie or raynie weather; they are made of this compoſition following: Sulphur, Salt-peeter, Roſin, Calxvine, quick Peal, Lin-ſeed Oyle, and common Lamp-oyle; Pitch, Tarre, Camfire, Waxe, Tutia, Arſnicke, Quick-ſilver and Aqua-vitæ: of this compoſition, may bee Torches, Candles, or Balls of Wild-fire made that will burne in the water without extinguiſhing.

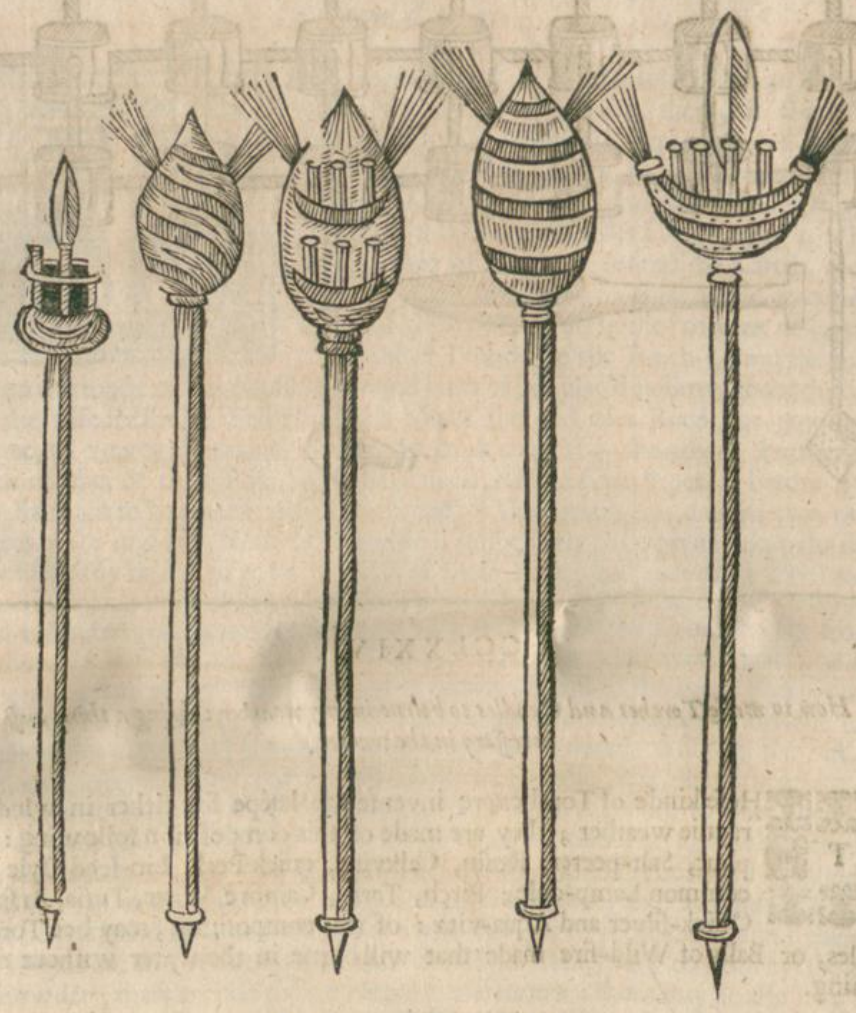
Chap. CCLXXV.

How to arme Pikes with Wild-fire and Piſtols for to with-ſtand a Breach, and defend it againſt the Enemie.

THis kind of arming of Pikes at the Speares end with Wild-fire was invented for the defence of a Breach, Port or Bridge; and it hath beene approved that an Enemy hath beene more feared with it then with any other kinde of weapon: the manner of framing theſe Weapons is after this faſhion. Firſt, there muſt be Powder bruiſed, eight parts; Peeter in Roch, one part; Peeter in Meale, one part; Sulphur in Meale, two parts; Roſin-Roch, three parts; Turpentine, one part; Lin-ſeed Oyle, one part; Verdigreaſe, halfe a part; Bole-Armoniack $\frac{1}{3}$ part: theſe ingredients muſt bee put in a Bagge made of ſtrong Canvas, which firſt muſt be put upon the Pikes end, and the lower end of it being tyed faſt to the Pike, and the Bagge filled up with this Compoſition, the other end thereof muſt alſo bee faſt tyed to the end of the Speare; the whole Bagge muſt be ſoundly woulded with a ſmall Cord: this being done, then there muſt bee moulten in a Pan, Pitch, foure parts; Lin-ſeed Oyle, one part; Turpentine, one part; Tarre, $\frac{1}{3}$ part; Tallow, one part: theſe being mixt together muſt be daubed

all

all over the Canvas a good thicknes: then being cold, two holes muſt be bored into the Bagge two inches deepe with a ſharp ſquare Iron, filling the ſame with fine bruiſed Powder; to this may be made faſt divers Piſtoll-Barrels charged with Bullets: this inſtrument will performe excellent ſervice in a throng of people. *View the figure.*



CHAP. CCLXXVI.

A Device to make a Muſquet ſhoot with the ſame quantity of Powder halfe as farre againe, as her uſuall Shot is.

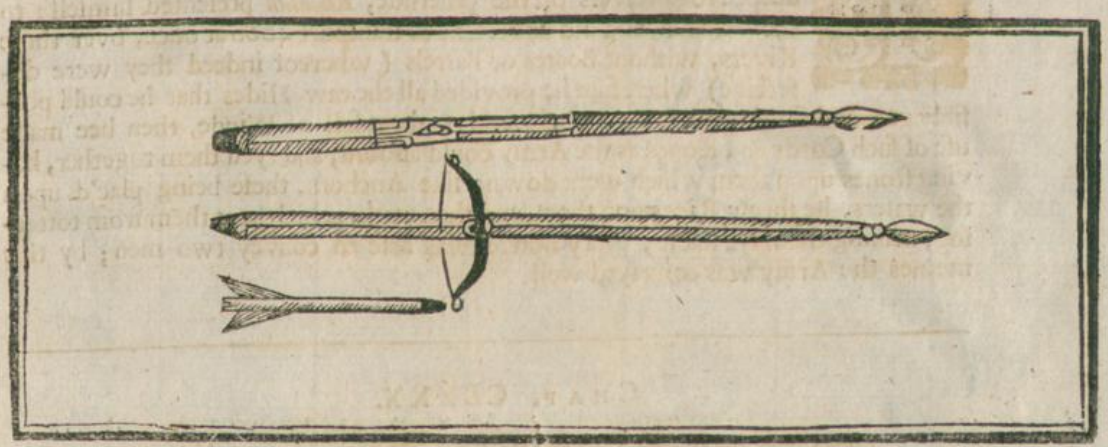
THis Invention the King of Sweden did make tryall of, and it is a thing highly to be prized in the Warres: for many times it happens, that the wings of Shot in a pitch'd Battell are drawn out to skirmiſh with an Enemie before they be within the true diſtance of the Muſquets commanding Shot; or being diſcharged by the Enemie out of ſome Fort many times when they are out of diſtance, whereby much Powder and ſhot is ſpent to no purpoſe; now to remedie this there is an approved device which will cauſe a Muſquet or Canon to ſhoot halfe as farre againe with the ſame quantity of Powder: and this is effected by taking of white Caſe-pepper of the ſoundeſt Cornes, and ſteepe them 24 houres in the ſtrongeſt Aqua-vitæ; then being taken out and dryed in the Sunne, ſo that they may not danke the Powder; then charging the Peece with the uſuall charge of Powder, you muſt take ſo many of theſe pepper Cornes as will cover the circumference of the Bore, and being put downe cloſe with the ſticke to the Powder; then putting next to the Pepper the Bullet; this being tryed at any marke, it ſhall be ſenſibly found to convey the Bullet with ſuch a violence farre beyond the accuſtomed ſhooting, and being charged without this ingredient, the Bullet ſhall not come little more then halfe the way.

CHAP.

CHAP. CCLXXVII.

Of the Bow-Pike, and how it is best to be used in the Warres.

THis Invention of joyning a Bowe to the Pike, may bee of excellent use in the Warres, to impale the Flankes of an Army, for when the Horse shall charge eyther in Flanke or Reare those Arrowes will gaule them: they are very good to be drawne out to safegard some small troopes of shot, that shall bee sent out to discharge upon the Horse; but for the placing of these in the Front of the maine Battalia's, I hold it not so good, unlesse it be onely the two first rankes; for it will bee very troublesome when the Troopes shall joyne at push of Pike; besides, the Pikes heads will soone cut their Bow-strings in sunder, and make them of no validitie: and questionlesse in the time of stormie wet weather, these Bowes would doe great service, when the Musquet cannot be discharged for wet; but were it so, that a Pike were made of such an indifferent bignesse towards the But end, that there might be disposed in it three Petronell Barrels, made of a very light substance, as there is a new Invention found out in that kinde; there is a light locke to be plac'd a yard from the But end, this shall at once pulling up, strike fire twice, having a double pan, and that part of the Pike the Petronell is plac'd in, is to be turned round, so that the Touch-holes of these Barrels may turne to the locke one after another, without removing either of hand or foot; this would worke some effect against the Enemies Pikes, it going with that force, that it would enter their Corslets; which the force of an Arrow could not performe. *View the Figures.*



CHAP. CCLXXVIII.

The Description of an Engine, whereby the diversitie of the strength of powder may be truely knowne.

TO know which are the strongest sortes of Gunpowder; according as this Figure demonstrates, you must prepare a Boxe as *A B*, beeing foure inches high, and two inches wide, having a Lid joyned unto it; the Boxe ought to be made of Iron, Brasse, or Copper, and to be fastened to a good thicke Planke, and to have a Touch-hole at the Bottome as *O*, and that end of the Boxe where the hinge of the Lid is, there must stand up from the Boxe, a peece of Iron or Brasse, in length answerable unto the Lid of the Boxe, this peece of Iron must have a hole quite through it towards the top, and a Spring as *A G*, must be skrewed or rivited, so that the one end may cover the said hole; on the top of all this Iron or Brasse that stands up from the Boxe, there must be jointed a peece of Iron (made as you see in the Figure) the hinder-part of which,

which, is bent downeward and entreth the hole that the Spring covereth ; the other part reſteth upon the Lid of the Boxe, open this Boxe Lid, and put in a quantity of Powder, then ſhut the Lid downe, and put fire to the Touch-hole at the Bottome, the Powder being fired, will blow the Boxe Lid up the notches, more or leſſe, according to the ſtrength of the Powder ; thus by firing the ſame quantity of divers kindes, at ſeverall times, you may know which is ſtrongeſt.

CHAP. CCLXXIX.

Of a Bridge made without Boates or Barrels, Cordage or Timber-worke which tranſported 4000 *men at once, ouer a great River.*

IN the Aſcent of *Cyrus*, the third Booke, *pag.* the 57. the Army being in agreat diſtreſſe inviroued on one ſide with high Mountaines, and deepe broad Rivers on the otherſide, *Rhodian* preſented himſelfe to the Generall, and did undertake to tranſport 4000 at once, over thoſe Rivers, without Boates or Barrels (whereof indeed they were defective) wherefore he provided all the raw Hides that he could poſſibly get, and ſowing them up very cloſe, blew them full of Winde, then hee made uſe of ſuch Cords and Ropes as the Army could affoord, and tyed them together, having ſtones upon them which went downe like Anchors, theſe being plac'd upon the waters, he threw Rice upon them, and then earth, which kept them from tottering, making them lye ſtable, every Bouget was able to convey two men ; by this meanes the Army was convayed well.

CHAP. CLXXX.

How Cæſar *made a Bridge upon the River* Rhine *and carried his Army over into* Germanie.

CÆſar holding ſcorne to tranſport his Army over the River *Rhine* by Boates into *Germany*, he bethought himſelfe to try what hee could doe to make an artificiall Bridge, which ſhonld ſtand more for his honour, and the terrour of his Enemies ; they conceiving it impoſſible to frame a Bridge over a water ſo deepe, broad, and ſwift, wherefore he cauſed great ſtore of Timber to be brought, and at two foot diſtance, he placed two Trees of a foot and halfe ſquare, ſharpened at the lower end, and cut anſwerable to the depth of the River ; theſe he let downe into the water with Engines, and drove them in with Commanders ; not perpendicularly, after the faſhion of a Pile, but Gablewiſe and bending with the force of the water ; oppoſite unto theſe, he placed two other Trees, joyned together after the ſame faſhion, being 40 foot diſtant from the former by the demenſion betweene their lower parts in the bottome of the water, and reclining againſt the recourſe of the River ; theſe two paire of Couples thus placed, he joyned together with a Beame of two foot-ſquare, equall to the diſtance betweene the ſaid Couples, and faſtned them at each end on eyther ſide of the Couples, with

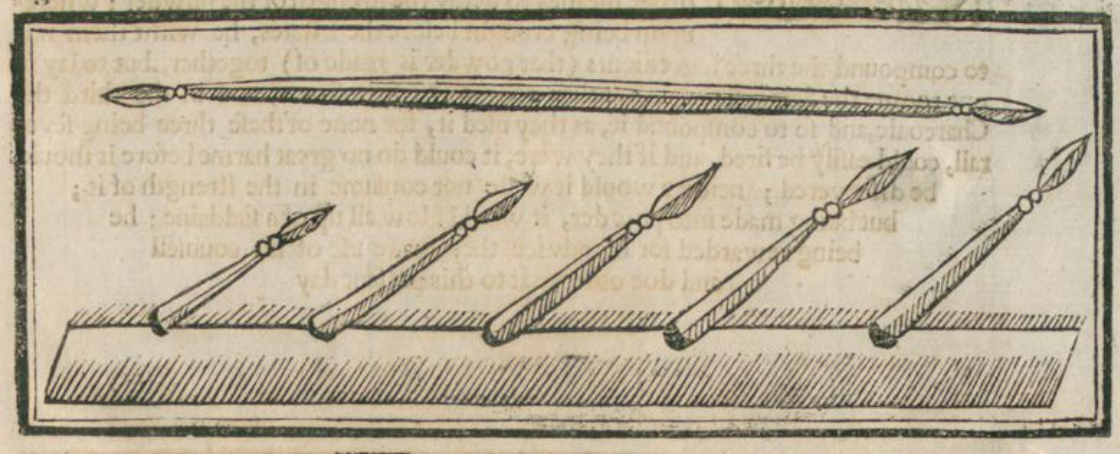
Braces

Braces and Pins, whereby the strength of the worke and the nature of the Frame was such, that the greater the violence of the streame was, and the faster it fell upon the Timber worke, the stronger the Bridge was united together in the couplings and joynts; In like manner he proceeded with Couples and Beames, untill the Worke was brought unto the other side of the River, then he layed straight plankes from Beame to Beame, and covered them with hurdles, and so hee made a floore to the Bridge. Moreover, on the Lower side of the Bridge, he drove Supporters, which being fastened to the Timber-worke, did strengthen the Bridge against the force of the water, and at the upper side of the Bridge at a reasonable distance, he placed Piles to hinder the force of Trees or Boates, or what else the Enemy might cast downe to damme up the water, whereby the Bridge might have beene borne downe by the violence of the streame; this worke was begun and finisht in ten dayes.

CHAP. CCLXXXI.

The Description of an Instrument, invented by King Henry *the fifth, at the Battell of* Agincourt, *and since used by the King of* Sweden, *and by him called a Swines-Pike,*

THis Instrument was first invented by King *Henry* the fifth; at the Battell of *Agincourt*, and did infinite service there; and now of late dayes was used by that famous Generall, the King of *Sweden*: the manner of it is thus; First, the Instrument is made of a strong peece of Ash, about foure foot in length, biggest in the middest, and shaved Taper-wise towards each end; upon each end is fastened on an Iron Pike of an indifferent length, with cheekes downe a pretty way the staffe to strengthen it; this instrument every Musquetier carried one of them at his girdle, & when they were upon service, as they advanc'd to give fire upon the Enemie, they stucke down one of these somewhat sloping, to the intent if the Enemies horse should charge them, these Instruments would prevent them; for they could not possibly shift them, but they would pierce their Horses Breasts: by this they were able to maintaine a skirmish, against the potency of the Horse. *View the Figures of it.*

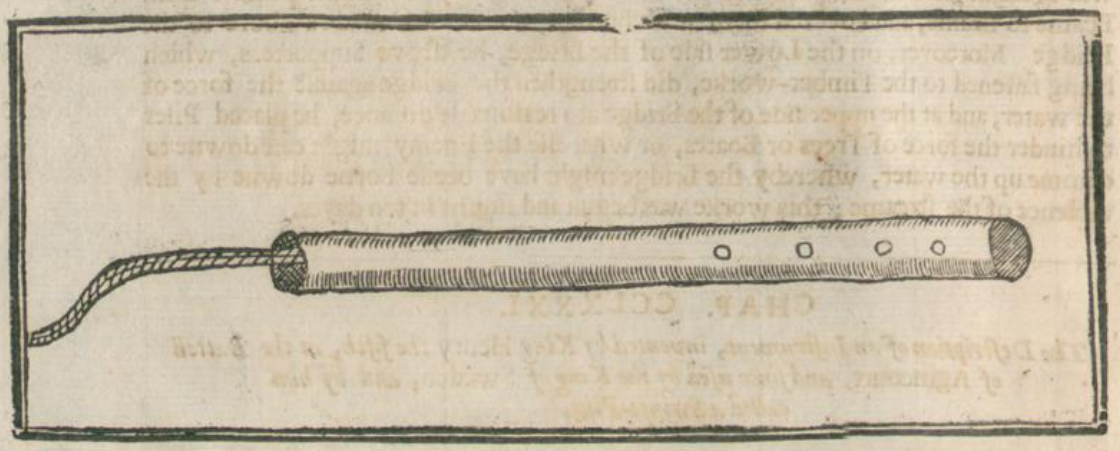


CHAP. CCLXXXIII.

How a Case of Tinne is to be made, to carry light Matches in, that the Enemy may not discover them.

THe Prince of *Orange* when he intended to assault a Towne by night, upon an On-slaught, he invented an Instrument to carry the light matches in, so that the sparkes of them might not be discovered from the walles by the Enemies Sentinels; the manner of forming them was thus; there was a peece of Tinne or Lattin, made like an elder pipe about a foot long, the hollownesse of it was of sufficient bignesse to hold the match within it; it had

had alſo divers holes on eyther ſide, like the holes of a Flute, to let in the ayre to keepe the match from extinguiſhing; the match being drawn in a good way into the Pipe, it cannot be diſcovered, for the winde can have no power to make the ſparkles flye. *View the figure.*



CHAP. CCLXXXIII.

How the Venetians did order their Powder, after their Arſnall was burnt.

THe *Venetians* had their *Magazine* blowne up with Gunpowder, two or three ſeverall times, and for a future prevention they ſate in counſell a long time, how they might prevent this danger, which might come either by accident or treachery, but they could in no wiſe contrive a way to their liking; a poore man in *Venice* hearing of it, had preſently a device in his brains how to order the matter, ſo that no damage might enſue eyther by fire to conſume it, or by any other meanes to decay the ſtrength of the powder; whereupon being brought before the Eſtates, he wiſht them not to compound the three ingredients (that powder is made of) together, but to lay in one roome the Salt-peeter, in another roome the Brimſtone, and in the third the Charcoale, and ſo to compound it, as they uſed it, for none of theſe three being ſeverall, could eaſily be fired, and if they were, it could do no great harme before it ſhould be diſcovered; neither would it waſte nor conſume in the ſtrength of it; but being made into powder, it would blow all up of a ſuddaine; he being rewarded for his advice, they made uſe of his counſell and doe obſerve it to this preſent day.

FINIS.