



THE RAYMOND J. LORD

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The Arte of shooting in great *Ordnance.*

Contayning very necessary matters for all sortes of
Scrutoures eyther by Sea or by Lande,

Written by William Bourne,
(.)



Imprinted at London for
Thomas Woodcocke,

1587.

TO THE RIGHT
 honorable Lord, Ambrose Dudley,
Earle of Warwick, Baron of Lisle, of
 the most noble order of the Garter Knight, Generall
of the Queenes Maieslies Ordnauce within her highnesse
Realme and Dominions, and one of her Maieslies
 most Honorable priuie Counsell, *William Bourne*
 wisheth long life, increase of Honor,
 with al happy successe.



Ight woorthie and Noble
 Earle, whereas I before this
 time haue writtē sundry sim-
 ple Treatises, whereof two of
 the are extant in print, thone
 called the Regiment of the
 Sea, and the other the Trea-
 sure for Trauellers, and now
 also this barbarous and rude
 thing, called the Art of sho-
 ting in great Ordnauce, and as it is most cōmonly seen,
 that euery person doth most cōmonly cōmend that thing
 wherein he is most expert, and therefore some there are
 that doe most extoll Diuinitie, and great reason it is that
 it should be so, for that it teacheth vs both to know God
 and to instruct others: also other some doe most preferre
 Philosophie: other some the Lawe, with such like as they
 are most delighted in. Also other there are, that doe not
 onely extoll them, but wil make arguments, and dispute
 whether of them are most commendable and most wor-
 thie to be preferred aboue the other. There are also, thre
 after long disputation, doe not onely assigne euery Sci-
 ence his senerall laude and praise, but also discourse whe-
 ther of them are most necessarie for a common wealth.
 And I am of that opinion, and that no man can denie,

The Epistle.

but that the Arte of shooting in great Ordnance is necessarie to be aduanced for the defence and mainteynance of a Kingdome, and countrey, and the common wealth thereof. Wherefore (Right honorable) being as one extraordinarily bolde, I present the same vnto you, for that I knowe your Lordshippe can truly descerne and iudge in these causes, as one whose wisedome is not vnknowne, hoping that your Honour will take this simple worke, as my good will, rather than the valour of the thing, or the finenesse of the penning of the matter. And thus I cease to trouble your Honorable Lordship any longer at this time, desiring you to accepte this simple Booke at the handes of a poore Gunner, as a true token of my good will towards your Honour: desiring God to prosper your Honor in all your doings in perfect health

By your Honours humbly
as commaundemens
William Bourne.

The Preface to the Reader.



Entle Reader, it is possible that you would marvel that I should write this booke called the Art of shooting in great Ordnance for two great causes: the one is this, first for that I haue not seeme to most peoples iudgement,) so great experience in these affayres, whereby you may thinke that I haue not knowledge sufficient to be a teacher in these matters. And the second canje is this: for that my order of teaching is contrary vnto all that haue taken vpon them to be teachers, or instrulters in these matters or affaires before time. Therefore for so shew vnto you the cause that hath moued me to write this rude volūe, is this: for that we English men haue not bene counted but of late daies to become good Gunners, and the principall point that hath caused English men to be counted good Gunners, hath been, for that they are hardie or without fear about their ordnance: but for the knowledg in it, other nations and countreies haue tasted better therof, as the Italians, French and Spaniards. for that English men haue had but litle instructions but that they haue learned of the Dutchmen or Flemings in the time of King Henry the eight. And the chiefest cause that English men are thought to be good Gunners, is this: for that they are handsome about their Ordnance in shipps, on the Sea, &c. And furthermore, I doe thinke it good to shewe vnto you three great causes besides diuers other small causes, that the thing that hath letted or hindred English men to become cunning in the shooting of great Ordnance, although diuers prooues haue bene made at sundrie times, and Ordnance hath bene had into the field, both in maister Bromesfelds time whē that he was Liesetenāt of the Ordnance, & at diuers times since, and yet those prooues that haue bene made then were no proofes, but to cause those Gunners that did see the experience of those proofes, so committe a further error as touching the shooting

The Preface

ting in great Ordnance, and the reason thereof is this: the first & principal cause is, that they did make their prooffe with a *Quadrant*, and so it ought to be, that is to say, the fourth parte of a Circle deuided into 90. equall partes, which some simple Gunners will call a *Triangle*, but there is no instrument so called, but onely a *Quadrant*: and the original of the making thereof is the fourth part of a Circle deuided into 90. equall partes, what forme so euer that it hath. And now the principal vse of the quadrant, is to know what any peece will cast at the mount of euerie Degree, and so from degree vnto degree, vnto the best of the Rander. And the cause that hath made the Gunners to commit error by the mounting of the peeces by the degree of the *Quadrant*, hath bene this, although that it be true that such a peece will cast the shot so many scores at the mount of so many degrees, and yet whē that they haue made prooffe thereof, they haue found it mere false, & yet the thing most true, although sometime the shot hath flien a great deale further, and sometime much shorter, which causes were no other thing but the highnes or the lownes of the ground, for that there is seldome any ground that you shall find leuell, but it will be higher or lower then the ground that the peece standeth upon, as I doe more at large declare in the thirteenth chapter of the booke, and yet in the time of seruice there is no vsing of the *Quadrant* but in some cases, and then take a great large one, for in a small you may soone commit error. And furthermore I doe know diuers that will haue instruments, and yet be utterlie void of the uses of them, for it is the reason of the person in the doing of any thing, and not the instrumentes, for in the doing of any thing, if the person doth not consider of all thinges with him and against him, he or they be apt to commit error, &c. The second great cause is this, in the vsing to giue leuell with a rule set one inche partes: but vnto this they cannot order it, nor giue it no Method to know what any peece wil doe at any number of inches advantage, for the peeces doe differ in casting, according vnto their lengths, as I doe further shew in the booke. Wherefore the use of the inche rule according as they doe vse it, is to no other

to the Reader.

her purpose, but onely to seeke out what numbers of inches will reach the marke, and that being knowne, then to keepe the length of the marke with that peece. And the necessarieſt thing that this kind of giuing of leuell in the time of seruice (as being in a *Castell*, *Fort*, or *Towne*, or such like, the Gunner hauing charge of any peece,) is to beate al those markes that be apte to doe any seruice at, and so know how manie inches will reach any marke, &c. but to become a cunning Gunner, he shall neuer be, although he should shoote 100. shottes euerie day through a yeere, for that he neuer doth know by that meanes the distance of any marke, but in euerie peece he must make a new prooffe, if that the peece be removed or changed from that place. Wherefore I haue made a table shewing how many inches, and what part of an inch will make a degree, and so vnto ten degrees whereby you may make a Method to hit the length of the marke in any peece at the first shot, as it doth appeare in the eight chapter of the booke, if so be that there were a true and exact table of proportion, of the casting of the peece at the mount of euerie degree, but I haue not had so great a prooffe but that I may bee deceiued, for I haue no other prooffe but at my owne charges, and my abilitie is able to doe nothing to make any prooffe in those causes. The third great cause is this, I do know few Gunners, yea none at all in respect, that hath any capacitie, to know the distance vnto any marke assigned, if that the marke be such that they can not come vnto it directly by land, and yet there be verie true and exact wayes to know the distance vnto any marke assigned, howsoener the thing is, if that it may be seene by Geometrie perspectiue: and the lacke thereof amongst Gunners is the principallest point that doth deceiue them, so that these three things doe utterly deceiue most men: the first is this, the height or lownes of the ground: the second the length of the peece: and the third not knowing the distance vnto the marke: for their reason in these causes that they doe suppose, can doe nothing, that is to say, to finde the distance vnto any marke assigned, by looking vpon the ground, and that neuer can shew vnto them the distance vnto the marke but yet must be knowne otherwise

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ther by the Scale or crosse staffe, or else it must be known by the lines of Position, which is shewed in a booke of mine that is extant in Print, called the Treasure for Trauelers, and also in a booke set forth by master Thomas Digges called Pantometria, wher in those two bookes you shall finde meanes and waies both how to finde the true distance unto the marke, and also how much that the marke is hie ground or lower ground, then the place that you are upon, and also the length of the line Hipothensall, whether it bee vpper the hill or downe the hill, which is verie necessarie and profitable for all them that will vse to shoote in great Ordnance, for so know, as all Gunners, Captaines, and Leaders of men, &c. And now friendly Reader, it is possible that some people will dislike of me, for that I haue writtten this booke: some of them for that they doe thinke that they haue better knowledge in those matters then I, and other some perhaps may be offended, for that they would not haue the thing known but amongst themselves, and other some possible will be offended with me that are Gunners, that are altogether without any knowledge in those causes, that would not haue their ignorance known. So by these meanes I am assured that I shal purchase a great number of enemies, as I do know that I haue already caused sundry people to enuie me, as some Sea men do mislike of me for writing of my booke called the Regiment for the Sea, and other some of late are offended with me for the writing and setting forth of my booke called the Treasure for Trauelers, but notwithstanding, I doe see that it is needfull to be known unto a number of them that be Gunners, waying and considering with my selfe what a number there bee, that will take vpon them to be Gunners, yea and that maister Gunners, that are not sufficient nor capable in those causes, but are in respect altogether ignorant, standing vpon no other thing but their antiquitie, that they haue serued as Gunners so long time. Wherefore I doe thinke it very necessarie for them to haue some good instructions: but as farre as I can see, enerie man maketh curtesie to doe the common wealth of our Realme of Englands any good therein, and as far as I can perceiue that no people

to the Reader.

ple may better pleasure the common wealth in the time of seruice, either by Sea or Land, then may good Gunners against the face of our enemies: for the Realme of England hath a great number of enemies: for as we haue seene by daily experience, that the Queenes progenitors asofortime were neuer long without warres, yet we haue a most gracious and louing Prince raigning ouer vs, which doth alwaies studie for peace and tranquillitie: God graunt of his mercie that he may liue long and raigne ouer vs. Amen. Yet notwithstanding it is good for vs to studie in the time of peace, how to defend our selues in the time of warres & troubles, as generally we provide in harness for to liue in the winter. And for that cause haue I writtten this little treatise, not to the intent to teach the that be cunning, but to giue instructions vnto the that be of the simplest sorte, &c. Wherefore (Gentle Reader) beare with my rudenes, for that I am so bold to be the first English man that put forth any booke as touching these causes, and it is possible that there be a number would looke that I should haue giuen them place, for that they are more worthy and skilfuller in these causes, thinking that I am so simple, for they doe not consider how that God doth giue his giftes, as we see daily he giueth vnto one man riches, and another man poertie, and one man to be a ruler, and an other to be inferior, one man wise & prudent, and an other ignorant, one man beautifull, and an other deformed, one man of a tall stature, & an other of a low stature, one man strong and lustie, and an other weake & lame: although that they be of one consanguinitie, linie or kindred, such is the maruelous workes of God. Wherefore men are not to be measured by elles, but by vertue, for God is not partiall in his giftes, for hee hath shed his most precious blood for the redemption of all mankind, so that afore him all are one, for we are all his creatures and the sheepe of his pasture, and the workes of his handes, so he is our God, and we are his people, so that we keepe his holy will and commandments, but flesh and blood is so fraile, that we can doe no good of our selues, for God worketh the will and deed in all his creatures, for by his holy spirit he doth giue sundry gifts & al for the

The Preface

the profite both of our soules & bodies, as Saint Paul saith to the Corinthians, so one is giuen through the spirite the utterance of wisdom, so another the utterance of knowledge, by that same spirite to another faith, by that same spirite to another the gifte of healing, by that same spirite to another professing, to another iudgment to discern spirits, so another diuers tongues, so another the interpretations of tongues, and al those doth the spirite of God worke and distribute vnto euery man according vnto his most holy will and pleasure. Then what a vaine generation of people be we to strine against the wil & pleasure of God, as who should say that God is bound to be ruled by the wil and pleasure of man. But what speciall gifte soeuer God doth giue vnto man, let them giue him thanks therefore, and looke that they doe not abuse the same gift, for if that they doe, it will be a snare to take them in, and so be an example vnto the whole world. For as soone as our heart is lifted up with vanities, then entred the Diuel, & he causeth a man to fall and decline from God, thinking with our selues, that the gift that God hath giuen vnto vs commeth of our selues. For as some do think that haue riches, that they haue it by their own industry, and some doing diuers other thinges, thinke that it commeth of themselves, with diuers other speciall gifts that god giueth vnto man, therefore whensoeuer God doth giue any speciall gift to any person, then let him giue him thanks therefore, vsing it to the laud, praise, glorie, and honor of God, & to the profite of his neighbour, and the common wealth of his Native countrie, for great is the wickednes of the people vpon the face of the earth, as considering this in these our dayes, that the Bishop of Rome with all his adherents, doth daily practise how and by what meanes to bring this our noble realme of England to utter confusion, therefore it is very meete and necessaries for vs to denife how to prenent them, and then there is no doubt if that we doe our good will and indemonstr, but the lining God wil deliuer vs from the hands and snares of such wicked Antichristes, that do seeke the blood of the Christian seruants of God. Wherefore it is very meet for vs that be faithfull Christians and true subiectes to our prince and Countrie, to

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to the Reader.

arme our selues first with faith, secondly with manly courage, and thirdly with armor for our back, for let vs be assured without Gods mightie providence vnto the contrarie, that as soone as they haue vs as any aduantage, that then let vs looke for no other matter, but that they will giue the attempt, for such is the wickednes of the malicious Papists, yea eue some of them are those that should or ought to be good subiects vnto their Prince and native countrie. Wherefore I beseech the lining God to cōfound such wicked Impes that should seeke the destruction of their Prince, and especially a vertuous, mercifull, and a godly Prince, and secondly the destruction of their native Realme and countrie, yea euen the nurce to them and their forefathers that hash yeelded vnto them all kind of foode and necessities. What greater wickednes can there be in men, and they themselves are bound by the lawes of God and also by the lawes of nature, to defend their Prince and Countrie: for we nor they haue no iust quarrell to fight by the lawes of God, but onely to defend our Prince and countrie and the liberties therof. Therefore it is meet for vs to cal vnto God for mercie and grace, and then there is no doubt but that he wil deliuer vs, & turne all their wicked denifes vnto their own destruction, euen as the that make a pitte for other and fall into it themselves. Wherefore it is meet for al them that are Noble men and Magistrates, & such as are in authoritie, to cherish and maintayne al those that are good and vertuous subiectes and good members in the common wealth, and contrariwise, it is very necessary and conuenient to punish all wicked doers and such as doe annoy and hurt the common wealth, hauing no regard, neither for loue nor fauour, nor hatred or malice, neither for bribes nor friends, but to reward euery man according vnto their deserttes: for as it is sin to suffer vice vnpunished, so in like manner it is as enill to see Vertue not rewarded, cherished nor mainteyned.

¶ Considerations to be had 1 in shooting of Ordinance.

Tenne principall things are to be considered in the shooting of Ordinance, to keep the length of the marke, or to make a perfit shotte at any marke assigned, according vnto the distance of the marke, and knowing what such a peece wil do at such an aduantage in mounting,

1. The goodnesse or badoesse of the powder.

The good powder driueth the shotte further than the marke, the badde powder shooteth shote of the marke: therefore you must vse discretion in lading of the peece, according vnto the powder.

2. The lading of the peece.

If you doe giue the peece moze than hir dutie, you doe ouershoote the marke: if you do giue hir lesse than hir duty, you shoote shote of the marke: you must therefore giue the peece hir dutie and no moze.

3. The winde, and especially to be mounted at much aduantage.

The winde with you, caueth you to ouershoote y^e marke, according vnto the hardnesse. The winde against you, maketh you shoote shote of the marke according vnto the hardnesse. The winde one the side, the peece casteth beside the marke: therefore you must weather the marke, according vnto the hardnesse of the winde, and the distance vnto the marke.

4. Of the shotte.

The shotte too bigge or too high, it putteth the peece in daunger: for you must driue the wadde and shoote home vnto the powder in the peece, for if the shotte doe rest any thing shote, it will breake the peece (or else it is a chaunce) in the vacant place betweene the powder and the shotte. The shotte too low or small, it will be too shote of the marke, & also it will not do his execution according vnto the peece and the powder, and it may chance to swarue in the deliuerance

rance out of peece, the therefore the shotte must be fitte for the peece

5. Of the wadde or the powder rammed in too hard or too loose.

The powder rammed in too hard, and the wadde also, and especially the powder being badde, or els not drye, it will be long before the peece goe off, and also halfe the force of the powder will be decayed, before the shotte bee deliuered, for that it bloweth out of the rutchhole, and also the peece will tremble before the goe off, & that may cause the shotte to flic awy from the marke, for that the peece is remoued from his leuell: and also it will heate the peece, and make the peece dangerous to shoote in presently afterwards.

The powder too loose, and not well put vp with the rammer head, and also the wadde too slacke in like manner, will make the shotte to come short of the marke by the meanes of the loosenesse: you must therefore put vp the powder with the rammer head somewhat close, and the wadde to go close in, and drive it home vnto the powder, but beate it not in too hard.

6. Of the standing of the peece.

The peece standing so that it maye or both recople vnto the lower ground, that is to say, that the ground bee lower at the taylor of the peece, than it is where the wheeles stand, it overshooteth the marke, for that in the deliuerance of the shotte, the breech goeth downewards, and the mouth vpwardes, and the peece is apte to recople downe the hill: and if that the ground be higher behind the peece then it is before the peece, then it may happen to shoote shorter: but that is but a chaunce, for that is not so apte to recople agaynst a hill, as it will do downe the hill.

And if it doth happen so, that the one wheele dothe recople faster than the other wheele, then the peece will shoote awy from the marke, or if any thing doe lette or stay the wheele, it may shoote awy, for the deliuerance of the shotte causeth

causeth the recople of the peece, which is nothing else, but the suddayne thrusting or the putting out of the ayre which is in the mouth of the peece.

7. Of shooting towards a hill or valley with

a Quadrant.

If you shoote towards a hill, you shoote shorter in the giuing leuell with a Quadrant. If you shoote towards a valley, you do overshoot the marke, as in the thirteenth Chapter you shall see the reason thereof. If vpon a leuell ground, you shall keepe the length of the marke by the degrees of the Quadrants, otherwise not.

8. If you giue leuell with an ynche rule, you shall shoote at no certapnetie, but in such a peece as you doe knowe wel, for that it doth varie accordyng vnto the length of the peece: as for example this, if you haue three Culuerings, the one is the ordinarie length, that is, twelue foote long: the other is more then the ordinarie length by two foote, that is, fouretee foote longe: and the thirde is shorter than the ordinarie length by two foote, that is, but tenne foote longe: nowe if you doe shoote at any marke, and doe knowe the distance vnto the marke, and also doe knowe, that a Culuering mounted at so many ynches vantage, will reach the marke, and admitte that it will reach the marke at twelue ynches vantage, nowe in the shorter peece, it overshooteth the marke, and in the longer peece it shooteth shorter of the marke, and in that peece that hath the ordinarie length, you shall keepe the length of the marke: and the cause thereof is this: In the peece that is but tenne foote longe, the twelue ynches vantage commeth neere vnto syxe degrees wyth the Quadrante in the mounting: and in the peece of twelue foote long, the twelue ynches commeth not to siue degrees in the mounting with the Quadrant, and in the peece of fouretee foote long, it commeth but vnto foure degrees in the mounting with the Quadrant, as in the eighth Chapter you may plainly see.

Considerations to be had

9. It is to be considered what vantage your peece must haue. If you doe giue leuell with an ynche rule at any advantage, and also, if you doe shoote at any marke within the right line of your plancke, as in the fourth Chapter it is shewed

10. You must consider whether the peece be true-ly bozen, as it is declared how you shall know it in the second Chapter: and how to shoote with a peece that is not truly bozen, you shall see by the eleventh Chapter.

Thy

The Arte of shooting in great Ordinance.

How to know the goodnesse or badnesse of Powder.

CHAPTER I



First concerning Powder, for that it is the chiefest matter as touching the shooting in Ordinance. According to some Authours, the first deuice of the making thereof beganne in Germany, by a Monke named Bertholdus Schwartzus, neere about the yeare of oure Lozde. 1380. and since that time it hath bine put in practise from time to time, and from age to age, both by the learned Mathematicians, and also by the best Machanickes, besides a number of other common people, as well by them that haue bine seruetours, in martiall affayres, as all other, so that of the making of the peter, and also of the powder, hath bin made great prooue vnto the bettermost, as touching the force of powder. So that it is not vnknowne now in these dayes, what quantitie of euery severall sortes of receipes both make the strongest sortes of powder, besides the perfect refining of the salte peter, & also by thorough working of the receipes in the making of the powder, so that it is now come to passe in these dayes, that the making of the powder, and also the making of the saltpeter, is become (in respect) a common thing amongst a number of people, as it is made commonly in many partes in Germanie by the Houses of husbandmen, and also by the women: wherefore it were but superfluous to say any thinge therein, considering how well the making thereof is knowne vnto a number of people, and therefore the principallest thinge in the shooting of Ordinance, is to knowe the goodnesse of the badnesse

nesse of the powder, and that is knowen after the common order, that is, by thre kinde of meanes, first by the tastng of the tongue, knowing by the sharpnesse thereof, whether that there be sufficient of the maister or peter or not: and secondly it is knowen by the coulour, for the good powder hath somewhat a blewish coulour, and if it be Serpentine powder, then the powder will be as fine as sande, and as soft as floure, and that signifyeth, that it is well wrought, and otherwise it will be harsh in your hande, and clammy, and looke with a darkish blacke coulour, and that signifyeth that it is well wrought, and the maister not refyned: and the third & principall is knowen by the burning, for if it be verie good powder, then in the burning, the fire will be gone in þe twinkling of an eye at a verie suddayne, & wll giue a snap or suddayne puffe, & nothing remaining afterwarde, but a white smoke on that place whereas it was burned: but badde powder in the burning fireth not so quickly, but fireth as dothe a fire worke, very slowly, makng some hissing, and after the burning, there wll remaine certayne burres or knottes that wll consume vnto moisture, and be dankish, and that signifieth that the peter or maister was not well refyned, neyther the powder well wrought: And after the burning of some kinde of powder, there wll remaine certayne whyte burres, or knottes (as before is rehearsed) that will remaine hard, and not consume after the burning, and that signifyeth, that the powder dothe lacke of the maister or peter. And also here is one principall thinge to bee noted, that when powder is drye, then the force of it in respecte, is as it were double, or a quarter stronger, than when it is moyste and dankish, whether the powder bee goode or badde. And also that powder that is verie good and well made, yet maye happen to become moyste, as manye times by carriage too and fro in rayny weather, and also by laying it in some moist places, the caske beeyng not very close

close and tyght, that the powder may growe dankish.

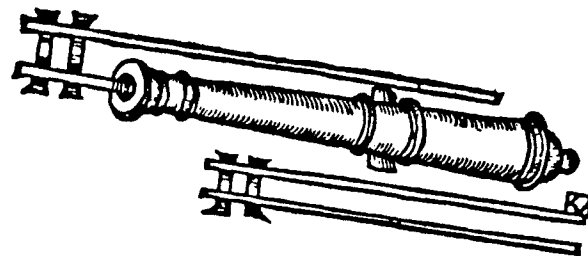
And also those kinde of powders that the peter or maister is not well refyned, but left full of salte, although that the powder bee neuer so drye when it is layd vp, yet it will giue agayne in rayny weather, and become moyst, how drye soeuer the place be that it is layd vp in. Wherefore there are a number of thinges to bee considered in powder, as touching the shooting in great Ordinance, in a number of causes: for men of reason maye know by the burning, coulour, tastng, and the handling of powder, which is good, & which is badde: but to say iustly how much the one sort of powder is stronger or weaker than another sort of powder is, that is harde to knowe, although he be the maker of the powder, and hath wayed out particularly the receiptes of the powder: and the meanes thereof cometh to passe, as this, by the working thereof, and by the meanes of the drying thereof, and by the moistng or giuing of it agayne, and especially if the powder haue bin long made: so that it is a hard matter if a man haue of sundry sortes of powder, to say iustly that thus much in weyght of this sort of powder, will doe as much, that is to say, to bee equall in force, as so much in weyght of that sort of powder, vntill that it be putte in prooffe in the shooting it in Ordinance. And thus I doe cease to write any more at this time of Powder.

To

The Arte of shooting
To know whether any peece of Ordinance
*be truelie bored, by the helpe of
certaine instrumentes,*
CHAPTE R.II.

I know whether that any peece of Ordnance be truly bored, ther be diuers waies Geometrically for it to be done, but some of them be too tedious, therefore for an easie way, they must make this kinde of instrument of two peeces of small timber, or two right stauess, that must be as long as the hollow or concauitie of the peece, which must be made in this forme, & the stauess must be made so fast at y^e one end, that it be not wider asunder at the one end, than it is at the other end, & so made fast, that they swaue not eyther wider or narrower: and then putting one of the stauess into the mouth of the peece, and so measuring or tryng the peece rounde about with the stasse that is without the peece, with an ynche rule, you shall know whether that the coze or hollownesse of the peece do rane right in the middle of the mettall, and if it doe not, you shall see howe much the mettall is thicker on the one side, than it is on the other. And also it is very good for you when you do meane to trie the peece, to prepare a rammer head that is made fitte for the peece, and to put it vppon the stasse that you do put into the peece, and to be made fast vnto the side of the stasse, and side of the rammer head, in such sort, that it may keepe the stasse close vnto the side of the peece, which it will do the better, if the rammer head be to low, and then to haue a peece of a Sheepes skime made fast, or nayled vnto the contrarie side of the rammer heade, and so it will keepe the long stasse close vnto the side of the peece, as by these two figures following you may perceiue.

And



And furthermore, they may make this kinde of instrument following, of yron, or any other stuffe meete for the purpose, for to gripe the peece in euery place at your pleasure,



This instrumente muste be double the length of the hollow or concauitie of the peece, and then you muste put one of the right ones into the mouth of the peece, and then griping the instrument together, then that parte that is without the peece, and that shall shewe you howe many ynches and partes of an ynche the mettall is of thickness, without any fayle: and then tryng the peece round about in euery place, the truth of the thickness of the mettall shal appeare.

C

Howe

How muche Poudre will serue any peece of Ordnance, by the weight of the peece, and weight of the shot: and at the end of this Chapter, there is a Table that doth declare the weight of Iron shot.

CHAPTER, III,

IF I know how much powder will serue any peece of Ordnance, there be two speciall points to be obserued, that is to say, the weight of the shotte of yron, and the weight of the mettall of the peece: and this is a generall rule, the peece ha-
uing a reasonable length, that is to say, that according vnto the accustomed manner, according vnto the names of the peece or peeces, all those peeces that haue two hundred weight of mettall, or bywardes vnto one pounce weight of shotte, must haue as much Serpentine powder as the shotte waieth. And all those peeces that haue three hundred weight in mettall, vnto one pound weight of shot, doe require as much Serpentine powder as the shotte waieth, and one ninth parte more. And all those peeces that haue vnder two hundred weight of mettall, and more than one hundred and a halfe, may haue as much Serpentine powder as the shot waieth, lacking one ninth part. And all those peeces that haue one hundred & a halfe of mettall or thereabout, vnto one pound weight of the shotte, must lack $\frac{1}{2}$ partes of powder that the shotte waieth. And all those peeces that haue but little more than one hundred, & vnder one hundred & a halfe, must lack $\frac{1}{2}$ partes of the weight of the powder that the shot waieth, & is but $\frac{1}{2}$ parts. Therefore for the making of Ladels for any peece or peeces of Ordnance, this thing must be noted. First, take the compass of the shot for the peece that you do make the Ladel for, and then diuide, or put the compass of the shotte into .5. equal

equall parts, and then cut the plate of the Ladel in breadth of three of those five partes, and put the other $\frac{2}{5}$ partes away, and then bende the plate for the breadth of the Ladel, according vnto the compass of the shotte, so that it may goe easily into the mouth of the peece: for $\frac{1}{2}$ partes is for to hold the powder, to the intent to put it into the peece, and the $\frac{2}{5}$ partes be put away, to be open to turne the powder into the peece. And now furthermore, for the length of the plate of the ladel, here is one thing to be noted, that euery nine balles of shot being layde close together, and the plate being bent, and cut off that breadth before rehearsed, and the plate in length to be cut off, that number of ynches that the nine shottes dothe reach, and that plate being equally filled with Serpentine powder, will holde the iust weyght in powder that the shotte waieth. Therefore for the length of the plate of the Ladel, thus you must vse it as followeth. For to make a Ladel for a double Canon, and the peece weying generally more or lesse. 7000. or. 8000. and the shot weying within little more or lesse. 64. pounce, that is, but little more than one hundred of mettall, vnto one pounce weyght of the shot, therefore this peece may lack $\frac{1}{2}$ part of the weyght in powder that the shot waieth: therefore they must cut the plate of the Ladel but. 3. times the length of the shot, in ynches and partes of ynches, and this Ladel twice equally filled, shall be the dutie of the peece. Then for to make a Ladel for a Demy Canon, as the peece in mettall waieth generally in or lesse. 5000 or. 5700. and the shotte waieth more or lesse. 14. pounce, whiche is about an hundred and a halfe of mettall, vnto one pounce weight of the shotte, therefore you must cutte the plate of the Ladel three shot or balles and a halfe high, or. 4. shot or balles high. In ynches and partes of ynches, according vnto the sorting of the peece with the mettall, and the Ladel twice

equally filled, to be the dutie of the peece. And for to make a labell for a double Culuering, those peeces being double fortified with mettall, and the peece waying generally moze or lesse foure thousande, or foure thousande eyght hundred, and the shotte waying moze or lesse 17. pounds, that is, about thzee hundred weight of mettall, vnto one pounce weight of shotte. Therefore you must cut the plate of the labell in length about the height of fower shotte or balles, in ynches and partes: this labell being twice equally filled, shall be the dutie of the peece. And in like manner the demy Culuering, and Falcōs, and Falcōnets, be double fortified with metall: therefore you must make their labell in length fower shottes or balles, in ynches or partes, and that labell twice equally filled, shall be the dutie of the peece. And furthermore, some Sakars and Minions haue but two hundred weight of mettall vnto one pounce weight of the shotte: therefore you must cut the plate of the labell in length but of fower shottes or balles & a halfe high: and that labell twice equally filled, shall be the dutie of the peece. And furthermore, now of late yeaeres, they haue deuised a moze stronger sorte of powder, and not without good cause why, for the base powder is not so good, if that it should come vnto seruice, as coyne powder, or any other powder is, that hath receipt ynough, and well wrought: for the base powder dothe heate and streyne the peece moze than the good powder doth: for if it be rammed in hard, che because it is not so quicke in firing, it lyeth and bloweth in the breech of the peece, befoze it can take fire, so by that meanes it heateth and streyneth the peece, and halfe of the force of the powder is gone, befoze y shotte be deliuered: and then they must vse balement for to saue the peece. Nowe whereas they shoote good powder, or coynepowder, they take much lesse powder, and it sendeth the shotte quicker awaye, and it dothe not
heate

heate the peece so fast: for this we doe see by common experience, that a little heat by long continuance, doth heat moze than a great heat by little continuance. And furthermore, in the shooting of good powder, they shall not shew theselues so often vnto their enemies. And especially, the powder would be put in cartredges, for in mine opinion, it is a greate deale better, for to charge a peece in time of seruice with a Cartredge, than with a Labell, for diuers considerations, as I doe moze at large declare in the sixth Chapter. And furthermore, for to charge a peece w coynepowder, or any other good powder, for the most parte, ther of two pounce will goe as farre as thzee pounce of Serpentine powder. As for example: that double Culuering that requirerh eyghtē pounce of Serpentine powder, twelue pounce of reasonable coyne powder will serue, according to the goodnes of the making of the powder. And furthermore, vpon good considerations, for diuers causes, and especially for the Quenes Maie, they haue deuised to make their Ordnance shoyter than the accustomed manner, and so by that meanes they are lighter than the peeces befoze time made, and yet as seruicable as the longer in some points, shooting that weight in powder, and y shotte that the heauier doth, in all poyntes as the other: for that mettall that is taken from the length of the peece, hurteth not the fortifying of the peece. And as for the making of the Cartredges for any peece, it is easie ynough to be done: for the compass of the shotte, and the length of the Label, shall rule that matter well ynough. Nowe shall followe a rule to know the weyght of the ypon shotte, by the height of the shotte.

A Table to knowe the weight of

from shotte.

- A Shot of 2.ynches high, doth wey. 1 lb. 1. ounce. $\frac{1}{2}$.
 A Shot of 2.ynches $\frac{1}{2}$ high, doth wey. 1 lb. 9. ounces. $\frac{1}{4}$.
 A Shot of 2.ynches $\frac{1}{4}$ high, doth wey. 2 lb. 2. ounces.
 A Shot. 2. inches. 3. quar. high, doth wey. 2 lb. 14. ounces.
 A Shot. 3. ynches high, doth wey. 3 lb. 12. ounces.
 A Shot. 3. inches 2 quar. high, doth wey. 4 lb. 12. ounces.
 A Shot. 3. ynches $\frac{1}{2}$ high, doth wey. 6 lb. lacke. 1. ounce.
 A Shot. 3. ynches. 3. quar. high, doth wey. 7 lb. 5. ounces.
 A Shot. 4. ynches high, doth wey. 8 lb. 15. ounces.
 A Shot. 4. inches 2 qua. high, doth wey. 10 lb. 10. ounces.
 A Shot. 4. ynches $\frac{1}{2}$ high, doth wey. 12 lb. 10. ounces.
 A Shot. 4. inches. 3. qua. high, doth wey. 14 lb. 14. ounces.
 A Shot. 5. ynches high, doth wey. 17 lb. 5. ounces.
 A Shot. 5. ynches 2 quar. high, doth wey. 20 lb. 1. ounce.
 A Shot. 5. ynches $\frac{1}{2}$ high, doth wey. 23 lb. 2. ounces.
 A Shot. 5. inches. 3. quar. high, doth wey. 26 lb. 6. ounces.
 A Shot. 6. ynches high, doth wey. 30. pound.
 A Shot. 6 ynches 2 quarter high, doth wey. 34. pound.
 A Shot. 6 inches $\frac{1}{2}$ high, doth wey. 38. pound.
 A Shot. 6. inches three quar. high, doth wey. 42. pound.
 A Shot. 7. ynches high, doth wey. 48. pound.
 A Shot. 7. ynches 2 quarter high, doth wey. 53. pound.
 A Shot. 7. ynches $\frac{1}{2}$ high, doth wey. 58. pound.
 A Shot. 7. ynches three quarters high, doth wey. 64 lb.
 A Shot. 8. ynches high, doth wey. 71. pound.
 A Shot. 8. ynches 2 quarter high, doth wey. 78. pound.
 A Shot. 9. ynches high, doth wey. 101. pound.
 A Shot. 10. ynches high, doth wey 138. pound.
 A Shot. 11. ynches high, doth wey. 184. pound.
 A Shot. 12 ynches high, doth wey. 240. pound.
 A Shot. 13. ynches high, doth wey. 305. pound.
 A Shot. 14. ynches high, doth wey. 380. pound.

To

To dispart any peece of Ordnance

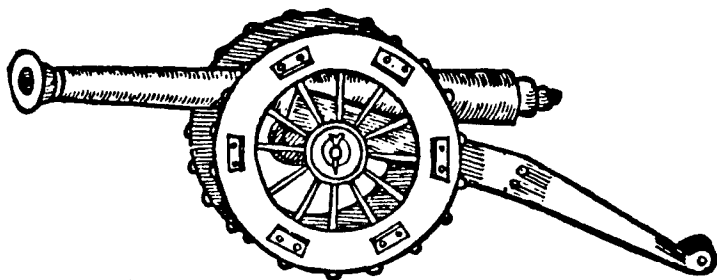
truely.

CHAPTER. III.

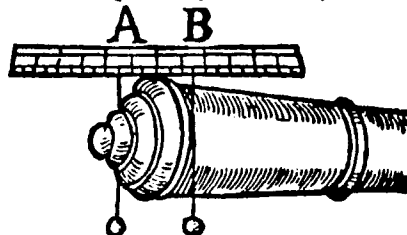


All thinges belonging vnto a Gunner,
 the chiefest is, to bying the mettall of hys
 peece euen, soz else hee shall neuer shoote
 iust to his marke, which Gunners call dis-
 parting of their peeces: and there be ma-
 ny wayes to do it. Howe to disparte your
 peece, do this, take a string, such a one as will not stretch,
 then giue your peece about his tayle oꝝ great ende, in the
 very biggell place of the peece, then measure the line
 iustly how many ynches the peece was in the compasse,
 and then looke howe many. 22. ynches there be in the
 compasse, take so many. 7. ynches for the Dyametre, highte,
 oꝝ thicknes of the circle, soz in al circles being perfect
 round, as timber, stone, oꝝ any other mettall, looke howe
 many. 22. ynches there be in the circumference oꝝ com-
 passe, so many times. 7. there is in the Dyametre oꝝ height,
 then the height oꝝ thicknes of y^e breech of y^e peece beeyng
 known, looke how many ynches and partes of an ynche
 it commeth vnto, then lay that vnto the mouth of the
 peece, and looke howe muche of that doth remayne ouer,
 then take halfe of that for your dispart. But some doe ble
 to giue them (as afoze is saide) and do put that into thzee
 equall partes, but that is not the exacte way, although it
 doche goe somewhat nere the matter. Some also wyll
 take a pyiming yron, and put it into the tutchhole, and
 then lay it vnto the mouth of the peece, and looke what
 it commeth vnto moze than the measure, they will
 take that for their dispart: but that maye deceiue them,
 as it is generally false. Wherefoze this is a verpe good
 way, to take poure rule of two foote long, and then lay

laye that crosse the tayle of the peece then take a plummet of lead vpon a line or a string. First holde the plumbe line on the one side close to the peece, that the line touche the peece without any bending, then on the other side, as circumspectly as you can, that the plummet line touch the side of the peece, without any bending, and then laye that measure to the mouthe of the peece, and looke what the ouermeasure commeth vnto, take halfe of that for your true dispart. Nowe for your better instructions by this figure.

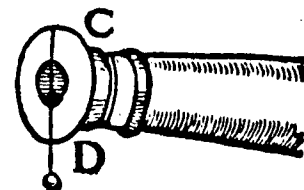


First I lay my rule of two foote long vpon the tayle of the peece crosse A and B and then I holde my plummet of leade first vpon the saide A as you may see, and then hold my hand vpon the other side B close to the side of the peece, then I do look how many ynches the tayle of the



peece

peece was from A and B, and I finde it nineteene ynches and a halfe: then I lay my rule vnto the mouth of the peece C and D, and finde that the mouth of the peece is fiftene ynches, so there remaineth foure ynches and a halfe: then I deuide the foure ynches and a halfe into two equal parts, & that is two ynches and $\frac{1}{2}$ which I take for my dispart: then with my plummet of leade, I goe vnto the mouth of the peece, and making a perpendicular line, and so I find the vppermost parte of the peece: then I take a strawe, setting that perfectly by right, according to the dispart, two ynches & a quarter aboue the mouth of the peece, and make it fast with a little waxe, at the letter C, then by bringing y^e taile of the peece to the toppe



of the strawe which is my disparte, leuell with my marke, there is no doubt, but I shall make a perfite shotte, so that it be as farre as within the cast of the right line: for the disparting of your peece, is but to bring the mouth of your peece before, to be as high as the tayle behinde. For this you must consider, that he that can by arte lay the hollow of the peece right against the marke, must needes hit it, so that it be not farther than the peece doth cast vpon the right line, for he that shall giue leuell to a peece without disparting, shall shoote a great deale ouer the marke, because that the side of the peece is contrarie vnto the coye or hollownesse of the same: for the mettall of the tayle of the peece, is a great deale thicker than the mouth. And furthermoze, this is a very good way to disparte all manner of peeces of Ordnance: take your Calapar compasses

D

passes

passes, and so take the height of the taylor of the peece, then measure it with your rule and looke what it is more at the taylor, than it is at the mouth, take halfe that for your disparce, and doing (as before is said) there is no truer way, so that your Calapat compasses be large ynough to reach it. Now in like case, you may disparce your peece with your Quadrant, and also with a square, but to teach tedious wayes as long as a man may teach easilie, it were but superfluous, and the easie wayes as good or better than the other.

Now as concerning chambered peeces, for the disparcing of them, there can be no perfecte writing, for it must be considered and handled, according vnto the forme of the Chamber, and fashion of the hall of the peece, whether it be Sling, Roller, Woylepeece, or Bares: but any reasonable man, (when hee doth see the peece and the Chamber) may easilie know what he must doe, as touching those matters.

How to giue leuell with any peece

*of Ordnance, to make a shotte, as the most sortes of
Gunnners vse to doe, although there be
no Arte in it*

CHAPTER.5.



Of the making of a shotte, that is to saye, to giue leuell vnto anye marke assigned, with a peece of Ordnance, without the right line, according vnto the accustomed manner that Gunnners vse, for that they doe not knowe the distance vnto the marke, and therefore doe but giue a

gesse what aduantage will reach the marke, and if that it be with an ynche rule, then thus they doe.

First by their iudgements they doe giue that so many ynches aduantage as they suppose will reach the marke, and then by the first lighting or falling of the shot, hee doth see whether it be shotte or gone ouer the marke, and if it be shotte, then at the next shooting hee will giue the peece more aduantage by the ynch rule: and if it be ouer, then he will giue the peece lesse aduantage with the ynche rule: and so by diuers times shooting off the peece at a marke, they will finde howe many ynches and partes will keepe the length of the marke. And if they doe not shootte with an ynche rule, then they will giue the peece the aduantage by some assigned place beyonde the marke that they doe shootte at: and if the shotte doe lighte shotter, then they will giue the peece more aduantage at the next shotte: and if the shotte be farther then the mark, then they will giue the peece lesse aduantage at the next shotte. And so by often shooting at the marke, they will hitte the length of the same, and then knowing at what marke the peece must be mounted vnto righte ouer the marke, then they alwayes mounte the peece vnto that aduantage, and they shall alwayes keepe the length of the marke, with that peece at that marke, the peece to be laden alwayes equally with Powder.

But by this order of shooting, hee shall neuer become cunning, although he shootte a thousand shootes, for that there is no methode or order in the doing thereof, but onely with that peece at the marke: for if you doe shootte with another peece at that marke, although the peece dothe shootte that shotte, and that weighte in Powder, the peece maye shootte vnder or ouer by the meanes of the length of the same, or the hignesse
D.ii. or

of smallness of the breech, and the mouth of the peece in mettall. And to bring that peece vnto any other place, they must doe as at the first, to proue what will reach the marke: and therefore this kind of shooting is to no purpose, but onely in a Towne or Castell, in the time of seruice, for him that hath the charge of Ordnance, to proue what the peece will doe at euery marke, as touching the keeping of the length of the marke, whereby they may the better shoote at their enemies when they doe serue, otherwise it will be to no great purpose: for as often as you doe alter or chaunge your peece, or take that peece away to serue in an other place, so oft you are to seeke, and to proue the thinge newe againe, whether you doe vse to shoote with the yuch rule, or by the degrees in the Quadrant: for if you doe shoote with the yuch rule, then the length of the peece will alter it as is shewed in the 8. chapter following. And if you shoote by the degrees in y Quadrant, then the highnesse or lownesse of the ground shall cause them to erre, as I doe shew in the thirteenth Chapter. Therefore, if I were worthy to giue counsell, I could shew them how to vse the matter, that they might attayne to know the length of the marke at the first shotte, but I neuer saw it so handled, whereby they should attaine it: for all the proofes that haue bene made as yet by Englishmen, are no prooffe, but altogether to cause them that did see the prooffe, to committe further error, as touching the distance vnto the marke, or hitting the length of the marke.

What

What a degree is &c.

CHAPTER 6.



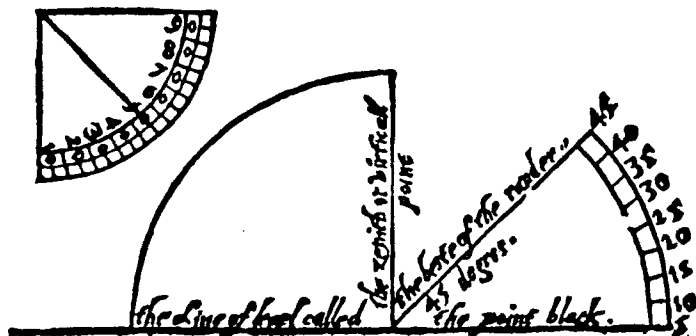
Furthermore, whereas this book is named The Arte of shooting in great Ordnance, so in like manner I thinke it conuenient, to shew you what the word Arte meaneth or signifieth, which is, the describing of a way or methode, how to attayne to the certayntie of any matter. Which as hitherto I haue not seen any such book, although it hath been very neer two hundred yeeres since the first inuentis of Ordnance: and excepte there bee any better booke in some mens hands, such as I haue not seene, as it is like enough that there may be, there is no Arte in any of them: yet I haue seene a number of bookes that haue bene written concerning Ordnance, but surely they that wrote the, were not seene in any part of y Mathematical science, neither good Machanicians, but (in respect) vnderly boyd of any science: (in comparison) no good order described in the shooting of Ordnance, to knowe what distance the shotte is deliuered from the peece: neyther haue they knowne what instruments haue meened. And although they haue named degrees in their bookes, yet it appeareth vnto me that they haue not knowledge what a degree signifieth, for that they haue named a Quadrant, a Triangle and other fond and foolish by-names. Therefore they that haue written those bookes that the Gliners haue amongst them, were vnderly vlearned in any manner of science, which were in the beginning, in the time of King Henry y eight, made by Flemmings: for in the wars in those daies the King sent our into Flaunders, and those parts thereabout, to haue Gunners to serue him in the warres, & the Gunners haue no other bookes, but such as were written by

D iii.

by

by them: wherefoze I do thinke it good to shew vnto you what a degree is.

A degree is a parte or deuision of a whole circle into 360. equall parts, as the the auncient fathers also tyme haue taught, and especially in Astronomy. And it is very profitable for Gunners to knowe the vse of them. The Quadzant that they doe occupie, is the fourth part of a circle, deuided into 90. equall partes, according vnto þ fourth part of the Heauens, for the Zenith or picke in the Heauens (ouer the Crowne of your head, downe to the Horizon) is deuided into 90. equall partes, according vnto the Quadzant. As for example: If there were a perpendicular line let downe out of the Heauens vnto the earth, then shuld the earth be a right line, and make a square angle vnto the furthest parte of the Horizon that you can see, and so passe vnto the Heauens, as doth the Quadzant: and then the best of the Rander is 45. of these deuisions, called degrees (as some mens opinion hath been) and that is half 90. and the said. 45. degrees be the best of the Rander in some cases, and that is with the winde, but otherwise, it is not, as it is further declared in the 1. Chapter. And for better example, I haue placed this figure.



Howe to make a shotte vpon the

right line, and also to know how much
ground any peece of Ordnance doth drine
or conuey the shot as the mount of
euery degree of the Rander.

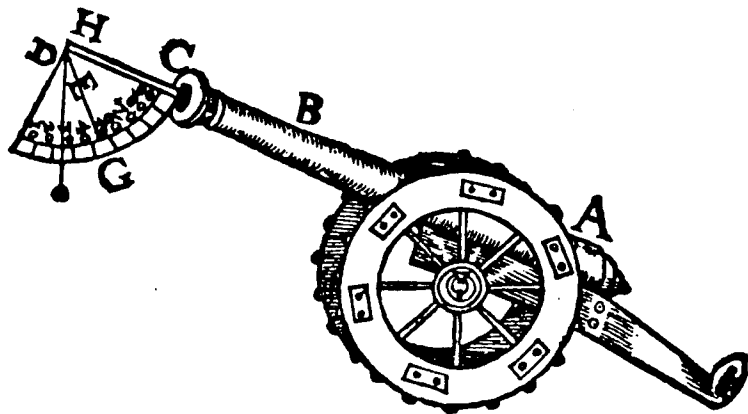
CHAPTER. 7.



Furthermoze, any peece of Ordnance being truly disparted, as is declared in the fourth Chapter, they may know at all times how for to shote iust vnto the mark, especially within point blank, & point blanke, is the direct fleeing of the shot, without any descendin from the mouth of the peece vnto the mark, þ mouth of the peece to stand directly with the Horizon, so that it be vpon a plaine and leuell ground, as far as þ peece may cast, hytting any thing that standeth directly as hygh as the mouth of the peece, laying the holowe or concauie of the peece against the thing that you doe shote at &c. And to shote at anye marke vpon the right line, you shall doe it by this meanes: your peece being truly disparted, and the dispart sette vpon the mouth of the peece, bringe the middle of the tayle of the peece to the toppc of your disparte vpon the mouth of the peece, and the marke that you doe shote at, all thye vpon one right line, by the sight of one of your eyes, and then soe fleeing that the peece standeth vpon a leuell ground, and the one wheele to bee as nimble as the other, this doone, there is no doubt but you may shote as nere the marke with a Cannon as with a Parababus, or Calluer. This is most certaine. Therefore it is very necessary to know how far any peece wil conuey the shot vpon the right line, & that is somewhat hard to do, for
D illi, there

there is sel dome any grounde, but is higher in one place than in another, and then if the peece should bee layd close vnto the ground, it woulde graze befoze that it were at the end of the right line, and then if the peece be in her carriage, the shotte will not graze befoze that it were descended, as much as the height of the carriage. And soz to set by any thing certaine at the end of the right line, it were too tedious, therefore in my opinion, this is one of the best wayes, in the finding what distance any peece conuayeth oꝝ byteth the shotte vppon the right line oꝝ any degree of the Rander, as thus: Repaire vnto a very leuell ground, as a plaine marish, that is iust water leuell, and then to finde the right line oꝝ point blanke, rayse a butte oꝝ banke in that plaine grounde, and then sette vppe a marke the iust height of the peece that lyeth in the carriage, and take a quadrant, with a rule fast thereunto, and put the rule into the mouth of the peece, and coyne the breech of the peece vp and downe, vntill the plummet hang at the corner of the Quadrant, and then shall the Concavities of the peece, lye right with the Horizon, neyther higher noz lower: then shoote off the peece against the butte: if the shotte bee vnder the marke, it is moze then the right line, then you must hyinge the peece neuer vnto the butte, banke oꝝ marke: but if it be the iust height of the marke, then remooue the peece farther off from the marke, and so remoouing the peece sozwardes and backwardes, you shall finde the true right line of the peece. By this order, you may trye the true right line of all manner of peeces of Ordnance. And whereas the opinion of diuers Gunners is, the one contrarie vnto the other, some holding an opinion, that the longer peece doth ouershoote the shorter, and some that the shorter doth ouershoote the longer: the troth is, that the longer peece doth shoote further than the shorter, although that in the mounting of a long peece,

peece and a shorter with an ynche rule, the shorter peece dothe ouershoote the longer, although bothe shoote one shotte, and one sozte and weyght of powder, as you may perceyue in the next Chapter following, and also in the beginning of the Booke in the eyght consideration. &c. Furthermoze, to knowe what any peece of Ordnance wyll doe at the mounte of euery degree, and what distance of grounde the shotte dothe flye, doe thys, the grounde being playne and leuell (as befoze is rehearsed) place the peece in thys manner: you muste make a hole in the grounde, to the intent to make a platteforme, to set the peece vpon, in such order, that the tranchions of the peece being in hir carriage, be iuste in height leuell with the grounde, neyther higher noz lower: then take your Quadrant, and the rule fastned thereto, and put the rule into the mouth of the peece, and so mount the peece vnto one degree, shooting off the same, and seeing the first graze, measure the distance of grounde, and note oꝝ marke that: then in like manner mount the peece vnto two degrees, and so vnto thzee degrees, and so sozth from degree to degree, vntill the peece bee mounted vnto the best compasse of the Rander. Thus shall you know what any peece will doe at the mounte of euery degree. &c. But if you shoulde make youre prooofe vppon suche grounde as is not leuell, then your prooofe shoulde be erroneous, soz that the Quadrant sheweth by the degree, howe muche it is higher than the Horizon, soz if the shotte doe not finde grounde in his descending, equall with the height of the peece, the shotte fleeth further than it shoulde do. And also if the ground be higher than the place that the peece doth stand vpon, then the shot will be stayde the sooner, by the meanes of the height of the ground, as I do moze at large declare in the. 13. Chapter following. And soz your better instruction of the mounting of the peece, I haue made this figure following. E First



Firste take the Quadrant, and put the rule of the Quadrance B into the mouth of the peece C and then putting by or downe the tayle of the peece A, till the plummet G fall vpon the corner of the Quadrant at D, then looke whatsoeuer you see right with the vpper side of the Quadrance H, shall be leuell with the mouth of the peece, and that is called the point blanche, for that vppon a leuell ground without anye hylles, as vppon the sea, that all thinges standeth so leuell, shall bee ryght wth the Horizon, that is to say, at the parting of the earthe and the Skye, by the sighte of youre eye: and then putting downe the tayle of the peece A, the plummet line G will hang

hang at what degree you please towards the myddle lyne of the Quadrant E, then the mouth of the peece B and C will goe vpwardes, &c. Nowe shall followe (according vnto the prooofe that I haue made, but yet not to my contentation, neyther in respect to no purpose) the argumente of the proportion of the mounting of euery degree vnto the best of the Randare, according vnto the prooofe that I haue made. Looke howe muche ground the peece conueyeth the shotte from the ryght lyne, vnto the mounting of syue degrees, that is as muche ground as the ryght lyne, and two nyneh parts moze, and from the mounting of syue degrees vnto tenne degrees the shotte is conueyed as muche ground as the ryght lyne, and $\frac{1}{2}$ parte moze, and from the mounting of tenne degrees vnto fiftene degrees, the shotte is conueyed as muche ground as the ryght lyne iust. And from the mounting of fiftene degrees vnto the mounting of twentye degrees, the shotte is conueyed halfe as muche ground as the ryght lyne iust: and from the mounting of anye peece from twentye degrees vnto the best of the Randare, the shotte is conueyed in all aboute $\frac{1}{2}$ partes of the ryght lyne, and that is in a faire calinc daye, and then two and fortye degrees is the best of the Randare, and wth the wynde syue and forty is the best of the Randare, and agaynst the wynde, as the wynde is in hignesse, that is, one and fortye, or fortye, or nyne and thirty, or ryght and thirtie, or seauen and thirtie, or syue and thirtie degrees, the wynde beeing altogether the ruler therof. Therfoze it is but a folly to make accounte thereof, neyther is there any seruice about the mounting of any peece of Ordnance, about .20. degrees, excepte it be a mortar peece, and the shotte is conueyed off ground from the mouth of the peece vnto the lighthing or falling of the shotte, to the beste compass

of the Rander, aboute five times and a halfe as muche greiv as the right line, being (as befoze is declared) within a little border of ouer, according as the winde bloweth moze or lesse, against the winde, or with the winde, and so forth. But here is one principall thinge to be considered, and that is this, that you do alwayes charge the peece with iust one weighte, and one sorte and kinde of powder, for otherwayes, in the doyinge thereof, you may committe error, as befoze is declared in the firste Chapter. As touching the knowing the goodnesse of Powder, for that it chanceth many times that they haue not alwayes one sorte of Powder, neyther alwayes of one mans makinge but of sundry mens makinge, and so by that meanes, some Powder is better than some is: therefore it is a harde matter for to knowe certainly, y thus much in weighte of this powder, is equall vnto the force of so muche in weighte of that sorte of Powder: wherfoze in mine opinion, that engine or litle bore that is deuised to proue the force of the Powder is verie necessarie to be vscd, for by it you maye iustly knowe which sorte of Powder is stronger or weaker in force than the other, by weyinge alike some small quantitie of each sorte, and so puttinge the powder into the engine or bore, and burninge it, firste the one sorte, and then the other sorte, and looke whiche sorte of Powder doth blowe, or lift the lidde of the bore highest, that is the stronger sorte of powder, and you shall knowe by howe muche, by the teeth or notches that doe stay the lidde of the engine or bore, and so by that engine or bore, you maye sette the force of the powder, that is to say, if that you doe occupie so muche powder with anye peece of Ordnance. And for that you woulde keepe that length of the marke at suche an aduantage in mounting, if you haue no moze of that sorte of powder, but that the powder that you haue is eyther stronger or weaker, then do thus: wey
out

out some smal quantitie, as the weighte of a grose or sixpence, moze or lesse at your discretion, as the engine or bore is, and firste burne that sorte of powder in the bore that you do knowe the force of it already, and then looke vnto what teeth or notch that the lidde of the engine or bore is lifted by vnto, and then wey out of the other sorte of powder the like weighte, and so burne that in the bore or engine, and if it dothe blowe or lift the lydde hygher than it was befoze, then it is a stronger sorte of powder, if not so high, then it is a weaker sorte of powder: and by the number of notches, you shall knowe how much. Therfoze, if it be a larger sorte of Powder than that you haue occupied already, then weye out a lesser weyghte of the same, and burne that in the bore or engine, and so doing, both by the weying and burninge of it in the engine or bore, vntill that it lift or blowe the lidde of the engine, vnto the iuste heygth that it was with the firste sorte of Powder: but if the firste sorte of Powder did blow or lift the lydde higher than the other, then wey out moze in weyghte than the firste, and so by the weying and burninge of it in the engine, vntill the lydde be lyfted vnto the iust heygth that it was befoze, so by that meanes you shall knowe iustly howe muche weyghte of one sorte of Powder shall be equall with the force of that sorte of Powder, and so by this meanes, although you change the sortes of your Powder neuer so often, yet you maye sette the peece by the weyghte of your Powder, that the peece of Ordnance shall keepe one length at the marke. Having this consideration, both in the lading and the wadding, to be in such order, that is to say, to keepe a methode in the doinge thereof, neyther to putte in the powder too harde, neyther too loose, neyther the wadde to goe in too loose, neyther to be too much too harde, but reasonable. And as touching the fashon and the makinge of the en-
gine

gine of bore, I do omit that in this booke, for that I doe shew it in my Booke, called The Inuentions or deuices, in the. 54. Deuice.

Howe for to mount any peece of

Ordnance by the degree with an

Inch rule, with a Table, shewing what parte of

an ynche rule wyll make one degree, and

so unto tenne degrees.

CHAPTER. 8.



DO the making of a perfitte shotte at any degrec of the Randare, & to haue a good length at y^e marke, the distance of ground being knowne, first it behoueth him for to knowe the force of his Powder, whiche is shewed in the Chapter going before, and to haue his Powder putte in Cartredges, eyther of Paper or Canvas, and the Powder wated, that the one Cartredge bee not heauier than the other, according vnto the peece, and the goodnesse of the Powder: for there can be no certaynetie when y^e peece is laden. or charged, sometime with more Powder, & sometime with lesse, and especially in the tyme of seruice, I do see, that there is no worse lading or charging of Ordnance, than with a Ladell, whether that it be by Sea or by lande, for by the lading with a Ladell, it muste bee twice filled, and then at euery tyme that the Powder is putte into the peece, it muste bee put vppon with the Rammer heade, so that they muste eyther turne the other ende of the Ladell, or else if that the Rammer heade bee vppon the Spownde staffe, then he muste change the stauers, whiche

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is a greate cumber to doe in a narrowe roome. And also in the carrying of a peece wyth a Ladell, hee cannot fill it so equally, but that the Ladell shall haue sometyme more Powder, and sometyme lesse Powder, by a good quantity, and especially if that hee dothe it hastily as in the tyme of seruice it alwayes requirerh haste, and that may cause hym that gyueth leuell, to shoote vnder or ouer the marke, or too shote, or too farre, although y^e he hath found what aduantage wyll reach the marke.

And also it is vnprofitable and dangerous to lade or charge a peece wyth a Ladell, for that the Powder is apte to bee shedde or spylled beeryng hastily done, and then it is apte to bee fired, considering what a dangerous poynte it is for the burning and spoyleing of men.

Wherefore if youre Powder bee in Cartredges, and also wyth, the peece is more sooner and easlyer laden or charged, and hee shall keepe the length of the marke the better, and also you may keepe the Powder the closer and better, and not so apte to bee shedde or spylled, for when that the Cartredges bee fylled, then they may bee set vprighte in some Tubbe or Barrell, and then they maye take out one by one as neede shall require, and so couer the Barrell close againe, that it maye bee wythout daunger.

And nowe for the guyding of leuell wyth any peece of Ordnance, and the marke more than the peece canne reache vppon the ryghte lyne, and the distance knowne vnto the marke, and also you knowing what ground the peece will conuey the shot vppon the righte line, then by the order in the Chapter going before, you may know how many degrees will reach y^e mark. And for that it is somewhat tedious & difficulte to moue

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any peece of Ordnance with a Quadrante, excepte it be upon a playne and leuell grounde, that the peece standeth no more, but the iuste heygth, or the lownesse of the mark, which happeneth very seldome. Therefore I doe thinke it very good to shew you howe to mount any peece of Ordnance by the degree, with an ynch rule, according to the length of the peece, and to knowe howe many ynches, and partes of an ynche will make or giue one degree vnto ten degrees. Hereafter is a Table, the length of the peece standeth in the margente towards the lefte hande, & p square right againste, that is the mount of one degree, and the hypermost number in euery square, is the ynches, & the vndermost numbers is the obde partes of an ynche, and the Table beginneth at the length of the peece sixe foote and a halfe, and so encreaseth by the half foote, till the peece be full fifteene foote longe.

This

¶ This Table doth shew what part of an ynch rule will make one degree, and so vnto tenne degrees.

		Degrees.										
		1	2	3	4	5	6	7	8	9	10	
Foot. 5.		1	2	3	4	5	6	7	9	10	11	Inches.
$\frac{1}{2}$ long.		$\frac{1}{22}$	$\frac{1}{11}$	$\frac{2}{11}$	$\frac{1}{5}$	$\frac{1}{10}$	$\frac{3}{11}$	$\frac{2}{11}$	$\frac{1}{5}$	$\frac{1}{11}$	$\frac{1}{11}$	Partes.
Foot. 6.		1	2	3	5	6	7	8	10	11	12	Inches.
long.		$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{3}$		$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{4}$		$\frac{1}{5}$	$\frac{1}{3}$	Partes.
Foot. 6.		1	2	4	5	6	8	9	10	12	13	Inches.
$\frac{1}{2}$ long.		$\frac{1}{4}$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{4}$	$\frac{2}{9}$	$\frac{1}{5}$	$\frac{1}{3}$	$\frac{2}{11}$	Partes.
Foot. 7.		1	2	4	5	7	8	10	11	13	14	Inches.
long.		$\frac{1}{11}$	$\frac{1}{11}$	$\frac{2}{11}$	$\frac{2}{11}$	$\frac{1}{5}$	$\frac{3}{11}$	$\frac{2}{11}$	$\frac{2}{11}$	$\frac{1}{5}$	$\frac{1}{11}$	Partes.
Foot. 7.		1	3	4	6	7	9	10	12	13	15	Inches.
$\frac{1}{2}$ long.		$\frac{1}{11}$	$\frac{1}{11}$	$\frac{2}{11}$	$\frac{2}{11}$	$\frac{1}{5}$	$\frac{3}{11}$	$\frac{2}{11}$	$\frac{1}{5}$	$\frac{1}{11}$	$\frac{1}{11}$	Partes.
Foot. 8.		1	3	5	6	8	10	11	13	15	16	Inches.
long.		$\frac{1}{11}$	$\frac{1}{11}$	$\frac{2}{11}$	$\frac{2}{11}$	$\frac{1}{5}$	$\frac{3}{11}$	$\frac{2}{11}$	$\frac{1}{5}$	$\frac{1}{11}$	$\frac{1}{11}$	Partes.
Foot. 8.		1	3	5	7	8	10	12	14	15	17	Inches.
$\frac{1}{2}$ long.		$\frac{1}{11}$	$\frac{1}{11}$	$\frac{2}{11}$	$\frac{2}{11}$	$\frac{1}{5}$	$\frac{3}{11}$	$\frac{2}{11}$	$\frac{1}{5}$	$\frac{1}{11}$	$\frac{1}{11}$	Partes.
Foot. 9.		1	3	5	7	9	11	13	15	17	19	Inches.
long.		$\frac{1}{11}$	$\frac{1}{11}$	$\frac{2}{11}$	$\frac{2}{11}$	$\frac{1}{5}$	$\frac{3}{11}$	$\frac{2}{11}$	$\frac{1}{5}$	$\frac{1}{11}$	$\frac{1}{11}$	Partes.
Foot. 9.		1	3	5	7	9	11	13	15	17	19	Inches.
$\frac{1}{2}$ long.		$\frac{1}{11}$	$\frac{1}{11}$	$\frac{2}{11}$	$\frac{2}{11}$	$\frac{1}{5}$	$\frac{3}{11}$	$\frac{2}{11}$	$\frac{1}{5}$	$\frac{1}{11}$	$\frac{1}{11}$	Partes.
		2	4	6	8	10	12	14	16	18	20	Inches.

Foot 10. long.	2	4	6	8	10	12	14	16	18	20	Inches.
	$\frac{1}{11}$	$\frac{2}{11}$	$\frac{3}{11}$	$\frac{4}{11}$	$\frac{5}{11}$	$\frac{6}{11}$	$\frac{7}{11}$	$\frac{8}{11}$	$\frac{9}{11}$	$\frac{10}{11}$	Partes. Inches.
Foot 10. $\frac{1}{2}$ long.	2	4	6	8	10	12	14	16	18	20	Inches.
	$\frac{2}{11}$	$\frac{4}{11}$	$\frac{6}{11}$	$\frac{8}{11}$	$\frac{10}{11}$	$\frac{12}{11}$	$\frac{14}{11}$	$\frac{16}{11}$	$\frac{18}{11}$	$\frac{20}{11}$	Partes. Inches.
Foot 11. long.	2	4	6	9	11	13	15	18	20	22	Inches.
	$\frac{1}{11}$	$\frac{2}{11}$	$\frac{3}{11}$	$\frac{4}{11}$	$\frac{5}{11}$	$\frac{6}{11}$	$\frac{7}{11}$	$\frac{8}{11}$	$\frac{9}{11}$	$\frac{10}{11}$	Partes. Inches.
Foot 11. $\frac{1}{2}$ long.	2	4	7	9	12	14	16	19	21	24	Inches.
	$\frac{2}{11}$	$\frac{2}{11}$	$\frac{3}{11}$	$\frac{4}{11}$	$\frac{5}{11}$	$\frac{6}{11}$	$\frac{7}{11}$	$\frac{8}{11}$	$\frac{9}{11}$	$\frac{10}{11}$	Partes. Inches.
12.	2	5	7	10	12	15	17	20	22	25	Inches.
	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	Partes. Inches.
Foot 13. $\frac{1}{2}$ long.	2	5	7	10	13	15	18	21	23	26	Inches.
	$\frac{2}{11}$	$\frac{1}{11}$	$\frac{2}{11}$	$\frac{3}{11}$	$\frac{4}{11}$	$\frac{5}{11}$	$\frac{6}{11}$	$\frac{7}{11}$	$\frac{8}{11}$	$\frac{9}{11}$	Partes. Inches.
Foot 13. long.	2	5	8	10	13	16	19	21	24	27	Inches.
	$\frac{2}{11}$	$\frac{1}{11}$	$\frac{2}{11}$	$\frac{3}{11}$	$\frac{4}{11}$	$\frac{5}{11}$	$\frac{6}{11}$	$\frac{7}{11}$	$\frac{8}{11}$	$\frac{9}{11}$	Partes. Inches.
Foot 13. $\frac{1}{2}$ long.	2	5	8	11	14	16	19	22	25	28	Inches.
	$\frac{2}{11}$	$\frac{2}{11}$	$\frac{3}{11}$	$\frac{4}{11}$	$\frac{5}{11}$	$\frac{6}{11}$	$\frac{7}{11}$	$\frac{8}{11}$	$\frac{9}{11}$	$\frac{10}{11}$	Partes. Inches.
Foot 14. long.	2	5	8	11	14	17	20	23	26	29	Inches.
	$\frac{10}{11}$	$\frac{2}{11}$	$\frac{3}{11}$	$\frac{4}{11}$	$\frac{5}{11}$	$\frac{6}{11}$	$\frac{7}{11}$	$\frac{8}{11}$	$\frac{9}{11}$	$\frac{10}{11}$	Partes. Inches.
Foot 14. $\frac{1}{2}$ long.	3	6	9	12	15	18	21	24	27	30	Inches.
	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	Partes. Inches.
Foot 15. long.	3	6	9	12	15	18	21	25	28	31	Inches.
	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	Partes. Inches.

Then first repaie vnto the order of the Chapter that goeth before, and consider by the distance that the peece conueyeth the shotte vpon the right line, and looke howe much the shotte maye bee conueyed at the mount of one degree, and so from degree to degree, till you haue the length in degrees, that the shot maye reach the marke, and then repaie vnto the peece, and measure how many foote long the peece is, then according to the length of the peece, there is a Table in this Chapter going before, in the Margent of the which, towards the lefte hand, that number is the length of the peece, then right against that number in the first square, it doth shew how many ynches, and partes of an ynche will make one degree: and the next square will shew you how many ynches, and partes of an ynch will make two degrees, and so forth vnto the number of tenne degrees, and no more: and the cause is this, for that there is commonly no seruice to be done, about the mounting of any peece of Ordnance, more then tenne degrees, neither the ynch rule will serue any further, for that the degrees be taken out of the circumference of a circle, and not out of a right line. And now to vse the matter in the handling of the rule, to make a persite shot doe this: prepare your rule, and lette it be well deuised into ynches, halfe ynches, and quarters of ynches, and halfe quarters of ynches, and then lette there bee a slitte in the middle of the rule, and in the slitte, lette there bee made in brasse or latine a sighte, that it maye bee moued vpper and downe at youre pleasure, and then the rule is finished. Nowe when you woulde make a shotte at anye marke, lette the peece bee truely disparted, and the disparte lette vpon the mouth of the peece, or else, if the disparte bee not sette vpon the mouth of the peece, yet you must knowe perfectly the Disparte of the peece, and to make accompte what num-

ber of ynches it is, and to reckon that as parte of the mounting of the peece by the degrees. Nowe the distance of ground being knowne vnto the marke, and also to knowe howe many ynches, and partes of an ynche wyll make the number of degrees, the accompte of the dispart being made, or else the dispart being set vpon the mouth of the peece, then set the rule vpon the breech of the same perfectly vpright, in such order, as the toppe of the rule bee not nearer vnto the mouth, than that place of the breech of the peece that the rule doth stand vppon, whether the peece haue much aduantage, or little, so that the toppe of the rule must not hang backwards or forwarde, but alwayes at on proportion from the mouth of the peece: that being done, turne the peece right vnto the marke, and then koyne the breech of the peece vppe and downe, vntill the middle of the mouth of the peece, or else the toppe of the disparte, and the marke bee seene throughe the sight, in the slitte of the rule, iust at the number of ynches, and partes of an ynche, that will answere vnto so many degrees, as the Table in this Chapter going before doth shew. This being done, the shot shall haue a good length at the marke. As for example, suppose that I doe shoote in a saker that conueyeth or vziueth the shot vpon the right line or point blanche. 26. skoye, and the marke that I doe shoote at is 40. skoye from the peece, then I haue eyther made prooffe by the order prescribed in the. 7. Chapter that goeth, before, or else I haue the Tables of some other men, as Tartalia y Italian hath made Tables thereof And so I do finde, that. 2. degrees will reach the marke, then I do repaire vnto the peece and measure it, how many foote long the peece is, and I doe finde that the same is. 9. foote and a halfe in length from the mouth to the breech, then I repaire to y Table in this Chapter before, wher I find that. 2. ynches doth make a degree iust, and now the peece

must

must be mounted vnto. 2. degrees iust, and then twisse. 2. ynches, maketh. 4. ynches: then I do dispart the mettall of the peece, as I do shew you in the. 4. Chapter, and so I doe finde that the mettall of the breech of the peece is an ynche and a halfe thicker at the breech, than it is at the mouth of the peece, and then I doe sette vp a rush or a straw on the mouth of the peece, and so making it fast with a little waxe iust one ynche and a halfe about the mettall of the mouth of the peece, then I doe take the ynch rule, and so I do remove the sight in the slitte of the rule vnto iust. 4. ynches, and I doe set y rule perfectly vpright vpon the middle of the breech of the peece, and so remove the peece too and fro, and koyne the tayle of the peece vp and downe, tyll such time as I may see the marke throughe the sight in the slitte, and the toppe of the dispart, all thre vpon one right line, by the sighte of my eye, and the sight in the slitte, to stand at iust. 4. ynches, then shooting off the peece, you shall make a perfecte shotte. And furthermore, if the disparte bee not sette vppon the mouth of the peece, then you muste make accompte thereof, for that the peece dothe mount himselfe one ynche and a halfe, therefore you muste giue the peece but. 2. ynches & a half aduantage, to reach the marke. And furthermore, I will giue you a seconde example in the same peece at a greater distance, at. 80. skoye fro the peece, and that is almost a mile, and then doing (as before is said) to seeke howe many degrees will reach the marke, and I find that peece that vziureth or couaureth the shot. 26. skoye vpo the right line, that at. 9. degrees it wyll couey or vziue the shot. 80. skoye, and (as before is shewed) that in that peece that is. 9. foote and a halfe long. 2. ynches maketh iust one degree, and then the peece must be mounted vnto iust. 9. degrees, which is. 18. ynches, if the dispart be set vpon the mouth of the peece, but if the disparte bee not set vpon the mouth, then you must rebate so much of

the advantage in the mounting, as the disparer cometh unto, and that is one ynch and a halfe. Therefore, you must set the sight in the sicke, but vpon sixteene ynches and a halfe, and so doing (as before is said) the shot shall haue a good length at the mark. And furthermore, I had thought to haue placed a Table of proportion of the casting of the peece at the mouit of euery degree, accordingly as y^e peece both conuey o^r diue the shotte vpon the right line, but that I haue not made any such exact prooofe, neither am I of that ability, neyther as farre as I can iudge, there is no man will be at any such charge. But the exactest matter y^e I haue heard that Tartalia the Italian hath made perfect prooofe therof before diuers of the nobility of Italy, wher vpon, he hath made Tables (by repoyte) very exact, yet I could neuer come by the sighte of them, neyther are they in his Booke that he hath made for these causes.

What manner of course the shot

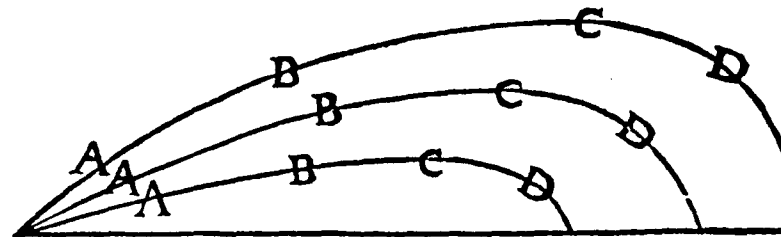
flyeth in the ayre.

CHAPTER. 9.



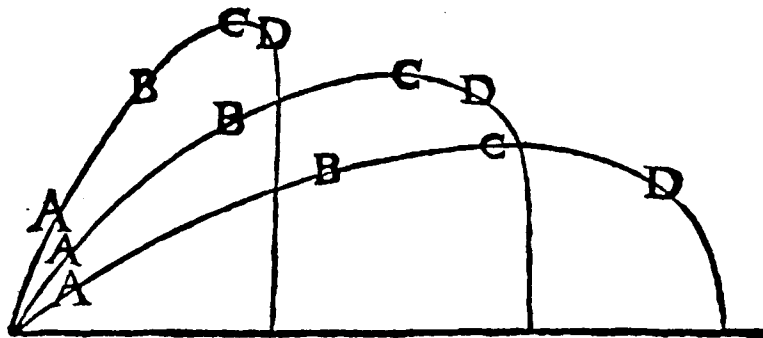
A I suppose, it is very necessarye to knowe what manner of course o^r proportion the shotte flyeth in the ayre in his compas, that is to say, at any degree mounted that the peece is shotte at the Randare. All those peeces that be shotte at the mounting of anye degree aboue poynte blanke, and vnder the best of of the Randare, hath. 4. manner of courses in hys vppuyng o^r flying, by the violence of the blast of the powder, before the shotte come to the ground, so that the peece be shot against a leuelled groun. The first course is by a right line, and so long as the shot goeth violently. And the second course both begin for to compasse, and yet flieth somewhat vppwards into the ayre, that

that is to say, further aboue the earth circularly. The third course is for a certayn space o^r quantitie at the highest distance from the earth. And the fourth course is, it cometh downwards circularly towards the earth, and so flouping more and more, till it cometh downe to the ground: as for example this: If any peece that is shotte at the best of the Randar, that is to say, at 45. degrees, and also at the mounting of thirtie degrees, and also at the mounting of sixteene degrees, and A signifieth the right line, and B the second course in flying of the shot circularly vppwards, and C sheweth the vppermost course for flying at the farthest distance from the earth, and D sheweth the circular falling o^r coming downewards, o^r the flouping o^r falling more circularly, than any of the other courses o^r falling of the shotte, and the more ncerer unto the ground, the more circularly the compasse is made, as this figure doth shew.



Now furthermore, if any peece be shot in y^e mounting of any degree, aboue. 45. degrees, then the shot shall haue a perpendicular line o^r fall, before that the shot shall come to the ground. Therefore I doe say, that the more that any peece is mounted aboue sixe and forty degrees, by the

the meanes of the perpendicular or falling, that the shotte falleth shorter and shorter at the mounting of euery degree: therefore they do neuer mount any manner of peece about the compasse of .45. degrees, except it be a Morter peece, and those be mounted alwaies aboue .45. degrees, for that the more the perpendicular line is, the more violently the shot cometh downe, and the more the peece is mounted, the higher into the ayre the shotte flyeth, and then the more is the perpendicular line, and the neerer unto the peece the shot falleth. Therefore that morter peece that is shot aboue .45. degrees, the shot hath .5. manner of courses, that is to say: first his right line vp into the ayre: secondly, his circular fleeing vp into the ayre: thirdly, his furthest distance from the earth: fourthly, his circular coming downewardes: and fifthly, his direct fall or perpendicular line downe to the earth, as this figure may represent, the one line to be the best of the Randare, the other lyne to be the mounting of .15. degrees more than the best of the Randar: and the third, the mounting of .30. degrees aboue the best of the Randar. And the cause that the shotte hath his direct fall vnto the earth, is his naturall



course, for firste it is diuied violently by the blast of the powder vp into the ayre by a right lyne, and then secondly, as the violent dyfte dothe decay, so it flyeth circularly, and thirdly, the force of the dyfte beeing all decayed, it muste needes haue hys naturall course, and all things that be of earthly substance, muste needes returne to the earth againe.

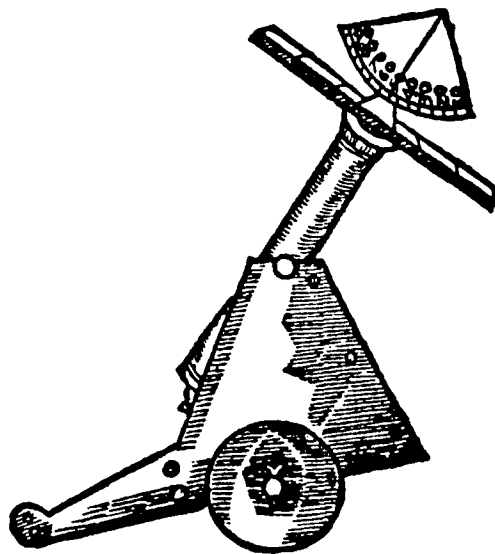
How to mount a Morter peece
for to lay the shotte at any distance
appointed.

CHAPTER.10.

Of the shooting of Morter peeces, it is to be considered, that those peeces must be mounted aboue the compasse of five and forty degrees, for that these peeces are vsed at the siege of Townes, for the annoyance of their enemies, y^e is to say, to the intent to beat downe their lodgings or houses, with diueres other purposes more. And to haue the shotte to fall at any distance appointed, they must do this: For euery degree that those peeces be mounted, the shot falleth shorter, as in the Chapter before is declared, & til y^e the mouth of the peece doth stande directly on your perpendicular line or Zeneth or picke, with the crowne of your head, and then the shotte shall fall directly into the mouth of the peece againe, excepte that the accedence of the winde doth put it beside the mouth of the peece, as this: first shoote this peece at the mount of five and forty degrees, that is the best of the Randar, then measure the ground from the mouth of the peece vnto the first falling of the shotte, and y^e measure being knowen, diuide that into five and forty equall parts, and euery one of these parts of measure, shal be the falling

falling shorter of the shot, at the mounting of one degree. As for example, a shorter peece, that shooteth a. 180. paces at the best of the Randare, shall shoot at the mounting of euery degree foure pace shorter: and so from degree vnto degree, till that the mouth of the peece standeth directly vpright with your Zenith. Nowe for to shoot wyth your shorter peece, doe this: first lay the rule E crosse the mouth of the peece B, then take your Quadrante and set your square place G vppon the rule E, then put downe the table of the peece A, till that the plummet line F fall at the corner of the Quadrant C, then shooting off your shorter peece that is the best of the Randare, and putting downe the table of the peece A, till that the plummet line fall at tenne degrees towardes the middle lyne of the Quadrant D then that shorter peece that shooteth a hundred and eyghtie paces at the best of the Randare, the shotte shall fall fortye pace shorter, that is, at a hundred and fortye pace from the peece, then at the mount of twenty degrees, the shotte shall fall 80. paces shorter, that is to say, at a hundred pace from the peece, then at thirtie degrees the shotte shall fall a hundred and twenty pace shorter, that is to say, threescore pace from the peece, then at the mounting of forty degrees, the shotte shall fall at a hundred and threescore pace shorter, that is, at twenty pace from the peece. And thus it may be seen, that from the mounting of euery degree the shot falleth shorter foure pace, and thus, by diuiding the best of the Randare into five and fortye equal partes, you shall know the mount of euery degree, at what distance the shotte shall fall from the peece, as by these figures following it doth appeare.

Howe



How farre about the marke the

*shotte flyeth ouer the marke by the length
of the peece, and distance vnto
the marke,*

CHAPTER. II.



Arthermore, heer is one especiall poynte to bee noted, for a number of Sea Gunners doe not vse for to diparte there peece: and I doe thinke that a great number
of

of them can not doe it very well, for that cause they will say, & they neede not disparte their Ordnance. But if they do not disparte their great Ordnance, and especially those new peeces that be nowe adaped made for the Shippes, they shall do but simple seruice, besides the great charge in wall that they shall put them to that beare the charge thereof: for one shotte of the great Ordnance, is twenty times the charge of the small peeces: and many of the small peeces in a maner needeth no disparte, but the great peeces: for the mettall of the taylor of the peece is a great deale bigger than the mouth of the peece. And this is generall for euer, looke howe muche that the mettall is thicker vpon the one side at the taylor of the peece than it is at the mouth of the peece, then looke howe many times that the length of the peece is vnto the marke; so many times the thiknesse of the mettall is thicker at the breech of the peece, than it is at the mouth, so many times the quantitie shall the shotte flye ouer the marke, if so bee that the peece be shotte without disparting, and the mark within poynt blanke, or the righte line of the peece: as for example thus, by a peece of Ordnance, that the mettall of the breech of the peece is thicker by three ynches on the one side, than it is at the mouth of the peece, and the peece is iust tenn foote longe, and the marke is iust twentye skope from the peece. Nowe the peece being tenn foote long, there is iust sixe times the whole length of the peece in euery skope, for that a skope is sixtie foote, and sixe times tenn is sixtie foote, then the mettall of the breech of the peece, being three ynches thicker than it is at the mouth of the peece, & peece shall cast ouer the marke at the ende of euery skope eyghtene ynches, for that the peece shooteth three ynches ouer the marke at euery tyme the length of the peece, and then sixe tymes three ynches, maketh eyghteen ynches: so then it must needes be

he sayde, that at the ende of twentyskope, the peece must needes caste twenty tymes eyghtene ynches ouer the marke, and twenty tymes eyghtene ynches, maketh three hundred and sixtie ynches, and that containeth thirtie foote, so that I doe conclude, that the peece whiche is but tenn foote long, and the mettall three ynches thicker on the one side at the breech of the peece than it is at the mouth, and the marke twenty skope from the peece, bys peece being shotte wythout anye disparting, being shotte agaynst an vpright wall, then bringing the middle of the mouth of the peece, and the myddle of the taylor of the peece, and the marke, all three vpon one righte lyne, and then the shotte shall hitte the wall iuste thirtie foot right ouer the marke, and this shall be true without anye faile. Then this being true, what madde men be those Gunners that will be of such an opinion, that they neede not to dispart their Ordnance.

Howe to make a perfite shotte

*with a peece that is not truly bored, shal
is to say, that the core or hollownesse
goeth not right in the myddle
of the mettall.*

CHAPTER.



As it chanceth many times thorough & negligence or default of Founders, that some peeces be not truly bored, & is to say, that the core or hollownesse of the peece runneth not right in the myddle of the mettall, but & core or concavities declineth or leaneeth more vnto the one side, than it dothe on the other, for although at the mouth of the peece the mettall be round about of one like thiknesse, yet at the breech of

of the peece the mettall may bee thicker on the one side, than it is on the other, and then that peece wyll neuer shoot right vpon the marke: and also, this peece is very dangerous to shoote in for feare of breaking. And this is generally for euer. Looke at that side that the mettall is most thickest at the breech, from that sidewardes the peece both cast, and then righte against the thickest parte of the peece, there is the thinnest side of the mettall, so that the mettall be perfite rounde on the outside of the peece, and also the hollowe & concauities wpythin the peece, and towards the thickest side of the mettall of the peece, towards that side the peece casteth. And for to knowe howe much, you may easily perceiue: looke how much the thickest side of the mettall is thpycker than the thynner side, looke howe many times the hollowe of the peece is vnto the marke, so many times halfe the thicknesse that pmetall is thicker on the one side, thā it is on the other, so maye times that proportion shal the shot slye wide of the mark, towards that side that the mettall of the peece is most thickest. As for example this, there is a peece, & the mettall is thicker on the one side, than it is on the other side by two ynches, and the coze or hollownesse from the tutchhole, vnto the mouth of the peece, is .10. foote longe, and the marke that the peece is shot at, is 20. skoye from y^e peece: now there is .6. times the length of the hollownesse of the peece in euery skoye, and the peece casteth one ynche awrye at euery time the length of the hollow of the peece, for that the mettall is thicker on the one side, than it is on the other by .2. ynches, then take from the thicker side one ynch, and adde vnto the other side that one ynch, then it will set the hollownes of the peece right in the middle of the mettall, as it is .5. ynches thicke on the thicker side, and but .3. ynches thicke on the thinner side, then take from .5. ynches one ynche, and there both remain but .4. ynches, & then adde vnto .3. ynches one ynche, and then it maketh .4. ynches,

ynches, & then both the sides be of one like thicknes: then (as before is said) there is .6. times the length of the hollownesse of the peece in euery skoye, so that the peece casteth awrye in euery skoye .6. ynches. Thē it must needes be said, that at the ende of .20. skoye, the peece casteth besides the mark .20. times, .6. ynches, and it maketh .120. ynches, and that is .10. foote iust. And furthermore, for to make a perfite shot with this kinde of peece, it is a strange matter vnto Gunners, and they had neede to be very circumspect for feare of ouercharging, for you must not giue this kind of peece powder according vnto the weyght of the mettall, for that the hath too much mettall on the other side, wher it both is good. And now for to make a shotte with this kind of peece, do this: first search the peece with those kind of instrumētts that I haue spokē of in the .2. Chapter, then if the thickest part of the mettall be vpon the vpper side of the peece, that is to say, at the tutchhole, the peece being as before is declared .2. ynches thicker of mettall ther, than it is on the lower side, when that you haue disparsted youre peece truly, as though the hollownesse of the peece ran right in the middle of the mettall, sette vp your dispart vpon the mouth of the peece one ynch y^e more, for that the mettall is thickest vpon the vpper side therof by .2. ynches, and halfe .2. ynches is on ynch: then byinging the middle of the rayle of the peece, and the top of youre dispart, and the marke, all thre vpon one right line, by the sight of your eye, the peece being shotte off you shall make a perfite shot vpon the right line. When if the thickest part of the mettall by .2. ynches be vnder the peece, that is to say, that at the tutchhole, the mettall is at the thinnest, when you doe sette vp youre true disparte vpon the mouche of the peece, rebate one ynche of the lengthe of the disparte, or else the peece will caste the shotte vnder the marke, for that the thickest side of the mettall is downewardes. And furthermore, if that the thickest parte

of the mettall chāceth in any other place, howsoever that it chāceth, then at the thickest side of the peece make a little marke, as you may do it wyth a little ware as hygge as a plumes head vpon the very hzech of the peece: then when you haue disparted this peece truly, as though the hollownesse of the peece did runne right in the middle of the mettall, sett by your disparte vpon the side of y^e mouth of the peece, as right as you can make it, with a line against the little ware that is on the thickest side on the hzeche of the peece, and then make the dispart one ynche the more, for that it is y^e thicker side with mettall by two ynches, and then bying the toppe of the dispart and the little ware and the marke, all thre vpon one right lyne, you shall make a perfecte shotte. And furthermore, if that it chance so, that the thicker side both lye somewhat vnderneath the peece, then set by your dispart vpon the thinner side of the peece, and also the little war vpon the hzeche of the peece, and then you must rebate one ynch from your true disparte, and this by consideration, there can bee no peece, but that you may make a perfecte shotte, for he that can by Arte lay the hollowe or concauitie of the peece against the marke, must needes hitt the marke, so that the marke be not farther off than the peece can reach vpon the right line: and this is true without any sayle.

How to giue leuell at a marke vpon

a hill or valley, with the Quadrant.

CHAPTER. 13.



Of the shooting at a hill or valley to giue leuell with the Quadrant, there is two principall thinges to be considered, and especially, if that the marke be further than the peece will reach vpon the right lyne. First, when they doe knowe the distance vnto

vnto the marke, and the marke more than that the peece will reach vpon the right line, then mount the peece so many degrees, till that the peece be able to reach the marke, then take your Quadrant, and looke through the two sight of the Quadrant, the plummet hanging at libertie, till you may see the marke iustly vpon the hyl, twinkling with one of your eyes, then looke vpon what degree and place the plummet line doth hang vpon, then mount the peece so many degrees more as that doeth come vnto, for the height of the hill, then that being done you shall make a perfecte shotte: as for example this: by a marke that stood vpon the side of an hill, and by Geometrie perspectiue, the distance is founde to bee fiftie skoze from the peece, and now the peece is a Culuering, such a one as shooteth thirtie skoze vpon the right line or point blanche. Now the marke is thirtie skoze more then the peece can reach vpon the right line, therefore you must mount the peece, till it be able to reach the marke, and that is, at the mount of foure degrees, as it doth appeare by the examining of the seauenth Chapter, and there you shall finde it to appeare to be at the mounte of foure degrees: now that being knowen, take your Quadrant, and take the number of degrees that the hill is in height, higher then the ground that you stand vpon, and that is done (as before is declared) and then you finde that the marke is fise degrees higher than the grounde that your peece lyeth vpon, then adde that number vnto the other, and that maketh in all nine degrees iust, for that the peece is moued foure degrees for to reach the marke, and fise degrees for the height of the marke, whiche is higher grounde than that the peece doth lye vpon, then laying the peece right vpon the marke, there is no doubt but that you must needes make a perfecte shotte, and to lay the peece right vpon the mark, the peece being moued

ted (as befoze is said) then take a plummet of leade vpon a small line or string, and lette that be holden vp at the breech, at the very end of the peece, euen at the very middle of the tayle of the peece, then stand directly behind the peece, and wind the peece, till you doe see the middle of the mouth of the peece, and the marke, all thre vpon one right line, by the sight of your eye, twinkling with one of your eyes, and there is no doubt, but your peece doth lye right vpon your marke, and so forth. And now in like manner, if you doe make a shotte towards a valley, and the marke moze then the peece will reach vpon the right line, then knowing the distance vnto the marke mounte the peece, till it be able to reach the marke, then turne your Quadrant, that the sight go downewards, the plummet hanging at libertie, then you may see how many degrees the ground is lower, then the ground that the peece doth lye vpon, and rebate so many degrees as that number commeth vnto, and laying the peece right vpon the marke, there is no doubt but you shall make a perfite shotte, as by an example with that peece and at that distance befoze rehearsed, to a marke in a valley, the ground being lower at the marke you shoote at by thre degrees, then that ground that the peece doth lye vpon: now you must mount the peece foure degrees to reach the marke, and then you must rebate thre of those degrees for the lownesse of the marke, and then you may conclude, that the peece being mounted but one degree, it doth shoote that distance that it did at nine degrees. And the reason thereof is most manifest, for that the one is by the hill, and the other downe the hill. And furthermore, with that peece, and at that distance befoze spoken of, and also at that number of degrees downe the hill that the other was by the hill, that was at five degrees, & now foure degrees will reach the marke vpon a platne leuell ground, but for that

that it is done the hill, you must rebate five degrees. Wherefoze you may conclude, that the peece must be leuelled with the Quadrant, one degree vnder the poynct blanke. that is to saye, lower then the Horizon by one degree, for that the depenelle of the valley is the cause thereof. Wherefoze in mine opinion, it is better for Gunners to vse to giue leuell with an ynch rule, as I do afoze declare in the eight Chapter, for I doe know, that this is the cause that hath deceiued a greate number that are meanly scene in those matters, and for lacke of considering of those causes that may happen or chaunce, hath discouraged many that would haue been wel scene in those matters.

Howe to make a perfite shotte vpon

on the lande, at the brode side of a Shippe that is vnder sayle, and going.

CHAPTER. 14.



Furthermore, for the making of a perfite shotte vpon the lande, at a shippe that is vnder sayle in a Riuer, the chiefest matter is, to haue good Powder, that the peece may goe off so soone as shee hath fire giuen vnto her: and to shoote at her by the side, doe this: First befoze she commeth to you, vnto at what proportion she commeth, that is to say, whether that she commeth in the middle, or vnto any of the sides, or vnto any other proportion, then your peeces being truly disparced, lay your peece against some marke tye the further side of the Riuer, that being done, then layne by the tayle of the peece, till the top of the disparced standerth with that proportion which the ship commeth vpon: that being

being done, then it is good for you to haue another imagined marke, somewhat neerer the Shippe, besides that marke which the peece lyeth vpon, like a twentieth foote, according vnto the way of the Shippe, for if that the Shippe haue fresh way, then giue fire vnto the peece of peeces, twentieth or thirtie foote, before that the Shippe cometh vnto your thwart marke that the peece lyeth right against, and this being discretely done, there is no doubt but you shall make a perfect shot. And furthermore, if it be vpon the Sea coast, where there is no land scene vpon the further side, then take a thwart marke by some Cloude that is alow nere the Horizon. And furthermore, if that any shippe doe go directly from you wards, or else come directly to you wards, then it is a small matter to make a perfect shotte, that is to say, if that her head or sterne be towards your Ordnance. &c.

Howe to make a shotte out of one

*Ship vnto another, that although the Sea be wrought,
or out of a Galley to a Shippe.*

CHAPTER. 15.



As for Gunners that do serue by the Sea, must obserue this order following. First that they doe foresee that all their great Ordnance be fast breeched, and foresee that all their geare be handsome and in a readinesse. And furthermore that they be very circumspect about their Powder in the time of seruice, and especially beware of their linestockes & candles for feare of their Powder, & their fireworks, & their Drum, which is very dangerous, and much to be feared. Then furthermore, that you do keepe your peeces as nere as you can, vnder within, and also, that you keep their tutch-
holes

holes cleane, without any kinde of drosse falling into the. And furthermore, it is good for the Gunners to view their peeces, and for to know their perfect dispart, and marke it vpon the peece, or else in some Booke or Table, and name euery peece what it is, and where she noth lyeth in the ship, and name how many ynches, and half ynches and quarters of ynches the dispart cometh vnto, and then in time of seruice, although that you haue no time to set vpon your dispartte you may consider of it, and doe it well ynough. And furthermore, if that you were giuen to make a shot vpon a loddayne, and knowe not what dispartte would serue the peece, yet this you may doe, and speede well ynough: first looke all alongst by the side of the peece as nere as you may at the middle of the breech of the peece, vnto the middle of the mouth of the peece, and so by the sight of your eye, lay it right against the marke, and then koyne by the table of your peece fast, for that giueth the peece the true height of the marke: then take the next sight aloft vpon the peece, from the breech of the peece, vnto the mouth, and so laye the peece right vpon the marke. But you would iudge by the sight of your eye, that the peece lyeth a great deale, vnder the marke: for that the mettall of the peece is a great deale thicker then the mettall of the mouth of the peece, and therefore the sight of the side of the peece, giueth her the true height of the marke, and then laying the peece right with the Ship that you doe meane to shooote at, looking well to your Streetadge. Nowe furthermore, if the Sea be wrought or growen, & the Shippes do both heaue and set, then if you would make a perfect shot, do this: First choose your peece between the Lauslau, and the mayne Mast, vpon the lower Dylippe, if the Shippe may keepe the pozte open, and for this cause you shall do it, for that the ship weth least labour there: for any Shippe that doth heaue, and set neuer
It is. so

to soze, doth hang as though she were vppon an Ariltee, there labouring least, except she doth scel oꝝ roule. But if any Ship hang any thing by the wind, is will not lightly scel oꝝ roule. Then if you doe make a shoote at another Shippe, you must bee sure to haue a good helme-man, that can stirre steadie, taking some marke of a Cloude that is aboue by the Horizon oꝝ by the shadowe of the Sunne, oꝝ by your standing still, take some marke of the ocher Shippe through some hole, oꝝ any such other like. Then he that giueth leuell, must obserue this: first consider what disparte his peece must haue, then laye the peece directly with that parte of the Shippe that he doth meane to shoote at: then if the Shippe bee vnder the lee side of your Shippe, shoote your peece in the coming downe of the Gayle, and the beginning of the other Ship to rise vpon the Sea, as neere as you can, for this cause, for when the other Shippe is aloft vpon the Sea, and shee vnder your Lee, the Gayle maketh her for to head, and then it is likeliest to doe much good.

Now furthermore, if that the Shippe you doe shoote at haue the weather gage of you, then your peece that you doe shoote at her, must needs bee on the weather side of the Shippe: then giue fire vnto the peece in the righting of both the Shippes. When that the Gayle is ouer, you must awaite when the other Shippe doth beginne for to arise vpon the Sea, and especially that part of the Ship that you doe meane for to shoote at, for this cause, for when that the Gayle is ouer, then both the Shippes doe righte, for if that you should shoote in the helding of your Shippe, then you shoulde shoote ouer the other Shippe. And furthermore, if you shoote when the other Shippe is aloft on the toppe of the Sea, you haue a bigger marke than when she is in the trough of the Sea. Therefore there is no better time for to giue fire,

fire, then when shee is beginning to rise vpon the Sea, that is, when you see her in the trough of the Sea: and you must vse that according vnto the distance betwene two Shippez, for you must consider, that the shotte must haue a time for to come to the shippe, for no man can describe the thing so well, as hee that doth see the thing apparance befoze his eyes, for his reason in those causes must helpe him, and the principallest thing is that, that hee that is at the Helme must be sure to stirre steadie, and bee ruled by him that giueth the leuell, and hee that giueth fire, must bee nimble, and readye at a suddayne. And also hee that is at the Helme, must bee nimble and steady, that is, to putte roomer, when that the other Shippe dothe putte roomer, and for to loose, when that the other Shippe doeth plye his loofe. And it is good for the Gunner to koyne the mouth of his peece, somewhat with the lowest, rather then any thing with the highest, for if that the shotte flyeth ouer the Shippe, then it dothe no good, but if that it cometh shorte of the Shippe, it will graze in the water and rise againe, and speede well ynough, so that it bee not too muche too shorte of the Shippe, for too muche too shorte dothe kill the shotte in the Sea and especiallly if that the distance bee anye thing farre off. And furthermore, for the Sea fight, if the one doe meane to laye the other aboozde, then they doe call by their company, eyther for to enter oꝝ to defend: and first, if that they doe meane for to enter (as you may knowe) that hee will please to laye you aboozde, then marke where that you doe see anye Scottles for to come vnye at, as they will stande neere there aboues, so the intentione for to bee readie, for to come vnye vnder the Scottles: there giue leuell with your Fowlers, oꝝ Slingses, oꝝ Balles, for there you shall bee sure to doe most

most good, then furthermore, if you doe meane for to enter him, then giue leuell with your Fowlers and Portpees, where you doe see his chiefest sight of his Shippe is, and especially be sure to haue them charged, and to shoote, them off at the first boording of the Shippes, for then you shall be sure to speede. And furthermore, marke where his men haue most recourse, there discharge your Fowlers and Bales. And furthermore, for the annoyances of your enemy, if that at the boording that the Shippes lye, therefore you may take away their steeradge with one of your great peeces that is to shoote at his Rother, and furthermore at his mayne mast, and so forth. Thus muche haue I said as touching Sea Gunners, for that I doe know they do meddle with no other sightes, and therefore it is meete for him to seeke as much as in him lyeth, for to annoy the enemy with fireworkes and Ordnance &c. And furthermore if the Shippe both seell or rowle, then the best place of the ship for to make a shotte, is out of the head or sterne. And furthermore, for to make a shot out of a Galley, and especially the Cannon that lyeth in the Case, or Prow, he that giueth fire, must be ruled by him that is at the helme, because he can neyther koyne her vp nor downe, for that she lyeth in the case, for he that stirreth, must giue leuell. And furthermore, the Cannon that lyeth in the case, can not lightly shoote a shippe vnder water, neither betwene the wind and the water, where that it is not on the Sea, and especially if the Ship be at hand, for that she lyeth leuell, for looke how high, that the peece is above the Sea, so high shall the shotte hitte any thing above the water, as farre as the peece can cast vpon the right line. And for to make a shotte out of a Galley vnto a Shippe, for to strike him vnder the water, or betwene the wind and the water. First waight the Shippe lying in the trough of the Sea, when she both begin to rise vpon the

the Sea, and then in lyke manner, when you do see that the Galleys head doth beginne to descende, then giue fire vnto the pece, and you shall make a perfitte shotte. Furthermore, if the Galley be in sight with another Shyppe in a calme, then the Shyppe will skant waue oꝝ stirre, and then the Galley may play off and on at hir pleasure: and then to make a shotte at hande, is some matter, foꝝ in a calme, the Shyppes doe neither ryle noꝝ fall, but a little, in comparisō of any thing to the purpose: neyther dothe the Galleys heau either heaue noꝝ set to any purpose, if the Shippe be at hand, to the intent oꝝ purpose to shoote a Shippe vnder the watter. Therefore when you meane to strike a Shippe vnder the water with a Galley, and dare not lay them abooꝝde, then hoyle your Cabels forwarde, with the trimming forwarde of your waightie geare into the Galleys head, so lowe, till it shall serue your turne, by spinging also your men forwarde: then by y^e Steeradge with your Ores, oꝝ with your Helme, you may shoote against what part of the Shippe you will, and so shoote hir vnder water at your pleasure.

In what order to place Ordnaunce

in Shippers.

CHAPTER 14



Ad further more, I do thinke it conueniense to shew you how to sit oꝝ place Ordnance in any Schippe: this is to be considered, first that y^e cariage be made in such sort, that y^e peece may lye right in the middle of the poꝛt, & that the trockes oꝝ wheeles be not too hygh, soꝝ if y^e trockes be too high, then it will keepe the cariage that it will not goe close vnto the Schippes side, and by that meanes the

Peere will not scant go out of the pozte, excepte that the peere be of some reasonable length: and also, if that the Shyppe doe holde that waye, the Trockes will alwayes rine close to the Shyppes side, so that if you haue any occasion to make a shoote, you shall not hying the Trockes off from the Shyppes side, but that it will rine too again. And the wheele oꝝ Trocke beyng very hygh, it is not a small thinge vnder a Trocke wyll stay it but that it may runne ouer it, &c.

And also, if that the Trocke be hygh, it wyll cause the peere to haue the greater reuerse oꝝ recople, therefore, the lower that the wheeles oꝝ Trockes be, it is the better and so forth.

Alwayes prouided, that the peere bee placed in the verye middle of the pozte, that is to saye, that the peere lye leuell at poynte blaunke, and the Shyppe, to bee vprighte, without anye heldding, that it be as many inches from the lower syde of the pozte beneath, as it is vnto the upper part aboue iustely. And the deeper oꝝ hygher that y^e poztes bee vp and downe, it is the better to make a shot, for the heldding of the Shyppe, whether that it bee the lee syde, oꝝ the weather syde of the Shyppe, for if you haue anye occasion to shoote eþther forwarde oꝝ backwards, the steradge of the Shyppe wyll serue the turne, but if that the Shyppe dothe heelde muche, then if that the peere bee lette by the lower parte of the pozte, then you muste needes shoote ouer the marke, and if it bee lette by the upper syde of the pozte, then you shall shoote shorte of the marke. &c. Wherefore, when that the Carpenters dothe cutte out anye poztes in a Shyppe, then lette them cutte them out deepe ynough hye and doونه. &c.

And also, it is verye euill, for to haue the Dylippe
oꝝ

oꝝ Decthe too lowe vnder the pozte, for then the carriage muste bee made verye hygh, and that is verye euill in dyuers respectes, for then in the shooting off the peere, it is apte to ouerthrowe, and also by the labouring and the sccleng of the Shyppe, and so forth.

And furthermoze, you muste haue a consydera-
tion for the setting of youre Ordaunce in the Shyppes, as thys, the shorter Ordaunce is beste to bee placed out at the Shyppes syde, for two oꝝ thre causes, as this.

Fyrst, for the ease of the Shyppe, for the short-
nesse they are the lyghter: and also, if that the Shyppes shoulde heelde wþ the bearyng of a Sayle, that you muste shutte the poztes, especially if that the Ordaunce bee vpon the lower Dylippe, and then the shorter peere is the easer to bee taken in, both for the shortnesse and the weyght also.

In lyke manner, the shorter that the peere lye-
eth oute of the Shyppes syde, the lesse it shall annoy them in the tacklyng of the Shyppes Sayles, for if that the peere doe lye verye farre oute of the Shyppes syde, then the Sheetes and Tackes, oꝝ the Bolynes wyll alwayes bee foule of the Ordaunce, whereby it maye muche annoy them in foule weather, and so forth.

And it is verye good for you to haue long Ordaunce to bee placed righte oute of the Sterne of the Shyppe for two causes: the one is this.

The peere muste lye verye farre oute of the pozte, oꝝ else in the shooting, it may blowe vp the Counter of the Shyppes sterne.

And also, the peere had neede be very large, for else it
A 2 will

will not go very farre out, for the worke of a ships sterne hangeth very farre outwards from the decke of Dylloppe by to the pozte, so that the carriage may be close belowe, but not aloft, &c. And also if you haue any chaling peeces to shoote right forwarde, then they must bee long Ordnance in like manner, so that you must sitte your Ordnance, according vnto the place that it must lye in, and also (as is before rehearsed) that it is not good for to haue the mountance of carredge to high. Therefore, if that the Dylloppe of decke bee too lowe vnder the pozte, then it is good for you to make a platforme vnder the pozt, that the trockes of the carredge may stand vpon. And also, when you doe take the measure of the pozte, from the decke of Dylloppe, to the end to sitte the mountance of carredge in heighe, that the peere may lye right in the middle of the pozte, then you viewing the decke of Dylloppe, and considering what heighe you will haue the wheele of Trocke, and also marke whether of how that the Ships side both hang inwards, or outwards, and also the Cambering of the decke of Dylloppe, and then you perceiving where the foremost trockes both of must stande, when that the carredge both go close to the pozte. Then where as the very middle of the foremost trockes dothe stande, there take the true measure in heigth from the Decke of Dylloppe, bywards, and so shall you knowe iustly howe many ynches will laye the peere righte in the very middle of the pozte: for if you doe take the measure of the heigth of the pozte from the pozte downe vnto the Decke of Dylloppe, then by the meanes of the Cambering, the Decke of Dylloppe, and also the wheelles of Trockes doth not come to stand right vnder the pozte, so by that meanes the Decke of Dylloppe is higher inwards, and that shal cause you to make the mountance of carriage too high, for that the wheelles of Trockes that the carriage lyeth vpon, shall be a foote

more

more or lesse into the Shipwards, and then looke into the Cambering of the Decke of Dylloppe, that it riseth inwards more, than it is righte vnder the Pozte, you shall take the measure so much too high for the peere to lay her right in the middle of the Pozte &c.

How to shoot at a moueable mark

*upon the lande, and also what kind of shotte is
the best to be vsed, according vnto
the cause &c.*

CHAPTER. 17.



And furthermore, to shoote at any moueable marke vpon the land, either at Horsemen, or at footmen, when you do see the comming, then place your Ordnance vpon some marke in their way, as right vpon some bush, or any other marke that is in the high way, that they must come by, or most specially at some place where there is a turning, for in a turning, there they doe carrie longest before they be altered fro the marke, and then it is best shooting off your Ordnance to do any spoule: and also vpon the land, you may try what any peere will do at any marke, as touching the keeping of the length of the marke, &c. And furthermore, as touching this, to knowe what kind of shotte is most meetest to be vsed to doe seruice in a field, or otherwise, with their great Ordnance, as Cannons, or Culuerings, at a great distance, to shoote the whole ppon shot as you doe at battery, & as they doe approach neere, then to shoote Faucon shotte, and as they doe come neerer, Faconet shotte, or final balle shotte, and at hand all manner of spoyling shot, as chayne shotte, or cliue shot, and dise shot, and such other like. &c.

A iii.

How

How you shal knowe if any peece

of Ordnance bee sufficiently mettalled, and

also the cause that the Cannons doe not occupie the weight in Powder that the shotte vrieteth.

CHAPTER. 18.



DO to knowe whether that any peece of Ordnance bee sufficiently metallled to beare her charge with Powder, then this is generall, that in the chamber before the tutchhole, so farre as the Powder doth reach to y^e mouthwards, that the mettall be in thicknesse as high as the shot round about the sides of the peece, and somewhat thicker, and if that the mettall be not in thicknesse as much as the height of the shotte, then she is too slenderly mettalled, &c.

And furthermore, the cause why the Cannons and other great Ordnance doth not shooe so much Powder in weight as the shotte vrieteth, although that the rule and order of the founders of Ordnance, is to cast the thicknes of the mettall as much as the shotte is in height of al sortes of peeces, as wel in Cannons, as in al other sortes of peeces, and yet the Cannon maye not haue the weight in Powder that the shotte weyeth, as all small Ordnance hath.

And furthermore, the cause thereof groweth by this meanes, for in the doubling the thicknesse of the mettall of the peece, it doth but increas as a platfome, or superficiall, that is, for double measure, to be foure times the quantitie. And as for the shotte in the doubling of the measure, it is eight times the quantitie, and so it is in all

bodys

in great Ordnance.

bodys as Cubes, or Globes, and such other like, as I haue moze at large declare in the third part of my booke, called A treasure for Trauellers. And yet you shall haue this example here by a shotte of thre ynches high, and that shot weyeth thre pound thre quarters, the peece being a Pinion, and the mettall is thre ynches thick. And now I haue another peece that the shotte is double the height, that is, six ynches high, and the shotte will wey thirtie pounde, and now the mettall being double, is but six ynches thicke, and the bigger shotte is eght times the bignesse of the lesser, and the measure but double, yet notwithstanding, the diuersitie is not so much as it seemeth: for if that both the peeces were cast of one length, and double in measure, in compasse in all places, then the bigger peece should wey foure times the weight of the lesser. And this is the cause, that the Cannons must not haue the weight in powder that the shotte weyeth, for the weight of the peece, and the weight of the shotte, must rule the matter, as I doe plainly shewe in the third Chapter of this booke going before.

In

In what order you shall giue

leuell with your Ordnance at
*a batterie, to beate downe the walles of
 any place, and also what so ob-
 serue, in the giuing fire
 vnto them.*

CHAPTER. 19.



A I doe think, it is not vnmeet to shew
 by what order you shall giue your leuell,
 and shoote off your Ordnance at a Bat-
 terie, that is to saie, to beate downe, or
 shake downe the walles of any Towne
 or fortesse: & for þe beating them downe
 in the giuing of your leuell, and shooting them off, do this:
 after that you haue placed your Ordnance, eyther in two
 places or in three places, as the place doth require, but in
 my opinion, two places is sufficient vnto one place, to beate it
 downe, to the intent to make a breach, and if it be vnto a
 Collion point, then it is best to place your battrey but in-
 to two partes, and otherwise as the place doth require, &
 then in giuing of leuell, do this. First, wheras you do mean
 to beginne to make the breach, and being but at one place
 of your Ordnance, giue leuell with one peece belowe, at
 the bottome of the wall, and with the next peece a foote
 higher right ouer that, and with the third, right a foote ouer
 that, and so sooth vnto euery peece at that part of þe bat-
 tery, sauing you neede not giue the leuell vnto no peece,
 moze than thre quarters the heighth of the wall, and then
 in like maner, giue your leuell with your peeces at the o-
 ther parte of poure battrie, vnto that place that the other
 part was layd right against, within a sadome or moze, at
 poure discretion, as the place requireth, so that the one
 place

place may flanke or beate against the other, crossing in
 the middle of the wall, and when you doe meane to shoote
 them off, then giue fire vnto them all at once at both the
 places, that they may all beate and shake the wall at one
 time together, and then it will beate it downe or shake it
 downe the faster, and the bottome being beaten away, the
 toppe will fall away of ic selfe, and so when that you haue
 broken the wall, and til do make it wider, then giue leuel
 at your discretion vpon the wall, obseruing the order be-
 fore rehearsed, both in the leuelling, and of the giuing of
 fire vnto the peeces, &c.

The weight of all manner of cast

*peeces of Ordnance, from the Cannon, vnto the Fauconet,
 and also the weight of the shotte, and the weights of the
 Powder that they doe occupie, with the heights of
 the shot, and length of the peece and all such
 other like causes, according vnto the
 names of the peeces, &c.*

CHAPTER. 20



Ad furthermore, I do thinke it conueni-
 ent, to shew vnto thee the weight of the
 shot, and the weight of the Powder that
 they doe wey, and the length and breadth
 of the Label, and the weight and length
 of þe peeces, according vnto their names.
 And first, for the Cannons, & there be of sundrie sortes. The
 eldest & biggest sorte of the double Cannons, the mouth of
 them is in height 8. ynches and a quarter. The shot is in
 height 8. ynches, and wapeth about 70. pound of yron, and
 the weight of the peece is about 8000. & in length, about
 12. foote moze or lesse, and composeth in Powder. 46.
 pound Serpentine. The length of the Label is 24. ynches,
 the

the breadth of the Ladell is. 15. ynches $\frac{1}{2}$ or.

The ordinarie double Cannons, the peece is. 8. ynches high in the mouth, the shotte is in heigh. 7. ynches three quarters, it weyeth of yron about. 64. pounce, and the weight of the peece is about. 7500. and in length neere about eleuen or twelue foote long, and occupieth in Powder. 42. pounce Serpentine, the length of the Ladell is 23. ynches a quarter, the breadth thereof fifteene ynches $\frac{1}{2}$ and the compasse of the shotte is foure and twentie ynches.

The French double Canons, the peece is in the mouth leauen ynches three quarters, in heigh the shotte leauen ynches $\frac{1}{2}$ high, and weyeth being of yron about. 58. pounce, and the peece weyeth about leauen thousande, and is in length as the other before rehearsed, composeth in Powder neere fortye pounce Serpentine: the length of their Ladels is but fifteene ynches, for that they doe lade their peeces with three Ladelfulles, and we heere in England but with two, and the breadth of the place of their Ladell is fifteene ynches, &c.

Demy Cannons,

And first the Demy Cannons of the eldest sorte, the peece is sixe ynches three quarters in heigh, in the mouth, the shotte sixe ynches and a halfe in heigh: the shotte of yron weyeth eight and thirtie pound, and the weight of the peece is neere sixe thousande, and in length eleuen or twelue foote long, and occupieth in Powder sixe and twentie pounce Serpentine, the length of the Ladell thye and twentie ynches, the breadth of the plate of the Ladell twelue ynches $\frac{1}{2}$ partes, and the compasse of the shotte is twentie ynches $\frac{1}{2}$ partes.

The

The ordinarie Demy Cannon, the heigh of the mouth is sixe ynches and a halfe, the heigh of the shotte sixe ynches a quarter, the weight of the shotte in yron thirtie three pounce, and the weight of the peece is about 5500. and the peece is in length tenne or eleuen foote, and her charge in Powder is foure and twentie pounce Serpentine, the length of the Ladell is two and twentie ynches, and the breadth of the plate of the Ladell is twelue ynches.

Some sortes of Demy Cannons, the heigh of the mouth of the peece but sixe ynches, a quarter, the heigh of the shot sixe ynches, the weight of the shotte of yron thirtie pound, and the weight of the peece sixe thousand, or. 5400. the length as aforesaid, her charge in Powder foure and twentie pounce Serpentine, the length of the Ladell thye and twentie ynches, the breadth eleuen ynches and a halfe.

The French Demy Cannon, and of some other soveraine Nations, the height of the mouth of the peece but 6. ynches, the height of the shotte sixe ynches three quarters, the weight of the yron shotte sixe and twentie pound, and the weight of the peeces sixe thousande more or lesse, their lengths of the ordinarie sorte, and shooteth in Powder two and twentie, or thye & twenty pound Serpentine, the length of the Ladell fifteene ynches, and thye Ladell fulles to charge the peece: the breadth of the Ladell eleuen ynches.

Culuerings.

The elder sorte of whole Culuerings, called of some Rorobow Culuerings, the height of the mouth of the peece sixe ynches and a halfe, the height of the shotte

¶ ii.

shotte

shot. 5. ynches a quarter. The weyght of the shotte in y^{rs} 20. pound. The weyghte of the peece. 4800. moze o^r lesse, their lengthes beuiden, as. 1 2. o^r. 1 3. foote long, and shooteth in Powder. 20. pound Serpentine, the length of the Ladell. 2 3. ynches, the breadth of the Ladell neere tenne ynches. &c.

The ordinarie whole Culuering, the heygth of the mouth of the peece. 5. ynches a quarter, the heygth of the shotte, 5. ynches. The weyghte of the shotte of yron. 17. pounce. The weyghte of the peece aboute. 4500. moze o^r lesse, the length of the peece. 1 2. foote, and composeth in Powder. 18. pounce Serpentine, the length of the Ladell 2 5. ynches, the breadth 9. ynches. v. &c.

Culuerings, not so high as ordinarie, the heygth of the mouth of the peece. 5. ynches, the heygth of the shotte foure ynches thre quarters, the weyghte of the shot. 15. pounce, the weyght of the peece moze o^r lesse. 4300. the length of the peeces diuers, some the ordinarie length, some otherwise, and occupieth in Powder. 16. pound, o^r therabouts Serpentine, the length of the Ladell. 24. ynches, the breadth 9. ynches.

Demy Culuerings.

The elber sort of Demy Culuerings, the heigth of the mouth of the peece. 4. ynches thre quarters, & heigth of the shot. 4. ynches $\frac{1}{2}$, the weyghte of the shotte. 12 $\frac{1}{2}$. v. of yron, the weyght of the peece. 3200. the length of the peece. 1 2. foote moze o^r lesse, and their charge in Powder 12. pounce Serpentine, the length of the Ladell. 22. ynches, their breadth. 8. ynches. v. &c.

The ordinarie Demy Culuering, the heygth of the mouth of the peece. 4. ynches v. the heygth of the shotte 4. ynches a quarter, the weyght of yron shotte. 10. pound, thre quarters, the weigth of the peece. 27. hundred o^r there-

therabouts, the length of the peece. 10. foote moze o^r lesse, and will compose in Powder. 11. o^r. 12. pounce Serpentine, the length of the Ladell. 21. ynches a quarter, the breadth. 8. ynches.

Demy Culuerings lower than ordinarie, the heygth of the mouth of the peece. 4. ynches a quarter, the heygth of the shotte. 4. ynches, the weyght of the shotte being of yron is neere. 9. pounce, the weyght of the peeces. 22. hundred moze o^r lesse, the length of the peece. 9. o^r. 10. foote moze o^r lesse, and their charge in Powder. 10. pound o^r. 10. pounce. Serpentine, the length of the Ladell. 20. ynches, the breadth. 7. ynches, thre quarters. &c.

Sakers.

Sakers of the oldest sort, the heygth of the mouth of the peece. 4. ynches, the heygth of the shot. 3. ynches thre quarters, the weyght of the yron shotte. 7. pounce a quarter, the weyght of the peece. 1800. the length of some of those peeces. 10. foot, and composeth in Powder. 7. pound a quarter Serpentine, the length of the Ladell. 17. ynches, the breadth. 7. ynches a quarter.

Sakers ordinarie, the heygth of the mouth. 3. ynches thre quarters, the heygth of the shotte. 3. ynches a halfe, the weyghte of the shotte of yron is neere. 6. pounce, the weyght of the peece. 1500. the length of the peece. 8. foote o^r. 9. foote, and his charge in Powder is. 6. pound, o^r therabouts of Serpentine Powder, the length of the Ladell is. 15. inches thre quarters, & breadth. 6. inches. 3. quarters. &c.

Sakers lower than ordinarie, the heigth of the mouth of the peece. 3. ynches a halfe, the heygth of the shotte 3. ynches a quarter, the weyghte of the shotte of yron. 4. pounce thre quarters, o^r neere. 5. pound, the weyghte of the peece. 1300. o^r. 1400. the length of the peece. 8. foote, o^r therabouts, and composeth in Powder. 5. pounce, o^r

5. pounce v. Serpentine, the length of the Laddell is thirteene ynches, the breadyth fyve ynches and a halfe.

Minions.

The Minion is. 3. ynches and a quarter high, in the mouth, the shotte is thre ynches bygh, the weyghthe therof of yron, is thre pound thre quarters, the weighte of the peece, neere aboute. 1000. The length of the peece eyght foote or therabouts, and shooteth in Powder thre pounce thre quarters, or neere foure pound Serpentine, the length of the Laddell thirteene ynches v. the breadyth 5. ynches and a halfe, some sayne peeces lower. The ordinarie Minion, the mouth thre ynches high, the shotte but two ynches thre quarters, and weyeth of yron neere thre pound, the weyght of the peece about nine hundred, the length of the ordinarie Minion, & shooteth in Powder thre pounce or thereabout, the length of the Laddell. 13. ynches, the breadyth 5. ynches. &c.

Faucons.

The Faucon, the heygth of the mouth of the peece. 2. ynches thre quarters, the heygth of the shotte. 2. and a halfe, the weyght of the yron shotte. 2. and half a quarter of a pound, the weyght of the peece seauen hundred, or seauen hundred and fiftie pound, the length of the peece seauen foote more or lesse, and occupieth in Powder two pound and a halfe, and the length of the Laddell is twelue ynches and a halfe, the breadyth of the plate of the Laddell is. 4. ynches and a quarter. &c.

Some sayne Ordnances not so high as the Faucon, and the mouth of the peece. 2. ynches and a halfe high, the shotte. 2. ynches and a quarter high, and weyeth neere one pound thre quarters, and the weyght of those peeces fyve hundred, or six hundred and fiftie pounce, the length is
as the

as the Faucon, and the charge is in Powder neere two pounce, the Laddell is eleuen ynches and a quarter, the breadyth foure ynches.

A Fauconet, the peece is. 2. ynches and a quarter high, in the mouth, the shotte two ynches high, and the yron shot weyeth one pound, and neere halfe a quarter of a pound, and the weight of the peece is aboute. 360. or 400 and the length fyue or six foote, and the charge is of Serpentine Powder, one pound and a quarter, the Laddell is tenn ynches long, and the breadyth of the plate of the Laddell. 3. ynches thre quarters. And thus much I haue said as touching all manner of peeces that shoot yron shotte, thinking this sufficient for instructions. &c.

How many shottes of Powder ther

is in a last of Powder, from the cannon, vnto the Fauconets and also, if that you are at any batterie, or in any Towne, Castell, or Shippe, how to know how much Powder will shoot all your Ordnance, &c.

CHAPTER. 21.



And also, I doe thinke it necessary for all sortes of Gunners, to know how many shottes of powder they may haue eyther in a last of Powder, as also in a hundred pounce, of Powder according vnto the peeces, whereby they may readily know, if that they haue any charge of Ordnance in any Towne, Castell, Fort, or Shippes, that they may know whether that they haue Powder to lade al their Ordnance throughout, & also how oftentimes about & they may shoot al their Ordnance wth so much Powder. And al so it is very necessary, if & there be any Ordnance placed against any towne or fort, & if & they haue any number of great Ordnance,

Ordnance, as Cannons such a number, and Demy Cannons such a number, to the intente to batter downe the walles thereof: and then it is very necessary to know how much Powder will shoote all those Ordnance off at one time, and so forth, if that they would continue the batterie, to shoote. 40. or 50. times ouer all their Ordnance in one day, and so to know how many last of Powder that the batterie will require to continue suche a number of dayes: wherefoze I doe thinke it conuenient to shew vnto you what a last of Powder is, and that is this. A last of Powder is 24 hundred weight, caske and all, and euery hundred weight to contayne. 112. pound, so that you may make your accompte, that you haue 24. hundred pounde of Powder in euery last, and so is allowed 12 pound in euery 100. weight, for the caske, which is in al allowed for the caske of a last of Powder, 288. pound. &c.

And first this: the biggest sortes of double Cannons doe occupie at one shotte. 46. pound of Serpentine Powder, and you haue. 2. charges in. 100 of powder, and eight pounde remayneth ouer, so that you haue 52. shottes of Powder, in a last of powder, and 8. pound remayneth ouer. And if that it be such a double Cannon, as doth occupie but 40. pound of Serpentine Powder, then you haue 2 shottes and a halfe of Powder in euery. 100. weight of Powder, that is iust. 60. shottes in a last of Powder. &c.

And also, those Demy Cannons that doe shoote. 24. pound of Serpentine Powder at one shot, they shall haue foure shottes in a hundred weight of Powder, and foure pound remayneth ouer, and that is a hundred shottes, in a last of powder iust &c.

And also those Culuerings that doe shoote eyghtene pound of Serpentine Powder at one shotte, then there is five shottes in a hundred weight of Powder, and then there remayneth ouer tenne pound, so that there is a hundred

ouer thirty three shottes in a Last of Powder, & five pound remayneth ouer. And furthermore, those Demy Culuerings that doe shoote eleuen pound of Serpentine Powder at one shotte, then there is nine shottes in a hundred weight of Powder, and one pound remayneth ouer, so that there is two hundred and eightene shottes in a last of Powder. &c. And also for those Sakers that doe shoote five pounde and a halfe of Serpentine Powder at a shotte, then there is sixteen shottes in a hundred weight, & two or three pound remayneth, so that there is. 369 shottes in a last of powder. And furthermore, for Pinions that shoote foure pound of Powder at one shotte, then there is. 25. shottes in a hundred weight, so that there is five hundred shottes in a last of Powder. And also those Faucons that doe shoote two pound and a halfe of Powder at a shotte, then there is forty shottes in a hundred weight, so that there is. 960. shottes in a Last of Powder. And in like manner those Fauconets that doe shoote one pound and a quarter of Powder at a shot, then there is. 80. shottes in a hundred weight, so that there is. 192. shottes in a last of Powder. And thus much I haue saide, as touching how many shottes of Powder, according vnto peeces, & there either is in a hundred weight of Powder, or in a whole last of Powder. And furthermore, if you desire to knowe how much Powder would shoote off all the Ordnance, either in a Towne, Fort, or Shippe, then looke how many peeces there is of euery sorte, and so buttill that you do know how many peeces there is of euery seuerall sortes throught a whole Towne, or Castell, or Shippe, and then looke how many peeces there is of one sorte, multiplie the number of those peeces by the weight of the Powder, that one of those peeces doth shoote at one shotte, and that will shew vnto you how many pounde of Powder will serue all one sorte of peeces, and by this order multiply euery seuerall sortes of peeces by themselves,

& the adde al your nũbers together, & that shall shew unto you how much Powder will shoote al your Ordnance off at one time. As for example this. Ther is a towne, y^e hath 3 double Canons & 6 Demy Canons, and 14 double Culuerings, & 10 Demy Culuerings, & 30 Sakers, and 25 Minions, & 28 Faucons, & 12 Fauconets, and 36 Foulers, & my desire is to know how much Powder will serue all these peeces: therfore first, the 3 double Canons, & they do shoote 40 lb. of Powder, and 3 times 40 is 120. & then y^e Demy Canons do shoote 24 lb. of Powder, & 6 times 24 maketh 144 lb. of Powder, and then the 14 double Culuerings & they do shoote 18 lb. of Powder, and 14 times 18 maketh 252. & then the 20 Demy Culuerings & they shoote 11 lb. of Powder, and 20 times 11 maketh 220. & now the 30 Sakers and they do shoote 6 lb. and a halfe of Powder, and 30 times 6 $\frac{1}{2}$ is 195. and then y^e 25 Minions, & they do shoote 4 lb. of Powder and 25 times 4 maketh 100. and then the 28 Faucons, and they do shoot 2 lb. and a halfe of Powder, and 28 times 2 $\frac{1}{2}$ both make 70. and then the 12 Fauconets & they do shoote 1 lb. and a quarter, and 12 times 1 $\frac{1}{4}$ both make 15. and now the 36 Foulers & they do shoote 2 lb. $\frac{1}{2}$ of Powder, and 36 times 2 $\frac{1}{2}$ maketh 90. & now this being done, then adde al your numbers together, as this.

Names of peeces.	Peeces number.	Powder in pounds.
Cannons.	3	120. pound.
Demy Cannons.	6	144 pound.
Culuerings.	14	252. pound.
Demy Culuer.	20	220. pound.
Sakers.	30	195. pound.
Minions.	25	100. pound.
Fancous.	28	70. pound.
Fauconets.	12	15. pound.
Foulers.	36	90. pound.
Summe totall.	174	1206. pound.

And now by this you may conclude, that all this Ordnance doth shoote at one time, to shote the off round once out doth require. 1206 lb. of powder, & by this order you may know at al times, whether you are in any town, fort, Castell, or Ship, how much powder will serue al the Ordnance at your pleasure. And furthermore, if so be you haue such a quantity of Powder, and if you would know how oftentimes it would shote all your Ordnance, rounde aboutes, then you knowing how much powder will shoote all your Ordnance once, and as by the order before is repeated, then deuide your whole summe of Powder by that nũber of the weight of the powder that all your Ordnance requirerth, & that summe that stãdeth in the quantity line, shal shew you how oftentimes it will shoote all your Ordnance off: As for example, by the Ordnance in a towne (as before is rehearsed) and suppose you haue 20. Last of Powder, and now to know how oftentimes it will shoote all your Ordnance off round about thorough the whole Towne, as you did see that al the Ordnance did require 1206 lb. of Powder, & one Last of Powder is 2400 lb. the 20. Last maketh. 48000. lb. wherfore deuide. 48000. by 1206. and then there will stãde in the quantity line, 39. and 966 lb. will remayne ouer, so you may conclude, that twenty Last of Powder will shoote all the Ordnance before rehearsed. 39 tymes ouer, and thre quarters of them moze, that is to saye, that it will shoote all the Ordnance off fortye times, lacking almost a quarter of them. &c. And also, if there were any batterie layde against a Towne, and then if that you doe knowe howe many Cannons or other peeces of Ordnance there is in the batterie, then you maye knowe (as before is rehearsed) howe much Powder that they wyll occuppe at once shooting them off, and also if that you wyll shoote them off rounde fortye or fiftye tymes in one day, then

You may knowe howe much Powder they will spende in one day: as this first (as before is rehearsed.) Multiplie all the Ordnance of one sort together, by the weight of the shotte of Powder, and so the other sorts of Ordnance, and adde them together (as afoze is said) and that being knowne, then multiplie that by the number of times that you haue shotte them off, and that shall shewe vnto you the number of poundes that the Ordnance hath occupied in that day: as for example this: Suppose that there is in a battery against a Towne. 24 double Cannons, and they doe shoote. 40. pounde of Powder a peece, therefore multiplie. 24. times 40. and of that multiplication, there cometh 960. and then there is eighteene Demy Cannons, and they doe shoote. 24. pounde of Powder a peece, and therefore multiplie eyghtene times. 24. and that maketh. 432. pound, and then adde both the numbers together, that is to say. 960. and. 432. & they wil make 1392. so that you may see, that the whole battery dothe spende 1392. of Powder at once shooting thereof against the wall of the Towne: and then suppose, that in a day the Ordnance hath bene shot off fire and sortie times, then how much Powder shall be spent that day, then multiplying 1392. by fire and sortie, and that will make 64032. so that you may conclude that the whole batterie hath spent in one day, 64032 pound of Powder, and y^e will be fire and twentie last and a halfe, and 432. pounde of Powder, and then if that the batterie shoulde continue seauen dayes in that order, the whole summe in Powder that shoulde be spent, amounteth vnto 448224. pound, and that maketh 186. Lasts, thye quarters, and 24. pound: therefore by this order you may know from time to time, how much Powder is spent at your pleasure, whether that it be in a batterie or in a Towne, & also how much Powder will shoote such a number of Ordnance so many times off

off at your pleasure. And thus much I haue thought good to write vnto you for instructions, &c.

How to knowe how many shotte

doth wey a Tunne.

CHAPTER. 22



Now in so much as I haue shewed in the Chapter going before, to know how much Powder is occupied in Ordnance: so in like manner, I doe thinke it convenient to shew vnto you how many shotte of euery seuerall sortes will wey a Tun weight, which is very necessary to be knowne, as wel for them that haue occasion to transport them either by Sea or by land. And first this, a Tunne weight is 20. hundred, and euery hundred for to conteyne an hundred and twelue pound, so that a Tun is 2240. pounde in weight: and first, the double Cannons shotte, and those that doe wey 64. pound, and then 35. shotte doth wey a Tun: and then the Demy Cannons shotte, and those that doe wey 34. pound a peece, and then 62. or 63. of those shotte do wey a Tun: and the Culuering shot of seauentene pound a peece, and then 131. or 132. wil wey a Tun: & also the Demy Culuerings, and those shotte that do wey tenne pound a peece, and then there is 224. in a Tun. And furthermore, those Sakers, that the shot doth wey sixe pound, and there doth go. 373. or 374. vnto a Tun: and in like manner the Siniens, and commonly their shotte doe wey thye pounde thye quarters, and 597. or 598. shotte wil wey a Tunne. The Faucons shotte doth wey two pound & halfe a quarter, and 1054. or 1055. doth wey a Tunne: & the Fauconer shot weyeth one pound, and nere halfe a quarter of a pound, and, 1991. or 1992. doth wey a Tunne. And thus much

much I haue saide, as concerning how many shottes of euery seuerall sortes both wey a Tun weighte, but if that you haue a great number of shottes of seuerall sortes, and you do desire for to know how many Tunnes there is in all of them, multiply euery seuerall sorte by themselves, according vnto the weight, and so adding all the numbers together, and then deuide that number by 2240. and it will shewe vnto you howe many Tunnes there is in the whole summe. As for example this, there is such a number of shottes to be transported, either by Sea, or by land, and you woulde knowe howe many that there is of them, as first, that there is a thousand Cannon shottes, and a thousande two hundred Demy Cannon shotte, and two thousand Culuering shotte, and three thousand Demy Culuering shotte, and three thousande five hundred Baker shotte, and foure thousand Spinion shotte, and five thousande Faucon shotte, and six thousande Fauconet shotte, and nowe for to knowe their weighte, and first for the Cannon shotte, and those that be seauen ynches thre quarters high, and those doth wey 64 pound a peece, and then being a thousande shotte, then therfore multiplye a thousand times 64. and that maketh 64000. and then there being 1200. Demy Cannons shotte, that are six ynches a quarter high, and those doe wey foure and thirtie pound a peece, and therfore multiplie 1200. times 34. and that maketh 40800. and then there is 2000. Culuerings shotte, of five ynches almost in heighth, and they do wey 17. pound a peece, and then multiply two thousand times seauenteene, and that maketh 34000. and the there is three thousand Demy Culuering shotte, of neere foure ynches and a quarter in height, and they doe wey tenne pound a peece, therfore multiply three thousande times tenne, and that maketh 30000. and then there is 3500. Baker shotte, that is three ynches and a halfe high, and

and that weyeth 6 lb. and therfore multiply 3500. times 6. of that there cometh 21000. & then there is. 4000. Spinion shot, of iust 3. ynches high, and they doe wey 3 lb. 3. quarters a peece, and therfore multiply. 4000. by $3\frac{3}{4}$ & that will make 15000. & then there is. 5000. Faucon shot, and they be 2. ynches and a halfe high, and doth wey. 2 lb. and halfe a quarter: therfore multiply 5000 by $2\frac{1}{4}$ and that will be 10625. & then there is 6000. Fauconet shot, of 2. ynches high, and they do wey one pound, and halfe a quarter, & that cometh in weight 6750. and now adde al your numbers together, as by this example following.

Names of peeces	Number of shots.	Weight in poundes.	Tunnes,
Cannons.	1000	64000	28 $\frac{2}{7}$
Demy Cannons:	1200	40800	18 $\frac{1}{10}$
Culuerings.	2000	34000	15 $\frac{1}{14}$
Demy Culuerings.	3000	30000	13 $\frac{1}{10}$
Sakers.	3500	21000	9 $\frac{3}{7}$
Minions.	4000	15000	6 $\frac{3}{8}$
Faucons.	5000	10625	4 $\frac{1}{16}$
Faconet.	6000	6750	3 $\frac{1}{16}$
Summe totall.	25700	222175	99 $\frac{1}{16}$

And now, al those numbers being added together, doth make 222175. pound in weight. And now to know how many Tunnes there is in al them, deuide the 222175. by 2240. and that being done, then there will stande in the quantitie line. 99. and 415. will remayne ouer, so that you may conclude, that of all the shotte there is 99. Tunnes, and 415. lb. that is neer $\frac{1}{2}$ parte of a Tonne moze, so that there lacketh little moze then thre quarters of a Tonne of 100. Tunnes, and by this order or meanes, you maye knowe how many Tunnes of shot there is in any number of shottes, &c.

How and by what order the shot

doth graze or glaunce vpon the
lands, or water.

CHAPTER 23.



For to know by what order that the shot doth graze or trundle either vpon the land, or the water, it is to be noted, that it dothe graze or trundle farthest, when that the peece is laid point blank, if that you do shote the peece towards the water, or a plaine or leuell ground, and then the shotte shall rine or graze nere three quarters of the best compassse of the Randace, so that the shotte bee not lette by anye chance by the way: and there is on great diuersitie in distance of the grazing or running of the shotte, betweene the land and the water, so that the ground be a playne and leuell ground, and the water or Sea to be smooth. And here is one thing to be noted, as touching the grazing of the shotte, whether it be vpon the water or the land, looke by what proportion the shotte doth strike or hitte the ground or water, by that proportion the shotte shall rise againe, although that it flyeth not so farre in that proportion, as long as the shotte hath force or vyfte in his flying, that is to say, if the shotte do strike or hitte any thing glauncingly that then it shall glance in that proportion from youwarde, and if do strike or hitte any thing directly, then it shall be vyuen directly backe agayne, if it doe not enter or sticke fast in the thing that it hitteth, euen like the shadowe of the Sunne, or anye other thing in the water or glasse, or such other like. As for exaple this. If you shote anye peece of Ordnance towards the water, and lay the peece at the poynte blanke, and the peece be but little higher

higher than the water, then shall the shotte runne grazing in this forme, to rise againe by that proportion that it doth hitte the water, and so to runne, till that the great force be decayed, as this example doth shew.



And furthermoze, if you doe mount the peece at much advantage, then it will not graze at all, if it do graze, then it will be made in this manner.



And furthermoze, if you doe shote at any Shippe vpon the water, and you do shote in that peece that do lye very high, and the shippe or marke nere hand, so that you must giue your leuell downewards, then if you doe giue your leuell shote of the shippe, the shot will flye ouer the Shippe, by the meanes of the direct hitting of the water, for that the shot doth glaunce from the water, by that proportion that it doth hitte the water, as by this example.



So that you may iudge by this example, by what proportion the shotte doth graze, either vpon the water or the lande: but the water is the moze certayner and truer if it bee smooth and calme, for that the water is not harder in one place, than it is in another, as the ground is or may bee, and the directer that it hitteth, epther the ground or the water, the moze it doth kill the force of the shotte, and by this meanes it will flye the lesser way: and the moze glauncingly that it doth bitte epther the ground or the water, the oftner it is doth glaunce or graze, and the further it flieth, &c.

Howe to batter the walles of any

*Towne as well by night as
by day*

CHAPTER 24.

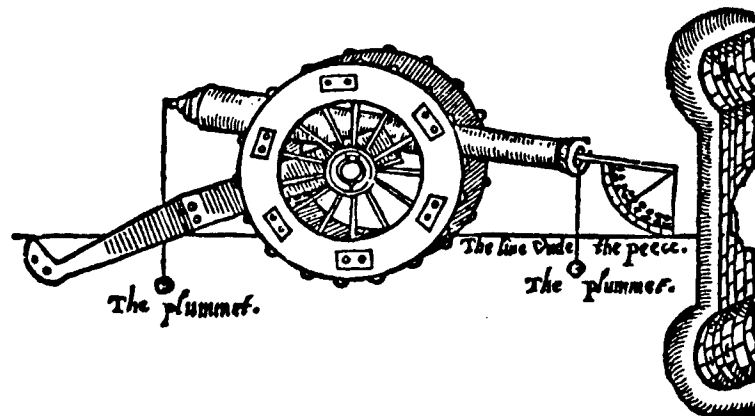


Although it hath not beene commonly used, yet notwithstanding it may be easily done, for to plant their Ordnance so, that they may batter or beat down the walles of a Towne as well by night as by day, although the night be neuer so darke. And also there shal no light appeare vnto the enemye, as thus. First after that your Ordnance is placed for your batterie, and you haue begunne to batter, & then the peeces being made ready for to shoote at the wall or place that you do mean to shoote at, and that you would continue for to shoote at the place all the night, then take a plummet of leade vpon a line or string, the peece being right vpon the marke that you do meane to shoote at, then with a plummet

met and the line, first plome the middle of the mouth of the peece downe to the grounde, and looke where the leade falleth to the ground, there make a mark vpon the ground, and then in like manner plome the very middle of the taile of the peece of the peece vnto the grounde, and there make a mark also vpon the ground, and then draw a right line from the one place vnto y other, as long as you list, & then that right line wil lye right vpon the mark, then take a large great Quadrant, set out with degrees, & parts of degrees, & the Quadrant, for to haue a rule fastned vnto it, and then the peece being laid ready for to shoote at the marke, hauing the true height of the marke, that is to say, that the hollow or concavtie of the peece doe lye right vpon the marke, neither higher nor lower: then put the rule into the mouth of the peece, and looke at what degree or place that the plummet line dothe hang vpon, then note that in some Booke or paper, and then when that the night is come, and that you doe meane to shoote as well by night as by day, then first with your plummet of leade vpon a line, then plome the mouth of the peece right vpon the line that is vnder the peece, and that will laye the peece right vpon the marke, and then in like manner take the Quadrant, and putte the rule into the mouth of the peece, and then kope the peece vpper and downe till that the plummet line doth fall vpon that degree and place that it did befoze, and then that in like manner will glue the peece the true height of the marke without any faile. And for to see whether that the plummet line doth hang vpon the degree or place that it did befoze, and also to knowe by the line and the plummet with the lyne vpon the grounde vnder the peece, for to laye the peece right vpon the marke, there muste bee prepared a close Boxe lyke a Lantern,

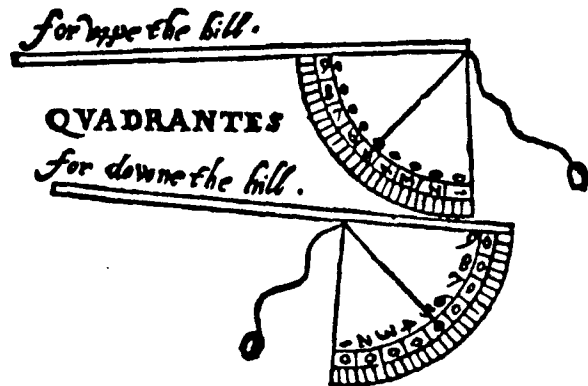
Lanterne, made with boordes, with a doze of a liode for to open and shutte, to the intente to see how the plommet both hang, and so forth, as for example, supposing that at the siege of a Towne, the Ordnance being placed, and had battered al the day, & to continue that they shoulde not make up their breach in the nighte, and furthermore, that the breach shoulde be made wyder in the morning, then they wente unto the middle batterie called the persers, and there tooke a plommet of leade and a lyne, the peeces being all charged and leuelled vnto the breach and markes appoynted, and firste, the plommet at the middle of the mouth of the peece, and then righte vnder the plommet, they do driue in an yron pinne, and then in like manner at the tayle of the peece, they plome the peece, and righte vnder the plommet they driue another pinne into the ground, and for that they could not draw a perfite line, they made a line of string fast, longer than the length of the distance of the two pinnes by two yardes, and the line of threed did come righte ouer the lead of those two pinnes, and so passed a yard further at both the ends, than the two pinnes: & thus they did lay every peece at that place, and then the peeces lying still, ready to haue fire giuen vnto them, then they take their Quadzant, being very large, of two foote in the semp Diameter, that is to say, from the Center of the circle, and every degree was set out in foure partes, and put the rule into the mouth of the peece, and the plommet line did hang at one degree and a quarter iust, and that they did note in a booke for remembrance, and this being done, they shotte off their peeces. And now when that the nighte was come, and the same very darke, and the morning very foggy, or that they could not see the walles of the Towne, yet they battered the walles of the Towne as perfite as all the night, and as well as though it had bin by day, for every time y they

they had charged all their peeces, they did this, first, they did plome the mouth of the peece, and likewise at the taile of the peece, right vpon the line that was vnder y peece, right vpon the mark, and then they toke their Quadzant, and put their rule into the mouth of the peece, the koinen the tayle of the peece by and downe, till that the plommet line did fall vpon that degree and place that it did before the nighte, and that was at one degree and a quarter iust: and thus when they had laid all their peeces, then they shotte them off, and charged them agayne, and so continued all the night long.



And so in this manner, they may in like case handle the two side batteries, but and if that it chance that the battering peeces doe lie vpon hygher ground than the place that is battered, then y rule that is fastned, must be vnto that place wheras the plommet is made fast vnto, for

that the degrees goeth downewards towards the lower ground as you may see by these two figures.



How to plant Ordnance by night,

*to batter the walles of any Towne, or displace any
Ordnance in any Bulwarkes, or any
such other like, as well by
night as by day.*

CHAPTER. 25.



Et furthermore, there maye be meanes founde, that if there be any Ordnance placed that doth damage or hurte you, and that you maye not come at it by no meanes in the daye for to displace their Ordnance, but vnto your greate hurt and losse, both of men and Ordnance, yet you may displace

place them by nighte neere as well as by day, both for to place your Ordnance in the night, and also for to shooce perfectly vnto the place in the night, although the night be neuer so darke: and then if that you doe see cause, when that you haue beaten or displaced their Ordnance, you maye carpe awaye your Ordnance before it is daye, as thus. First prepare an Astrolabe, the larger the better, and then two stakes or pinnes of yron like to a foote long, or thereaboutes, according vnto your discretion, and also a sledge or beetle, to drive those stakes or pinnes into the grounde, and then viewing the grounde meete for the purpose a reasonable distance from the place that you doe meane to beate in the nighte, goe into that place in the daye tyme, and firste where you doe meane for to lay your Ordnance, there drive in one of your stakes, and then in lyke manner goe backwardes about twentye foote, and stande so, that you maye see the marke that you doe meane to shooce at ouer the toppes of the wicke that you haue driven, and then there in that very place drive your other stake, and then goe a litle backwardes more, and viewe whether that the two stakes stand as one right line vnto the marke, and if that they doe not, you maye amende them, and sette them ryghte, then take your Astrolabe, and holde that vpon your thombe by the ringe, and then turne your Achilleyday or Rule wth the two sightes that is on the backe side of the Astrolabe vpper and downe, tyll that you maye see that place that you doe meane to shooce at, thorough the two sightes of the Achilleyday holdyng that vpper before your eyes, winking wth one of your eyes, standing at that place where you doe meane for to place your Ordnance that is betweene the two stakes, then looke vpon the Achilleyday or Rule wth the two sightes, at

at what degree and place that the ende both pointe vnto, then remember to write that degree, and place it in some Booke of Table, for that it is finished: then in the nyghte you may bring your Ordnance vnto that place between the two stakes, and then place one of your peeces righte betwene the two stakes, and then take a threed of line, and make that fast vnto the two stakes, and that shall lay the peece right vpon the marke. And then for to place the rest, they must doe this. First on the one side measure out iust how many foote you doe meane to lay your peeces in distance asunder, then from the line of the stake, measure it truly, and there make a marke, or vntie a stake: and then at the other end, at that certayne distance, there in like manner vntie another stake: then betwene those two stakes place another peece, and then make a line fast vnto those two stakes, and that in like maner shall lay the peece right vpon the marke, and then you may place another peece vpon the other side of the peece, and so forth. And then when your Ordnance is all charged, then plome the middle of the mouth of the peece right vpon the line, vnderneath the peece, and then in like manner, the middle of the talle of the peece to be plomed, that it stand right ouer the line, vnderneath the peece, and then take your Quazant with the rule fastned vnto it, and put the rule into the mouth of the peece, and then koyne the peece vp and downe, till the plommet line do fall vpon that degree and place that the Achilleyday did pointe vnto vpon the Astrolobe, and that shall giue the peece the true height of the marke. As for example, suppose this after the breach in the wall of the Towne was made saurable, there the flankers lay so, that they coulde not come nere vnto the breach, neyther could they plant their Ordnance for to displace those flankers, but that they shoulde bee beaten from their Ordnance to their great losse and hinderance, therefore

therefore firste they prepared an Astrolobe of the largest sort, & two pinnes of yron made sharp at the endes, to goe into the ground, and then they caused an assaulte to be giuen vnto the contrary side of the towne, and whilst they helpe them play there, then two or thre chose out thyr groūd meece for their purpose, and ther vntie one pinne, and then they went backe twenty foote, and right against that pinne they vntie another pinne so euē, that the two pinnes, and the place of the bulwarke where the flankers lay, were all there vpon one right line: and then one of the tooke the Astrolobe, hanging it perpendicularly vpright, then they turned the Achilleyday vp and downe, till hee mighte see thorough both the sightes, the very place that the flankers lay, and then they departed, and wente their way, and looked vpon what degree the poynte of the Achilleyday stood vpon, and found it to be vpon iust two degrees and a halfe, and that they wrote in a booke for remembrance, and then after a night or two, when they saw their time, the nighte being very darke, then they carried thre peeces of artillerie, and placed the chiefest betwene the two pinnes, and vnto those two pinnes they made a line fast vnto them both close vnto the ground, and then they placed vpon the one side, one of the peeces, and the other peece vpon the other side, as this. First they measured out tenne foote from the foremost pinne iust vpon the one side, making a perfite square angle, and then in like maner they measured out .10. fote moze at the hindermost pinne, so that those two pinnes stood iust .20. fote asunder, & so placed the peece betwene those two pinnes: & now for that they must shooote all thre peeces vnto one place where the flankers lay, & for that the peeces did lye .10. foot asunder, therefore they remoued the hindermost pinnes of both sides .4. inches, so that there was .10. fote distāce, & 4. inches, & the cause was this, for that the marke was .10.

Shote off from the place where the peeces lay, and the peeces lay iust from the middle, vnto the middle, tenne foote asunder, and the line vnderneath the peece, was iust twentie foote long, and there is thirtie tymes the length of the lyne vnderneath the peece vnto the marke, and thirtie inches maketh two foot and a halfe, and foure times two foote and a halfe, maketh tenne foote, so that the hyndermost pinne beyng remoued foure ynches further off, must needs lay that line iust vpon the marke that the middlemost lyeth vpon, without any faile, and in this order the one peece was placed on the one side, and the other peece on the other syde: and now those peeces being charged, firste they plome the mouth of the peeces righte vppon the lyne, and then in like manner the breeche or taylor righte vppon the lyne, and then they tooke theyr Quadrante, and putte the rule into the mouth of the peece, and koynd the breeche of the peece, till the plummett line fell at two degreys and a halfe iust, so that the Achilleyday byd shewe vnto them on the Astrolabe: and they shooting off those peeces, they made a perforce shotte at the place appoynted, and thus they charged and shotte all the nyght, and then before day, when they hadde serued their turne, they conueyed their Ordnance from that place, for feare of being beaten away from them when it was day light.

And furthermore, by that meanes in like manner, they may place their Ordnance in the night out of a Towne, to annoyne their enemies, as they may or can by no deuice or practise, but by industry or policie they may be persuaded by practise, and especially if that he doe knowe what the enemy doth meane for to doe, for this wee doe see many times in warres, that policie doth preuaile as oftentimes as greate and huge armies of menne of greate strength, hauing all kinde of engines for that purpose, for
euen

euen as it pleaseth God, so goeth the victorie, although it cometh by a naturall cause, and that naturall cause that I speake of, is knowelenge and industrie in those affaires,

How to keepe a Hauen or Riuer

*on the Sea coast for to sucke a Shippe as
well by night as by day in all
pointes.*

CHAPTER 26.



Now for the keeping of a Hauen or Ryuer, there maye be suche meanes or wayes vsed by industrie, that you maye keepe a Hauen or Riuer in this sorte, so that there may no Shippe passe neither by night nor by daye, but that hee shall be sunke, or else he escape very hardly, although by nighte he neuer so darke, so that the night be not foggy or Whistie, so that the Hauen or Riuer be not aboue a mile broad or ouer, as this. First, if the entraunce of the Riuer be therefore, to haue a watche there, then as soone as the watch doth perceiue the and their number, then they must haue a watchtoren and that must be a light or lightes vnto the Castell or Bulwarke, and then the watchtorens being so agreed vpon that the Castels or Bulwarke may know the number of the Shippes by the forme of the lights of the Castels or Bulwarke, if that they be on the one side, & the other on the other side, the at certaine knowen places appoynted for that purpose, and at a certaine distance from the Castels or Bulwarke towards the Seaward, each of the for to carrie a light thither, & to place the lightes as neere the water as may bee, and if that it
shall
chancer

chanceth so, that ther is but one Castell of bulwarke, and none vpon the other side, then they hauing a bote of Skiffe, or any other craft, they may rowe ouer the water, and place their Lightes in that knowne place appoynted, and then afoze night, that place beeing alwayes knowne vnto them, they may place their Ordnance right vpon that marke vpon the farther side of the water, the Light stāding alwayes to the Seawards of the marke that the Ordnance is placed right against, like. 20. or. 30. foote, & then the night being neuer so darke, the light is y better seene: then must the Shippes needes in their coming be twerne the light and you, take away the lightes of poure lightes, and then immediatly, as soone as you do see that the light is shadowed, then giue fire vnto those peeces that be placed against your ymagined marke appoynted, & then there is no doubt but you shall make a perfitt shot at that Shippe, being sure that the mouth of the peece bee koynd lowe ynough, leass they shoulde shoote ouer the Shippe, & especially if it be in a place where it doth ebbe and flowe: for at the full Sea, they must koyne the peeces at one proportion, and at a low water, at another proportion: and this being handled discretly, they shall not faile the hitting of y Ship. And furthermore, as it is declared in the. 2. Chapter going before, they maye haue a line drawen vnderneath the peece vpon the ground for to lay their peeces right vpon their appointed marke at al times after y they haue shot off their peeces in the night, then in the night they may place the againe, &c. As for example, Perce with vs at graues end, as there is. 2. Bulwarke y one right against the other, the riuer of Thames running betwerne them, and nowe they would keepe the riuer so, that there shoulde no Ship passe, neyther by night nor by day, but that they shoulde be sonke: then they must keepe a watche at the Masse of poynt belowe, at the entrance of y

Calber-

Calberrie hope, and that is a mile and a halfe from the Bulwarke, and there alwayes they must needes see them, and their number of Shippes, and specially by the help of a light vpon the further side of the water, and then they beeing knowne vnto the watche, the watche must make vnto them a token by a light or lightes that they haue agreed vpon before, and then thorough the watche token, the Bulwarke knoweth that they cometh such a number of Shippes, or but one or two as it chanceth, and then each of the Bulwarke hath an imagined marke, twentie schoe towards the Masse of Seawards, y they do alwayes plant their Ordnance right against it, both by day, and by night, and then as soone as they doe see their watchtoken then both the Bulwarke do place their lightes hard vnto the water, like twenty foote to the Seawards of their imagined marke: then the peeces being planted and koynd, so that the dispart standeth vnderneath the poynt blanke at the full sea one degree, and at the lowe water thre degrees, then giuing fire vnto the peece or peeces, as soone as the Ship taketh away or shadoweth y light, the theris no doubt but they do strike the Ship very neere y water without any faile. And so that the lighte standeth to the Seawards of the marke appointed, the shot must haue a time to come vnto the Ship, and the Ship goeth away in the meane time. And furthermore, when that the peeces bee charged againe, then the line that is vnderneath the peece, by plomming of hit at the mouth, and at the tayle of the peece, is laid right vpon the marke agayne: and the furthermore, if the Shipp chance to passe further, scaping both the Bulwarke, then they may haue moze ymagined markes, and also lightes placed there, and in like maner, lines vnderneath the peeces right vpon those markes, &c. And furthermore, you may know by the lightes, whiche side of the water the Ship cometh two wayes, and one

way is this, the land being higher then the water, and the lightes being placed hard vnto the water, if that the ship commeth hard vpon the further side of the water next vnto the light, then the hold of the ship will shadowe the light, and if that she commeth on your side, then the sayles will shadowe the lightes. And furthermore if the ship commeth right in the middle of the water or Riuer, then both the Bulwarke shall haue the lightes shadowed at one time, and if the ship come on the further side of the water from you, then your lightes will bee first shadowed, and if on the side you be on, then your light will bee last shadowed: and then furthermore for the making of a perfitte shotte, if that the other Bulwarke shoote before you, then kope the mouth of the peece one degree lower, for that the shippe commeth vpon your side of the water, and then for the neerenesse of her coming, you must needs kope the peece so much the lower. &c.

(.)

FINIS.

Some deserue ere they desire,
And yett shall lacke when they require.
Some desire and neuer deserue,
And gett the gayne the other shall serue.

*of The Table of the contents of this Booke, called
The Arte of shooting in great Ordnance.*

First, tenne principall things to be considered in the shooting of Ordnance.

1. Pouder the goodnesse or badnesse
2. The lading of the peece.
3. The winde.
4. The shotte.
5. The wadde or pouder too harde or loofe
6. The standing of the peece.
7. Of shooting vp the hill or downe the hill.
8. Of the length of the peece.
9. Of the disparting of the peece.
10. Whether the peece be truly bored.

Now beginneth the first Chapter of the Booke, called The Arte of shooting in great Ordnance, & first, as concerning pouder

The 1. Chapter sheweth, how to knowe whether any peece of Ordnance be truly bored, by the help of certaine instruments.

The 3. Chapter sheweth, how much pouder will serue any peece of Ordnance by the weight of the peece, and weight of the shot, and at the end of this Chapter there is a Table that doth declare the weight of yron shotte.

The 4. Chap. sheweth how to dispart any peece of Ordnance truly.

The 5. Chapter sheweth how to giue leuell with any peece of Ordnance to make a shotte, according as the most sortes of Gunners doe vse to do, although that there is no arte in it.

The 6. Chapter sheweth what a degree is.

The 7. Chapter sheweth how to make a shotte vpon the right line, and so how to know how much ground that any peece of Ordnance doth driue or conuey a shotte at the mount of every degree of the Randare.

The 8. Chapter sheweth, how to mount any peece of Ordnance by the degree with an ynnch rule with a table, shewing what part of an ynnch rule will make one degree, and so vnto tenne degrees.

The 9. Chapter sheweth, what manner of course the shot flieth in the ayre.

The 10. Chapter sheweth, how to mount a Morter peece, for to lay the shotte at any distance appoynted.

The 11. Chapter is how far aboue the marke the shot flieth over the marke by the length of the peece, and distance vnto the marke.

The 12. Chapter is, how to make a perfit shotte with a peece that is not truly bored, that is to say, that the core or hollownesse goeth not right in the middle of the mettall.

The 13. Chapter is how to giue leuell at a marke vpon a hill or valley with the Quadrant.

The 14. Chap. is how to make a perfit shot vpon the land, at the broadside of a ship that is vnder saile, and going.

The 15. Chap. is, how to make a shot out of one ship into another, although the sea be wrought, or out of a Galley into a shippe.