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The Arte of shooting in great Ordnaunce.

Contayning very necessary matters for all sortes of Scruitoures eyther by Sea or by Lande.

Written by William Bourne.

Imprinted at London for Thomas Woodcooke.

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 Maiesties Ordnance within her highnesse
Realme and Dominions, and one of her Maiesties
most Honorable privie Counsell, William Bourne
witheth long life, increase of Honor,
with al happy successse.

Right worthie and Noble
Earle, whereas I before this
time haue writte sundry simple
Treatises, whereof two of
the are extant in print, thone
called the Regiment of the
Sea, and the other the Treas-
ure for Travellers, and now
also this barbarous and rude
thing, called the Art of shoo-
ting in great Orndaunce, and as it is most commonly seen,
that every person doth most commonly comend that thing
wherein he is most expert, and therefore some there are
that doe most extoll Divinitie, and great reason it is that
it should be so, for that it teacheth vs both to know God
and to instruct others: also others some doe most preferre
Philosophie: others 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 above the other. There are also, that
after long disputation, doe not onely assigne every Sci-
ence his generall 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 Orndaunce is nece
cessarie to be aduanced for the defence and mainte
nance of a Kingdome, and countrey, and the common
Wealth thereof. Wherefore (Right honorable) being as
one extraordinarily bolde, I present the same vi
to you, for that I know your Lordshippe can truely deser
e and judge in these causes, as one whose wisedome is not
vunknowne, hoping that your Honour will take this sim
ple 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
proser your Honor in all your doings in perfect health

By your Honours humbly
as commandement
William Bourne.

The Preface to the Reader.

Easie Reader, it is possible that you would marvel that I should write this booke called
the Art of shooting in great Orndaunce
for two great causes: the one is this, first for
that I have not seen (so most peoples imagi
ment) so great experience in these affaires,
whereby you may think that a mane not knowledg sufficient to
be a teacher in these matters. And the second cause is this: for
that my order of teaching is contrary unto all that hace been
taken upon them to be teachers or instructers in these matters or
affaires before time. Therefore for to shew unto you the cause that
hath movd me to write this rude volume, is this: for that no Eng
lish men have not beene counted but of late dyes to become good
Gunners, and the principal points that hath caused English men
to be counted good Gunners, hath been, for that they are hardie
or without feare about their Orndaunce; but for the knowledg in it,
other nations and countreys have tafted better thereof, as the Ital
ians, French and Spaniards, for that English men have had but
little instructes but that they have learned of the Dutchmen
or Flemings in the time of King Henry the Eight. And the chief
case is this: that English men are thought to be good Gunners, is
this: for that they are hardie about their Orndaunce in shipt,
on the Sea, &c. And furthermore, I doe think it good to shew
unto you these great causes besides divers other small causes,
that the thing that hath letted or hindred English men to be
come cunning in the shooting of great Orndaunce, although di
vers prooves have beene made at sundrie times, and Orndaunce
hath beene had into the fieldes, both in mafter Brookesfields time
who hath been Lieutenaunt of the Orndaunce, & in divers times
since, and yet those prooves that have beene made shewe no
prooves, but to cause those Gunners that did see the experience of
those prooves, so committe a further error as touching the shoo
ing

As it.
The Preface

...ing in great Ordinance, and the reason thereof is this: the first principal cause is, that they did make their proofe with a Qaudrant, and so it ought to be, that is to say, the fourth part of a Circle divided into 90 equal parts, whereupon Gunners will call a Triangle, but there is no instrument so called, but only a Quadrant: and the original of the making thereof is the fourth part of a Circle divided into 90 equal parts, what soever that is it hath. And now the principal use of the quadrants, is to know what any peeces will cast at the mount ofuer Degree, and so from degree unto degree, unto the best of the Reader, and the cause that hath made the Gunners to commit errors by the measuring of the peeces by the degree of the Quadrant, hath beene this, although that it be true that such a peeces will cast the fist so many scores at the mount of so many degrees, and yet whatevther that they have made proofes therof they have found it otherwise false, or yet the thing was not true, although sometime the shot hath flung a great deal further, and sometime much shorter, which causes were no other thing but the hitnesse or the lonesse of the ground, for that there is seldom any ground that you shall find leuell but it will be higher or lower then the ground that the peeces shall stand upon, as I doe more at large declare in the thirteenth chapter of the booke, and yet in the time of Service there is no using of the Quadrant but in some cases, and then take a great large one, for in a small you may loose commiss errors. And furthermore I doe know divers that make 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 the doing of any thing, of the person doth not consider of all thinges with him and against him, but they are apt to commit errors, &c. The second great cause is this: in the using to give leuell with a rule set one in inches partes but unto this they cannot order it, nor give it no Method to know what any peeces will doe at any number of inches advantage for the peeces doe differ in casting, according unto their lengths, as I doe further shew in the booke. Wherefore the use of the inch rule according as they doe use it, is to no oth

to the Reader,

...how purpose, but only to feake out what number of inches will reach the markes, and that being knowne, to keep the length of the markes with that pece. And the necessary thing that this kind of guising of leuell in the time of Service (as being in a Caftell, Forte, or Towne, or such like, the Gunner having charge of any pece,) is to boaste at those markes that be apt to doe any Service at, and to know how many inches will reach any markes, &c. but to become a cunning Gunner he shall never be, although he should shoot too, foots everie day through a yeere, for he that never doth know by that measure the distance of any markes, but in everie pece he must make a new proofe, if that the pece be removed or changed from that place. Wherefore I have made a table, showing how many inches, and what part of an inch will make a degree, and so unto ten degrees whereby you may make a Me-thode to hit the length of the markes in anie pece as the first shot, as it doth appear 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 pece at the mount of every degree, but I have not bad so great proofe but that I may bee deceived, for I have no other proofe but as my owne charge, and my ability is able to doe nothing to make any proofe in those causes. The third great cause is this: I doe know how Gunners, yea none at all in respect, that hath anie capacitie, to know the distance unto anie markes assigned, if that the markes be such that they can not come unto it directly by land, and yet there be very true and exact ways to know the distance unto anie markes assigned, howfuer the thing is, if that it may be seen by Geometrice perspectives, and the lacke thereof among Gunners is the principal point that doth deceive the, so that those three things doe utterly deceive most men: the first is this, the height or lonesse of the ground: the second the length of the pece: and the third not knowing the distance unto the markes: for their reason in these cases that they doe suppose, can doe nothing, that is to say, to finde the distance unto anie markes assigned, by looking upo the ground and that never can shew unto them the distance unto the markes but yet must be known uo ethe
The Preface

Thereby the Scales or cross staffe, or else it must be known by the
lines of Perfection, which is shewen in a booke of mine that is extant
in Print, called the Treasure for Trauclers, and also in a booke
set forth by master Thomas Digges called Pantometria, where
in those two booke you shall finde meanses and manera both how to
finde the true distance unto the marke, and also how much that
the marke is higher ground or lower ground, then the place that you
are upon, and also the length of the line Hypothemal, whether
it bee uppe the hill or downe the hill, which is very neces-
sarie and profitable for all them that will use to boote in great
Ordinance, for to know as all Gunners, Captains, and Leaders
of men, &c. And now friendly Reader, it is possible that some
people will dislike of me, for that I have written this booke; some
of them for that they doe thinke that they have better knowledge
in those matters then I, and other some perhaps may be offended,
for that they would have the thing known but amongst them-
theselves, and other some possible will be offended with me that are
Gunners, that are altogether without any knowledge in those ca-
uses, that would not have their ignorance known. So by these meanes
I am assured that I have purchase a great number of enemies, as
I do know that I have already caused sundry people to ensue me,
as some Sea men do unlike of me for writing of my booke called
the Regiment for the Sea, and others some of late are offend-
ed with me for the writing and setting forth of my booke called the
Treasure for Trauclers, but notwithstanding, I doe see that it
is needfull to be known unto a number of them that be Gunners,
walking and considering with me selfe what a number there bee,
that will take upon them to bee Gunners, and that master
Gunners, that are not sufficient nor capable in those causes, but
are in respect altogether ignorant, standing upon no other thing
but their antiquiteit, that they have servued as Gunners so long
time. Wherefore I doe thinke it very necessary for them to have
some good instruction: but as soon as I can see, erie man may
make hisse to doe the common wealth of our Realme of Eng-
lande any good therin, and as far as I can perceive that no peo-
ple may better pleasure the common wealth in the time of ser-
vice, 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 we have seene by daily experience, that
the Queenes progenitors at sometime were never long without
warres; yet we have a most gracious and loving Prince reign-
ing over us, which doth also use studie for peace and tranquilli-
ties; God grant his mercy that he may live long and reign upon
us. Amen. Yet notwithstanding, it is good for us to study in the
time of peace, how to defend our felines in the time of warres &
troubles, as generally we provide in harvest for to live in the win-
ter. And for that cause have I written this little treatise, not to
the intent to teach the that be cunning, but to give instruction unte-
soth that be of the simplest sorte, &c. Wherefore (Gentle Reader)
bearer with my rudenes, for that I am so bold to be the first Eng-
lishe man that put forth any booke as touching these causes, and
it is possible that there be a number would beeke that I should
have given them place, for that they are more worthy and skil-
fuller in these causes, thinking that I am so simple, for they
do not consider how that God hath given his gifts, as we see daily
be giveth unto one man richesse, and another man poorenes, 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
derformed, one mā of a tall stature, & an other of a low stature, one
man strong and lustie, and an other weake & lame; although they
be of one consanguinitie, lusie or kindred, such is the mar-
velous works of God. Wherefore men are not to be measured by
elles, but by vertue, for God is not partial in his gifts, for he
hath feed his most precious blood, for the redemption of all man-
kinds, so that afores all are one, for we are all his creatures and
the sbeepe of his pasture, and the workes of his handes, so he is our
God, and we are his people, so that we keep his holy will and com-
mendements, but false and blood is so fraile, that we can doe no
good of our selves, for God worketh the will and deed in all his
creatures, by his holy spirit he doth give sundry gifts &c al for
the
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The profite both of our soules & bodies, as Saint Paul saith to the Corinthians, so one is given through the spirite the utterance of wisdom; to an other the utterance of knowledge, by that same spirite to an other faith, by that same spirite to another the gift of healing, by that same spirite to another professing, to an other the intelligences to discern spirits, to another divers tongues, to an other the interpretations of tongues, and al those doth the spirite of God workes and distributeth unto every man according unto his most holy will and pleasure. Then what a vaine generation of people be we to strive against the will & pleasure of God, as who should say that God is bound to be ruled by the will and pleasure of man. But what special giftseuer God doth give unto man, let them give him thanks therefor, and looke that they doe not abuse the same gift, for if they doe it will be a snare to take them in, and so be an example unto the whole world. For as soon as our heart is lifted vp with vanities, then entresh the Diuell & he causeth a man to fall and decline from God, thinking with our selves that the gift that God hath given us cometh of our selves. For as some do think that have riches, that they have it by their own industry, and some doing divers other things, thinkes that it commeth of them selves, with divers other special gifts that God giveth unto man, therefore whenseuer God doth give any special gift to any person, then let him give him thanks therefor, using it to the law, praise, glorie, and honor of God, & to the profite of his neighbour, and the common wealth of his native country: for it is the wickednes of the people upon the face of the earth, as considering this in these our daies, that the Bishop of Rome with all his adherents, doth daily practiseth how and by what meanes to bring this noble realm of England to utter confusion, therefore it is very meete and necessary for us to use such how to prevent them, and then there is no doubt that we doe our good will and induens, but the living God wil deliver us from the hands and nores of such wicked Antichristes, that do seekes the blood of the Christian servants of God. Wherefore it is very meete for us that be faithfull Christians and true subiects to our prince and Countrey, to arme our selves first with faith, secondly with mansly courage, and thirdly with armor for our back, for let vs be affered without Gods mightie providence unto the contrarie, as soone as they haue us at any advantage, that then let vs look for no other matter, but that they wil give the attempt that is the wickednes of the remediues of the Papists. Yet are some of them are those that should or ought to be good subiects unto their prince and native countre. Wherefore I beseech the living God to confound such wicked Impes that should seekes the destruction of their Prince, and especially a vertuous, mericful, and a godly Prince and secondly the destruction of their native Realme and countrey, even the nurce to them and their forefathers that hath yielded unto them all kind of food and necessaries. What greater wickedes 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 Countrey: for we not only have no just quarrell to fight by the lawes of God, but onely to defend our Prince and countrey and the liberties thereof. Therefore it is meete for us to call unto God for mercie and grace, and then there is no doubt but that he wil deliver us, & turne all their wicked densities unto their own destrucion, even as the that make a price for other and fall into it themselves. Wherefore it is meete for all them that are noble men and magistrates, of such as are in authoritie, to cherish and maineyntain all those that are good and vertuous subjects and good members in the common wealth, and contrariwise, it is very necessary and convenient to punish all wicked doers, such as doe annoy and hurt the common wealth, bazing no regard, neither for love nor favour, nor hatred or malice, neither for bribes nor friends, but to rewards every man according unto their deserts: for as it is fit to suffer vice unpunished, so in like manner it is as well to see vertue not rewarded, cherished nor maineynt. 
Considerations to be had in shooting of Ordinance.

Tene principal things are to be considered in the shooting of Ordinance, to keep the length of the marke, or to make a perfect shotte at any marke assign'd, according into the distance of the marke, and knowing what such a piece will do at such an advantage in mounting.

1. The goodnesse or badnesse of the pouder.

The good pouder displaceth the shotte further than the marke, the badde pouder shooteth shote of the marke: therefore you must use discretion in laying of the piece, according unto the pouder.

2. The lading of the piece.

If you doe give the piece more than his dutie, you do overshoot the marke: if you do give him lesse than his dutie, you choose shote of the marke: you must therefore give the piece his dutie and no more.

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

The winde with you, causeth you to overshoot your marke, according unto the hardnesse. The winde against you, maketh you shoote shote of the marke according unto the hardnesse. The winde on the side, the piece causeth belide the marke: therefore you must weather the marke, according unto the hardnesse of the winde, and the distance between the marke.

4. Of the shotte.

The shotte too bigge or too high, it putteth the piece in danger: for you must drive the wadde and choose home unto the pouder in the piece, for if the shotte doe rest anything shotte, it will break the piece (else it is a chance) in the vacant place betweene the pouder and the shotte. The shotte too low or small, it will be too short of the marke, and also it will not do his execution according unto the piece and the pouder, and it may chance to swarue in the deliev-
Consideration to be had

rnce out of piece, the wherefore the shotte must be siete for
the piece.

5. Of the wade or the powder rammed too hard or too loose.

The powder rammed in too hard, and the wade also, and
effectually the powder being badde, or els not drye, it will
be longe before the piece goe off, and also tylse the force of
the powder will be devaered, before the shotte bee delievered,
for that it bloweth out of the cuthole, and also the piece
will tremble before hee goe off, that may cause the shotte
to flee awaye from the marte, so that the piece is removed
from his leuell: and also it will heate the piece, and make
the piece daungerous to shotte in pretetelye afterwards.

The powder too loose, and not well put by with the ram-
mer head, and also the wade too slacke in like manner, will
make the shotte to come soote of the marke by the meanes of
the loofenette: you must therefore put by the powder with
the rammer head somewhat close, and the wade to goe close
in, and driv it home unto the powder, but heate it not in too
hard.

6. Of the stanting of the piece.

The piece stanting to it may be both recolpe into
the lower ground, that is to say, that the ground bee
lower at the tale of the piece, than it is where the wheeles
stand, it overbootsch the marke, for that in the delieverance of
the shotte, the heeche goeth downweards, and the mouth up-
wardes, and the piece is apte to recolpe vsome downe the hill
and if that the ground be higher behind the piece then it is before
the piece, then it may happen to shotte shorte, but that is but
a chance, for that is not so apte to recolpe agaynst a hill, as
it will do downe the hill.

And if it doe happen so, that the one wheel dothe re-
colpe faster than the other wheel, then the piece will ucose
awaye from the marke, or if anything doe lette or lie the
wheel, it may shotte awaye, for the delieverance of the shotte
causeth

in shooting of Ordinance

caneth the recolpe of the piece, which is nothing else, but
the cuthole thinge or the putting out of the eye which
is in the mouth of the piece.

7. Of shooting towards a hill or valley with a Quadrant.

If you shoote towards a hill, you should shotte in the glo-
ing leuell with a Quadrant. If you shoote towards a
valley, you do overshoot your marke, as in the thirteenth Chap-
ter you shall see the reason thereof. Upon a leuell ground,
you shall keepe the length of the marke by the degrees of the
Quadrant, otherwise not.

8. If you giue leuell with a pyche rule, you shall shotte
at no errapnetie, but in such a piece as you doe knowe well,
for that it doth varye according unto the length of the piece:
as for example this, if you have three Cullerings, the one is
the ordinarie length, that is, twelve foote long: the other is
more then the ordinarie length by two foote, that is, foure-
tecne foote longe: and the third is shotter then the ordinarie
length by two foote, that is, but tenne foote longe: none if
you use shotte at any marke, and doe knowe the distance be-
to the marke, and also doe knowe, that a Cullering mount-
ed at to manpe pyches vantage, will reach the marke, and
summite that it will reach the marke at twelue pyches vantage,
nowe in the shotter piece, it overshooteth the marke,
and in the longer piece it shotteh shotte of the marke, and in
that piece that hath the ordinarie length, you shall keepe
the length of the marke: and the cause thereof is, this: In y
piece that is but tenne foote longe, the twelve pyches vantage
commeth neere unto pyre degrees with the Quadrante
in the mounting: and in the piece of twelve foote longe, the
twelve inches commeth not to five degrees in the mount-
ing with the Quadrante, and in the piece of foureteene foot
long, it commeth but into foure degrees in the mounting
with the Quadrante, as in the eighth Chapter you may plain-
ely see.
Considerations to be had

9. It is to be considered what distar your piece must have, if you use give leuell with an yuche rule at any advantage, and also, if you doe shooe at any marke within the right line of popes plancke, as in the fourth Chapter it is shewed.

10. You must consider whether the piece be true, or true bozed, as it is declared, how you shall know it in the second Chapter: and how to shooe with a piece that is not true bozed, you shall see by the eleventh Chapter.

The Arte of shooting in great Ordinance.

How to know the goodnesse or badnesse of Powder.

CHAPTER I

First concerneth Powder, for that it is the chiefest matter as touching the shooting in Ordinance. According to some Authours, the first device of the making thereof beganne in Germany, by a Monke named Bertholdus Schwartus, near about the pearce of our Loche, 1380, and since that time it hath beene put in practice from time to time, and from age to age, both by the learned Mathematicians, and also by the best Mechanicke, besides a number of other common people, as well by them that haue bin ferretours, in martiall affairs, as all other, so that the making of the pether, and also of the powder, hath bin made great progress unto the bettore, as touching the force of powder, so that it is now not unknowne, now in these days, what quantitie of ever so great or small an amount of receipts doth make the strongest forces of powder, besides the perfect refining of the false pether, and also the thorough working of the receipts in the making of the powder, so that it is now come to passe in theses days, that the making of the powder, and also the making of the false pether, is common amongst a number of people, as it is made commonly in many partes in Germanie, by the Bouchers, butchers, and also by the women: wherefore it were but superfluous to say anything therein, considering how well the making thereof is knowne unto a number of people, and therefore the principal part of the shooting of Ordinance, is to know the goodnesse of the badnesse.
The Arte of Shooting

neste of the powder, and that is known after the common order, that is, by three kinde of measures, first by the tayling of the tongue, knowing by the sharp-sete thereof, whether that there be sufficient of the matter or powder or not: and secondly it is known by the colour, for the good powder hath somewhat a bledith colour, and if it be Sharpenittie powder, then the powder will be as fine as sande, and as soft as flourc, and that signifies, that it is well woundt, and otherwise it will be harde in your hande, and clammyish, and looke with a backish blacke colour, and that signifies that it is well woundt, and the matter not refined: and the third is principal is known by the burning, so if it be very good powder, then in the burning, the fire will be gone in a twinkling of an eye at a verie subdanye, you will have a snapp of subdanye puffe, and nothing remaining afterwards, but a white smoke on that place whereas it was burned: but badde powder in the burning streceth not so quickly, but streceth as bothe a fire tooke, very slowly, makynge some�ヒング, and after the burning, there will remaine certaine burrees of knottes that will conuerte into moppur, and be dandyse, and that signifies, that the piter or maister was not well refined, neither the powder well woundt: and after the burning of some kind of powder, there will remaine certaine white burrees of knottes (as before in refiret) that will remaine hard, and not consume after the burning, and that signifies, that the powder dothe lacke of the matter or piter.

And also here is one principal thing to be noted, that when powder is dyse, then the force of it in respecte, is as it were double, or a quarter stronger than when it is mopsite and dandyse, whether the powder bee good or badde. And also that powder that is verie good and well made, yet maye happen to become mopsite, as many times by carriage too, and so in rynny weather, and also by laying it in some moist places, the calke bepying not very close

close and tyght, that the powder may groome danderse.

And also those kinde of powders that the piter or matter is not well dyse, but left full of salt, although that the powder bee never so dyse when it is laid by, yet it will give agayne in rynny weather, and become mopsite, how tyght the place be that it is layde by in. Wherefore there are a number of things to be considered in powder, as touching the shooting in great Ordinance, in a number of causes: for men of reason maye know by the burning, colour, tayling, and the handling of powder, which is good, which is badde: but to say justly how much the one force of powder is stronger or weaker than another force of powder, is that harde to knowe, although he be the maker of the powder, and hath wayed out particularlie the recepctes of the powder and the means thereof committed to palte, as this, by the working thereof, and by the means of the dyes thereof, and by the moisting of giving of it againe, and especialie if the powder have bin long made: so that it is a hard matter if a man have of sundry forces of powder, to say justly that this much in weighte of this force of powder, will doe as muche, that is to say, to bee equall in force, as so much in weighte of that force of powder, untill that it be putte in proosie in the shooting it in Ordinance. And thus I doe resole to write any more at this time of Powder.

To
The Arte of shooting

To know whether any peece of Ordinance be truly bored, by the help of certaine instrumentes.

CHAPTER II.

To know whether any peece of Ordi-

nance be truly bored, ther be divers waies Geometrically to do 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 pieces of small timber, or two right stakes, that must be as long as the hollow or con- 

canite of the piece, which must be made in this forme, the stakes must be made so fast at y one end, that it be not wider at the one end, than it is at the other end, so made fast, that they swaine not eather wider or narrower; and then putting one of the stakes into the mouth of the piece, and so measuring or triyng the peece rounde about with the stakes that is without the piece, with an ynche rule, you shall know whether that the cave or hollowe of the pce doe rune right in the middle of the mettle, and if it doe not, you shall see howe much the mettle 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 piece, to prepare a rammer head that is made fitte for the piece, and to put it upon the stake that you doe put into the piece, and to make fast unto the side of the stake, and side of the rammer head, in such forme, that it may keepe the stake close unto the side of the piece, which it will do better, if the rammer head be to low, and then to have a piece of a Sheysters skime made fast, or napped into the contrarie side of the rammer head, and so it will keepe the long stake close unto the side of the piece, as by these two figures following you may perceiue.

And furthermore, they may make this kinde of instrument following, of yon, or any other stake meete for the purpose, to giue the peece in every place at your pleasure.

This instrument must be double the length of the hollow or concanite of the piece, and then you muste put one of the right ones into the mouth of the piece, and then griping the instrument together, then that parte that is without the piece, and that shal shewe you howe many ynches and partes of an ynche the mettle is of thicknesse, without any taple; and then trying the piece round about in every place, the truth of the thynknesse of the mettle that appeare.
The Art of shooting

How much Powder will serve any piece of Ordnance, by the weight of the piece, 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.

To know how much powder will serve any piece of Ordnance, there be two general rules to be observed, that is to say, the weight of the shot or piece, and the weight of the metal of the piece; and this is a general rule, the piece having a reasonable length, that is to say, that according to the accustomed manner, according to the names of the piece or pieces, all those pieces that have two hundred weight of metal, or by nature, one hundred weight of shot, must have as much Sarpsente powder as the shot weight; and all those pieces that have three hundred weight of metal, or by nature, three hundred weight of shot, do require as much Sarpsente powder as the shot weight, and one ninth part more. And all those pieces that have under two hundred weight of metal, and more than one hundred and a half, may have as much Sarpsente powder as the shot weight, lacking one ninth part. And all those pieces that have one hundred and a half weight of metal, or by nature, one hundred and a half weight of shot, must have half parts of powder that the shot weight. And all those pieces that have but little more than one hundred, or by nature, one hundred and a half, must have half parts of weight of the powder that the shot weight; and this is a general rule. Therefore, for the making of Labels for any piece or pieces of Ordnance, this thing must be noted. First, take the compass of the shot for the piece you desire to make the Label for; and then divide, or put the compass of the shot into 5 equal parts, and the cut the plate of the Label in breadth of three of those five parts, and put the other 2 parts away, and then bend the plate for the breadth of the Label, according to the compass of the shot, so that it may go easily into the mouth of the piece: for 2 parts is for to hold the powder, so let it be put into the piece, and the 2 parts be put away, to be open to turn the powder into the piece. And now furthermore, for the length of the plate of the Label, here is one thing to be noted, that every nine barrel of shot being laid 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 inches that the nine shots reach, and that plate being equally filled with Sarpsente powder, will hold the light weight of powder that the shot weighs. Therefore, for the length of the plate of the Label, thus you must divide it as followeth. For to make a Label of a Double Canon, and the piece weighing generally more than lefts. 7000. 9. 8000. and the shot weighing within little lefts. 64. pounds, that is, but little more than one hundred of metal, unto one pound weight of the shot, therefore this piece may lack 2 parts of the weight in powder that the shot weight; therefore they must cut the plate of the Label but 3 times the length of the shot, in inches and parts of inches, and this Label twice equally filled, shall be the duty of the piece. Then for to make a Label for a Demy Canon, as the piece in metal weight generally in lefts. 5000. 9. 5700, and the shot weight more than lefts. 44. pounds, which is about an hundred and a half weight of metal, unto one pound weight of the shot, therefore you must cut the plate of the Label three times the length of the shot, and the Label twice equally filled, shall be the duty of the piece.
The Arte of Atoing

equally filled, to be the dure of the pece. And so to
make a labell for a double Cultering, those pieces being
double fortified with mettall, and the pece waxing gen-
ernally more or less; because, wha are eighty hundred, and the botte waxing more or less 17.
pounds, that is, about three hundred weight of mettall, but
to one pound weight of botte. Therefore you must cut
the place of the labell in length about the height of five
botte (of) balles, in ynces and partes: this labell being
equally filled, shall be the dure of the pece. And in
like manner the demp Cultering, and Falscs, and Falc-
konets, be double fortified with mettall: therefore you
must mak their labell in length five botte of balles, in
ynces or partes, and that labell equally filled, shall be
the dure of the pece. And furthermore, some Sakers
and Pinions haue but two hundred weight of mettall
but one pound weight of botte: therefore you must
cut the place of the labell in length but of four botte of
balles at a halfe high, and that labell equally filled, shall
be the dure of the pece. And furthermore, now of
late yeares, they do use a more stronger foute of pow-
der, and not without good cause why, for the base pow-der is not so good, if that it should come unto service, as some powder; and any other powder is, that hath receipt ynow, and well wrought: for the base pow-der doth heate and strepue the piece more than the goodpowder doth; for it the ranune in hard, the because it is not so quicke in ste- ring, it lyeth and bloweth in the breech of the pece, be-
fore it can take fire, so by that means it heatcheth and stre-
neth the piece, and halfe of the force of the powder is gone
before shott is deliuered: and then they must use base-
ment so to fawe the pece. Nowe whereas they hoote
good powder, or copperpowder, they take much mettall pow-
der, and it tendeth the shott worse away, and it doth not
heate

In great Ordnance.

heate the pece so fast: for this we doe see by common ex-
perience, that a little heat by long continuance, doth heat
more than a great heat by little continuance. And fur-
thermore, in the shooting of good powder, they shall not shew
themselves so often unto their enemies. And especially, the
powder woulde be put in carretidges, for in mine opinion,
it is a great deale better, for to charge a peace in time of
service with a Cartridge, than with a Label, for divers
considerations, as I doe noate at large declare in the forth
Chapter. And furthermore, for to charge a peace to come-
powder, or any other good powder, for the most part, ther-
of two pounde will doe as farre as three pound of Serp-
vine powder. As for example: that double Cultering that
required eighteene pounde of Serpentine powder, twelve
pounde of reasonable corne powder will serue, according
to the goodnes of the making of the powder. And fur-
thermore, upon good considerations, for divers causes, and es-
specially for the Queenes Majeste, they have deuised to
make their Ordnance shottes than the accustomed man-
er, and do by that means they are lighter than the pieces
before time made, and yet as stricteable as the longer in
some parts, shooting that weight in powder, and shott
that the heauier doth, in all points as the other: for that
mettall that is taken from the length of the pece, hurteth
not the fortisying of the pece. And as for the making of
the Carretidges for any piece, it is easie enouogh to be done.
for the compasse of the shottes, and the length of the label,
shall rule that matter well enouogh. Nowe shall followe a
rule to know the weighe of the pece shott, by the height
of the shottes.
To dispart any piece of Ornaunce truly.

CHAPTER III.

Of all things belonging unto a Gunner, the chiefest is, to bring the mettall of his piece even, for else he shall never shoot just to his mark, which Gunners call disparting of their pieces: and there be many wapes to do it. How to dispart your piece, do thus: take a string, such a one as will not stretch, then giue your piece about his tayle of great ende, in the very biggest place of the piece, then measure the line, full long, how many ynches the piece was in the carde, and then looke how many. 22. ynches be in the circle, take to many. 7. ynches, for the Diameter, bigste, or thickness of the circle, so in all circles being perfect round, as timber, bone, or any other mettall, looke how many. 22. ynches be in the circumference, in compass so many times. 7. there is in the Diameter of height, then the height; 9. thickness of the breech of the piece being known, looke how many ynches and parties of an ynce it commeth unto, then lay that unto the mouth of the piece, and looke how much of that ynce remaine over, then take half of that for your dispart. But some doe heare to giue them (as above is said) and do put that into three equall parties, but that is not the exacte way, although it dothe goe somewhat neere the matter. Some also will take a pricking pion, and put it into the tutchhole, and then lay it unto the mouth of the piece, and looke what it commeth unto more than the measure, they will take that for their dispart: but that may be deceivd, as it is generally false. Wherefore this is a very good way, to take your rule of two foote long, and then lay...
The Arte of shooting

Take that crosse the capple of the pece then take a plummet of lead upon a line or a string. First hold the plummure line on the one side close to the pece, that the line touche the pece without any bending, then on the other side, as circumferently as you can, that the plummure line touche the line of the pece, without any bending, and then labe that measure to the mouth of the pece, and looke what the othermeasure commeth unto, take halfe of that for your true dispart, Note for your better instructions by this figure.

First I lay my rule of two foote long upon the capple of the pece cross A and B and then I hold my plummet of leade first upon the capple A as you may see, and then hold my hand upon the other side B close to the line of the pece, then I do look how many ynches the capple of the pece was from A and B, and I finde it nineteen ynches and a halfe; then I lay my rule into the mouth of the pece C and D, and finde that the mouth of the pece is nineteen ynches, so there remayneth foure ynches and a halfe; then I divide the four ynches and a halfe into two equal partes, 9 that is two ynches and a quarter which I take for my dispart; then with my plummet of leade, I goe into the mouth of the pece, and making a perpendicular line, and so I finde the uppermost parte of the pece; then I take a strang, letting that perpendicularly, according to the dispart, two inches and a quarter above the mouth of the pece, and make it fast with a little ware, at the letter C, then bring it ginge 9 taille of the pece to the toppe of the strang which is my disparte, level with my marke, there is no doubt, but I shall make a perfeke shotte, so that it be as farre as within the cast of the right line; for the disparting of your pece, is but to bring the mouth of your pece before to be as high as the capple behind. For this you must consider, that he that can by arte lay the hollow of the pece right against the marke, must never hit it, to that it be not farther than the pece both cast upon the right line, for he that shall give level to a pece without disparting, shall shote a great beale over the marke, because the line of the pece is contrarie unto the case of hollowness of the fame: for the mettall of the capple of the pece, is a great beale thicker than the mouth. And furthermore, this is a very good way to dispart all manner of pieces of Oronance; take your Caliper com-
The Arte of shooting

pallace, and s to take the height of the table of the piece, then measure it with your rule and look what it is more at the table, than it is at the mouth, take half that for your silhouette, and doing (as before is said) there is no truer way, so that your Calapar compasses be large enough to reach it. Now in like case, you may silhouette your piece with your Squint, and also with a square, but to reach various ways as long as a man may reach, all lie, it were but superfluous, and the select wayes as good or better than the other.

Now as concerning chamber peeces, for the disparting of them, there can be no perfecter writing, for it must be considered and handled, according unto the shape of the Chamber, and fashion of the hall of the piece, whether it be Sling, Fuller, Poste peeces, or Barres: but any reasonable man, when he doth see the piece and the Chamber, may easily know what he must doe, as touching those matters.

How to jieue leuell with any piece of Orunaunce, to make a shotte, as the most sorts of Gunnereye to doe, although there be no Artes in it.

CHAPTERS.

Of the making of a shotte, that is to take, to jieue leuell unto ampere marke assigned, with a piece of Ornaunce, without the right line, according unto the accustomed manner that Gunnereye, for that they doe not knowe the distance unto the marke, and therefore doe but jieue a gette

in great Ornaunce.

gette what advantage will reach the marke, and if that it be with an ync rule, then thus they doe.

First by thier judgements they doe jieue that so many yncs advantage as they suppute will reach the marke, and then by the first lighting or falling of the shot, they both see whether it be short or gone over the marke, and if it be short, then at the next shooting he will jieue the piece more advantage by the ync rule: and if it be over, then he will jieue the piece leffe advantage with the ync rule: and so by divers times shooting off the piece at a marke, they will finde how many yncs and partes will keep the length of the marke. And if they doe not shoote with an ync rule, then they will jieue the piece the advantage by some assigned place beyond the marke that they doe shoot at; and if the shotte doe light shotter, then they will jieue the piece more advantage at the next shotte; and if the shotte be farther then the marke, then they will jieue the piece leffe advantage 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 piece must bee mounted into righte over the marke, then they alwayses mounte the piece unto that advantage, and they shall alwayses keep the length of the marke, with that piece at that marke, the piece to bee laven always equally with Powder.

But by this order of shooting, she shall never become cunning, although she shoote a thousand shottes, for that there is no method or order in the doing thereof, but only with that piece at the marke; for if you doe shoote with another piece at that marke, although the piece dothe shoote that shotte, and that weight in Powder, the piece maye shoot under or over by the means of the length of the same, as the bignette D.I.
The Arte of shooting

of smallnesse of the breech, and the mouth of the piece in
metal, and to bring that piece unto any other place,
they must doe as at the first, to prove what will reach
the marke: and therefore this kind of shooting is to no pur-
pose, but only in a Towne or Castle, in the time of ter-
rible, for he that hath the charge of Division, to prove
what the piece will doe at every marke, as touching the
keeping of the length of the marke, whereby they may
the better shooe at their enemies when they doe serve, other-
wise it will be to no great purpose: for as often as you
doe alter or change your piece, or take that piece away
to serve in another place, so oft you are to seek, and to
prove the change newly againe, whether you doe use to
shooe with the yrch rule, or by the degrees in the Qua-
drant: for if you doe shooe with the yrch rule, then the
length of the piece will alter it as is shewed in the 8th
chapter following. And if you shooe by the degrees in the
Quadrant, then the highnesse or lowenesse of the ground shall
cause them to err, as I doe shew in the thirteenth Chap-
ter. Wherefore, if I were too short to give counsel, I
could shew them how to use the matter, that they might
attayne to know the length of the marke at the first shooe,
but I never saw it so handled, whereby they should at-
taine it: for all the proofs that have beene made as yet
by Englishmen, are no proofs, but altogether to cause
them that did see the proofes, to commit further error,
as touching the distance unto the marke, or hitting the
length of the marke.

What

in greater Ordnaunce.

What a degree is &c.

CHAPTER 4.

Furthermore, whereas this book is named
The Arte of shooting in greater Ord-
naunce, as in like manner I thinke it
convenient, to shew you what the word
Arte meaneth or signifies, which is,
the describings of a way or methode,
how to attayne to the certaintye of any matter.
Which as hitherto I have not seen any such book, although it hath
beene very neer two hundred yeeres since the first invention
of Division: and except there bee any better booke in
some mens hands, such as I have not seene, as it is like
enough that there may be, ther is no Arte in any of them:
Yet I have seene a number of booke that have beene
written concerning Division, but surely they that wrote
the, were not seene in any part of the Mathematical science,
neither good Mathematicians, but (in respect) utterly bode
of any science: (in comparison) no good order describ'd in
the shooting of Division, to knowe what distance the
shotte is delivereed from the piece: neither have they
known what instruments have beened. And although
they have named degrees in their booke, yet it appeareth
unto me that they have not knowledge what a degree signi-
ficeth, for that they have named a Quadrant, a Triangle
and other fond and foolish by-names. Wherefore they that
have written those booke that the Gunners have amongst
them, were utterly vnlearned in any manner of science,
which were in the beginning, in the time of King Henry 7th
eight, made by Flemmings: for in the wars in those daies
the King lent our into Flaunder, and those parts there-
about, to have Gunnys to serve him in the waeres, so the
Gunnys have no other booke, but such as were written
D. III. by
The Art of Shooting

by them wherefoe I do thinke it good to shew you what a degree is.

A degree is a part of division of a whole circle into 360 equal parts, as the the ancient fathers sometime have taught, and especially in Astronomy. And it is very profitable for Gunners to know the use of them. The Quadrant, which they do occupy, is the fourth part of a circle, divided into 90 equal parts, according to the fourth part of the Heavens, for the thirteenth picke in the Heavens, the Crowne of your head, downe to the Horizon, is divided into 90 equal parts, according to the Quadrant. As for example: If there were a perpendicular line let downe out of the Heavens into the earth, then should the earth be a right line, and make a square angle with the further part of the Horizon that you can see, and so yssue into the Heavens, as both the Quadrant: and then the best of the Rander is 45 of these divisions, 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 wind, but otherwise it is none, as it is further declared in the 7. Chapter. And for better example, I have placed this figure.

How to make a shotte upon the right line, and also to know how much ground any piece of Ordnance doth drive, or convey the shot as the means of every degree of the Rander.

CHAPTER 7.

Furthermore, any piece of Ordnance being truly dispacted, as is declared in the fourth Chapter, they may know at all times how to shoot first unto the mark, especially within point blank, & point blankes, is the direct firing of the shot, without any descending from the mouth of the piece unto the mark, mouth of the piece to stand directly with the Horizon, so that it be upon a plain and level ground, as far as the piece may cast, shooting anything that standeth directly as high as the mouth of the piece, laying the hollowe or concavite of the piece against the thing that you desire to shot at. And to shoot at some mark in the right line, you shall do it by this means: your piece being truly dispacted, and the dispacte fir the mouth of the piece, being the middle of the toppe of the piece to the topp of your dispacte mouth, and the shot to the mouth of the piece, and the mark that you desire to shot at, all three in the same right line, by the sight of one of your eyes, and then foreseeing that the piece standeth upon a level grounde, and the wheel of the piece in straight as the other, this alwayes, there is no doubt but you may shot at were the mark with a Cannon as with a Paragabus, or a Catleyer. This is most certaine. Therefore it is very necessary to know how far any piece will convey the shot upon the right line, which is somewhat hard to do, for
The Arte of shooting

there is selome any grunde, but is rather in one place then in another, and then if the piece should be lyes close unto the ground, it would graze before it were at the end of the right line, and then if the piece be in her carriage, the shotte will not graze before it were descened as much as the height of the carriage. And so to let by any thing cerneate at the end of the right line, it were too revious, therefore in my opinion, this is one of the best waies, in the finding what distance any piece conuerteth or bleteth the shotte upon the right line or any degree of the Rander, as thus: Repaire into a very leuell ground, as a plaine marish, that is first water leuell, and then to finde the right line or point blanke, rape a bute or banke in that plaine ground, and then sette uppe a marken the full height of the piece that ytheth in the carriage, and take a quadrant, with a rule fall thereunto, and put the rule into the mouth of the piece, and copne the breech of the piece by and downe, untill the plummet hang at the corner of the Quadrant, and then shall the Concavite of the piece, i.e. right with the Hopson, neither higher nor lower: then shooe of the piece against the butte: if the shotte be under the marke, it is more then the right line, then you must hinge the piece nearer unto the butte, banke or marke: but if it be the full height of the markes, then remove the piece farther off from the markes, and so removing the piece towaerd and backwardes, you shall finde the true right line of the piece. By this order, you may make the true right line of all manner of pieces of Ordnaunce. But whereas the opinion of theors Gunners is, the one concurrie unto the other, some holding an opinion, that the longer piece doth overhoote the shotter, and some that the shotte doth overhoote the longer: the truth is, that the longer piece doth shotter further than the shotter, although that in the mounting of a long piece.

In great Ordnaunce, peace and a shotte with an ynche rule, the short peace doth overhoote the longer, although both shotte one shotte, and one shotte and weight of powder, as you maye perceiue in the next Chapter following, and also in the beginning of the Booke in the right consideration. ye. Furthermore, to know what any piece of Ordnaunce will doe at the mounte of every degree, and what distance of grounde the shotto doeth ype, doe this, the grounde being plane and leuell (as before is repaired) place the peace in this manner: you must make a hole in the grounde, to the intent to make a plattefoime, to set the piece upon, in such order, that the cronchions of the peace being in her carriage, be yse in heighth leuell with the grounde, neither higher nor lower: then take your Quadrant, and the rule fastened thereto, and put the rule into the mouth of the piece, and so mount the piece unto one degree, shooing off the same, and being the first grade, measure the distance of grounde, and note of the markes that: then in like manner mount the piece unto two degrees, and so unto three degrees, and so forth from degree to degree, untill the peace be mounted into the best compass of the Rander. Thus shall you know what any peace will doe at the mount of every degree. But if you shoulde make your peace upon suche grounde as is not leuell, then you shoold be erroneous, for that the Quadrant sheweth by the degree, how much it is higher than the Hopson, so if the shotte doe not finde grounde in his descending, equall with the heighth of the piece, the shotte shoulde further than it shoulde do. And also if the ground be higher than the place that the piece doth stand upon, then the shot will be slayde the sooner, by the meanes of the heighth of the grounde, so doe more at large declare in the 13 Chapter following. And for your better instruction of the mounting of the piece, I have made this figure following.
Firke take the Quadrant, and put the rule of the Quadrant B into the mouth of the piece C, and then putting by or downe the tape of the piece A, till the plummet G fall upon the corner of the Quadrant at D, then looke whatsoever you see right with the upper part of the Quadrant H, shall be level with the mouth of the piece, and that is called the pointe blanche, so as upon a level grounde with oute any hylls, as upon the sea, that all things stanweeth so leuell, shall bee ryghte with the Horizon, that is to say, at the parting of the earth and the Sky, by the sighte of your eye: and then putting downe the tape of the piece A, the plummet line G will hange.

in great Orduuance.

hange at what degree you please towards the myndle lyne of the Quadrant E, then the mouth of the piece B and C will goe upwars, &c. Nowe shall followe (according into the prooves that I have made, but yet not to my contention, neither in respect to no purpose) the argument of the proprition of the mounting of every degree into the best of the ordnance, according unto the prooves that I have made. Looke howe muche grounde the piece conceyved the hotte from the ryghte line, unto the mounting of lyne degrees, that is as muche grounde as the ryghte lyne, and two synct parts more, and from the mounting of lyne degrees unto tenne degrees the hotte is conceyved as muche grounde as the ryghte lyne, and ½ parte moe, and from the mounting of tenne degrees unto fiftenee degrees, the hotte is conceyved as muche grounde as the ryghte lyne inuie. And from the mounting of fiftenee degrees unto the mounting of twentie degrees, the hotte is conceyved halfe as muche grounde as the ryghte lyne iust: and from the mounting of any piece from twentie degrees unto the best of the ordnance, the hotte is conceyved in all about ½ partes of the ryghte lyne, and that is in a faire calme sope, and then two and loftie degrees is the best of the ordnance, and wyth the wynde lyne and lofty is the best of the ordnance, and agaynte the wynde, as the wynde is in bignesse, that is, one and loftie, or loftie, or lyne and thirty, or ryghte and thirte, or leuence and thirty, or lyne and thirty degrees, the wynde beynge altogethuer the ruler therof. Therefore it is but a folly to make ancompaye thereof, neither is there any truice above the mounting of any piece of ordnance, above 20 degrees, excepte it be a moter piece, and the hotte is conceyved off grounde from the mouth of the piece unto the lyning or falling of the hotte, to the beste comparte.
The Arte of shooting

of the Rander, about five times and a halfe as much as it grew as the right line, being (as befoe is declared) within a little under of our, according as the winde bloweth more or leffe, against the wind, or with the winde, and so forth. But here is one principal thinge to be considered, and that is this, that you do alwayes charge the pece to just one weighte, and one foce, and kind of powde, for otherwayes in the doping thereof, you may commit error, as before is declared in the sexte Chapter. As touching the knowing the goodnesse of Poudre, for that it chanceth many times that they have not always one foce of Poudre, neither alwayes of one mans making but of sundry mens making, and so by that meanes, some Poudre is better than some is; therefore it is a harde matter for to know certainly, y thus much in weighte of this poudre, is equall unto the foce of so muche in weighte of that foce of Poudre: wherefofe in my opinion, that engine of little bore that is used to prove the force of the Poudre is borpe necessarie to be vse, for by it, you may truly know which foce of Poudre is stronger or weaker in force than the other, by wapinge alike some small quantite of each foce, and so putting the poudre into the engine of bore, and burning it, first the one foce, and then the other foce, and looke whiche foce of Poudre both blowe, or lift the livde of the bore highest, that is the stronger foce of poudre, and you shall know by howe muche, by the teeth of notches that doe stay the livde of the engine of bore, and so by that engine of bore, you may finde the foce of the poudre, that is to say, if that you doe occuppe so muche poudre with anie piece of Orndaunce. And so that you woulde keepe that lengthe of the markte at suche an advantage in mounting, if you have no more of that foce of poudre, but that the poudre that you haue is echter stronger or weaker, then do thus: wep out

in great Orndaunce.

out some final quantite, as the weighte of a grote or fre-
pence, more or leffe at your discretion, as the engine of
dore is, and firste burne that foce of poudre in the bore
that you do knowe the foce of it alreadie, and then looke
unto what teeth or notch that the livde of the engine of
dore is lifted by unto, and then wep out of the other foce
of poudre the like weighte, and so burne that in the bore
dore engine, and if it doth blowe or lifte the livde higher
than it was before, then it is a stronger foce of poudre,
if not so high, then it is a weaker foce of poudre: and by
the number of notches, you shall know how much: The
foce, if it be a larger foce of Poudre than that you have
occupied alreadie, then wep out a lesser wepht of the
same, and burne that in the bore of engine, and so
doing, both by the waping and burning of it in the
engine of bore, untill that it lifte or blowe the livde of
the engine, unto the ultihe heighte that it was with the ulti
foce of Poudre: but if the ulti foce of Poudre did blow
or lifte the livde higher than the othere, then wep out more
in wepht of the ulti, and so by the waping and burn-
ing of it in the engine, untill the livde be lifted unto the ultihe heighte that it was before, so by that meanes
you shall knowe istly howe muche wepht of one foce
of Poudre shall be equall with the foce of that foce
of Poudre, and so by this meanes, although you change
the foce of your Poudre neuer so often, yet you may
looke after the pece by the wepgh of your Poudre, that the
pece of Orndaunce shall kepe one lengthe at the markte.
Having this coloestation, both in the lading and the ws-
ding, to be in such oyer, that is to say, to keap a methode
in the doing thereof, neyer to putte in the poudre too
harde, neyer too loose, neyer the wads to goe in too
loose, neyer to be too much too harde, but reasonable.
And as touching the fashion and the making of the en-
gine
The Arte of Shooting

gave as hope, I do omit that in this booke, for that I doe
spoken it in my booke, called The Inventions or Devices,
in the 54. Deuice.

Howe for to mount any peece of
Ordnance by the degree with an
Inch rule, with a Table showing what partes of
an yarde rule will make one degree, and
so unto tenne degrees.

CHAPTER 3.

O7 the making of a perfecte shotte at any
degree of the Landwage, so to have a good
length at y marke, the distance of ground
being known, first it behooves him so7
to know the force of his Poudre, which
is shewed in the Chapter going before,
and to have his Poudre putte in Cartridges, ey-
ther of Paper or Canvas, and the Poudre wasted, that the
one Cartridge bee not heavier than the other, according
unto the piece, and the goodness of the Poudre; for there
can be no certayne nething when y the piece is laden y char-
ged, sometime with more Poudre, sometime with lighter
and especially in the time of Service, I do see, that there
is no waste lading y charging of Ordnaunce, than with
a Ladell, whether that it be by Sea or by lande, for by
the lading with a Ladell, it must bee twice filled, and
then at every stroke that the Poudre is putte into the
piece, it must bee put uppe with the Rammmer head, so
that they must bee ether turne the other side of the
Ladell, or else if that the Rammmer head bee upon the
ground haft, then he must change the haft, which is

in great Ordnaunce, is a great number to doe in a narrowe romme. And also
in the carbuncle of a piece with a Ladell, she cannot hit
it so equally, but that the Ladell shal take some the
Poudre, and sometime lesse Poudre, by a good quan-
tity, and especially if that she dothe it hastily as in the
tyme of Service it alwayes requyreth haste; and that may
cause hym that greteth leuell, to shooe Poudre ouer the
marke, or too short, or too farre, although y he hath foune
what advantage will reach the marke.

And also it is unprofitable and danegerous to laue
or charge a piece with a Ladell, for that the Poud-
ner is apte to bee theede or spiled hyply
borne, and then it is apte to bee flung, considering what
a danegerous poynte it is for the burning and spuling of
men.

Wherefore if youre Poudre bee in Cartridges, and
also yper, the piece is more sooner and easiely laden of
charged, and the piece keep the length of the marke the
better, and also you maye keepe the Poudre the closer
and better, and not so apte to bee theede or spilled, for
when that the Cartridges bee spiled, then they may bee
set up Hill in some Tubbe or Barreell, and then they
maye take out one by one as needs shall require, and
so cover the Barreell close againe, that it maye bee
wythout daunger.

And now for the graping of leuell wyth any
peece of Ordnaunce, and the marke more than the
peece came reache ypon the righte line, and the
distance know interpre on the marke, and also you knowing
what ground the piece will convery the shot ypon
the right line, then by the order in the Chapter going be-
fore, you may know how many degrees will reach ymark.
And so that it is somewhat teudious & difficult to mount
any
The Arte of shooting

any piece of Dymnaunce with a Quadrante, except it be upon a plane and level grounde, that the piece standeth no more, but the inste hege, or the lowness of the mark, which happeneth very seldom. Therefore I doe thinke it very good to shew you howe to mount any piece of Dymnaunce by the degree, with an yach rule, according to the length of the piece, and to knowe howe many yanches, and partes of an yach will make up, give one degree unto ten degrees. Hereafter is a Table, the length of the piece sheweth in the margent towards the left hande, y yach square right against, that is the mount of one degree, and the uppermost number in every square, is the yanches, the undermost numbers is the obve partes of an yach, and the Table beginneth at the length of the piece five yoots and a halfe, and so encreseth by the halfe yoot, till the piece be full fifteene yoots longe.

This Table doth shew what part of an yach rule will make one degree, and so unto ten degrees.

<table>
<thead>
<tr>
<th>Degrees</th>
<th>Inches</th>
<th>Partes</th>
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<tbody>
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<td>Foot.0</td>
<td>1 2 3 4 5 6 7 8 9 10</td>
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<td>Foot.0</td>
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<tr>
<td>Foot.0</td>
<td>1 2 3 4 5 6 7 8 9 10</td>
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</tbody>
</table>
In great Ordinance.

![Image description]

...
The Arte of shootinge, in great Ordinance.

must be mounted unto 2. degrees iust, and then stiffe 2. pynche, make it 4. pynche; then do dispart the metale of the pynche, as I do shew you in the 4. Chapter, and so I do finde that the metale of the bicep of the pynche is an pynche and a halfe thick at the bicep, that it is at the mouth of the pynche, and then do sett it by a rule of a straw on the mouth of the pynche, and so making it fall with a little warre, first one pynche and a halfe above the metale of the mouth of the pynche, then do take the pynche rule, and so do remove the light in the slette of the rule unto 4. pynches, and I do sett it perfectly upright upon the middle of the bicep of the pynche, and so remove the pynche too and so, and kynpe the taple of the pynche up and downe, till such time as I may see the marke through the light in the slette, and the topp of the dispart, all thers upon one right line, by the light of my eye, and the light in the slette, and at iust 4. pynches, then shotinge off the pynche, you shall make a perfect shotte. And furthermore, if the dispart bee not lette upon the mouth of the pynche, then you must make accomplice thereof, so that the pynche nothe mounte hime selfe one pynche and a halfe, therefore you must glue the pynche but 2. pynche is a half advantage, to reach the marke. And furthermore, I will give you a second example in the same pynche as a greater distance, at 80. skoze from the pynche, and that is almost a mile, and then doing (as before is said) to seek how many degrees will reach the marke, and I find that pynche that diueth 90. degrees, the slette 26. skoze by the right line, that at 90. degrees it will cause 90. diueth the slette. 80. skoze, and (as before is said) that in that pynche that is 90. foote and a halfe long, 2. pynches make it one degree, and then the pynche must be moued unto iust 90. degrees, which is 13. pynches, if the dispart be let upon the mouth of the pynche, but if the dispart bee not let upon the mouth, then you must rebate so much of the
The Arte of shooting

the advantage in the mountinge, as the disparate commeth
vowe, and that is one ynce and a halfe. Therefore, you must
set the shote in the stite, but upon sixtene pynches and a
halfe, and so doing (as before is said) the shote shall have a
good length at the mark. And furthermore, I had thought
to have placed a Table of proportion of the casting of the
piece at the most of every degree, according to 3 pieces
each way of the stote upon the right line, but that I have not made any such exact proffo, neither am I
of that ability, neither as farre as I can lye, there is no
man will be at any such charge. But the exactest matter
I have heard that Tartallia the Italian had made perfect
proffo thereof before mine own, of the nobility of Italy, where-
on, he hath made Tables, by report, very exact, yet A
could never come by the lighte of them, neither are they
in his booke that he hath made by these caues.

What manner of course the shot

fyleth in the ayre.

CHAPTER. 9.

I suppose, it is very necessarie to
knowe what manner of course or propor-
tion the shote fyleth in the ayre in
his compass, that is to say, at any degree
mounted that the piece is shote at the
Randare. All those pieces that are shote
at the mounting of any degree aboue pynte blanke,
and under the helte of the Randare, hath manner
of courses in his uppuyng or shynge, by the bysasive
of the blate of the pownder, before the shote cometh to the
ground, so that the piece doth hit against a leuell ground.
The first course is by a right line, and so long as the shot
goes violently. And the second course doth begin for to
compasse, and yet slightly somewhat upwards into the ayre,
that

Now furthermore, if any piece be shot in y mounting
of any degree, aboue 45 degrees, then the shot shall have
a perpendicular line of fall, before that the shot shall come
to the ground. Therefore I doe say, that the shot that an-
ny piece is mounted above fife and lyfte degrees, by
the
The Acte of shooting

The means of the perpendicular of falling; that the shotte falleth shorter and shotter at the mounting of every degree: wherefore they do not mount any manner of piece above the compass of 45 degrees, except it be a 300 shotter piece, and those be mounted alwayes above 45 degrees, for that the more the perpendicular line is, the more violently the shot commeth downe, and the more the piece is mounted, the higher into the ayle the shotte spight, and then the more is the perpendicular line, and the nearer the to the piece the shot falleth. Therefore that morter piece that is shot above 45 degrees, the shot hath 5 manner of courses that is to say first his right line up into the ayle: secondly, his circular seeing up into the ayle: thirdly, his furthest distance from the earth: fourthly, his circular coming downe towards: and lastly, his direct fall or perpendicular line downe to the earth, as this figure may repute, the one line to be the height of the Randare, the other the line to be the mounting of 15 degrees more than the height of the Randar; and the third, the mounting of 30 degrees above the height of the Randar. And the caute that the shotte haue his direct fall unto the earth, is his natural

In great Ordnance.

course, so first it is driven violently by the blast of the Powder up into the ayle by a right line, and then secondly, as the violent spight to the decay, so it spight circularly, and thirdly, the force of the spight being all decayed, it must needs have his natural course, and all things that be of earthly substance, must needs returne to the earth againe.

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

CHAPTER 10.

Of the shooting of morter pieces, it is to be considered that those pieces must be mounted above the compass of five and forty degrees, so that these pieces are used at the siege of Townes, for the annoyance of their enemies, y is to lay to the intent to beat downe their lodgings or houses, with divers other purposes more. And so the shotte to fall at any distance appointed, they must do this: For every degree that those pieces be mounted, the shot falleth shorter, as in the chapter before is declared: and y the mouth of the piece both stande directly on your perpendicular line of Zener or priche, with the crown of your head, and then the shotte shall fall directly into the mouth of the piece agayne, except the acrease of the wind doth put it beside the mouth of the piece, as this first shotte this piece at the mount of five and forty degrees, that is the height of the Randar, then measure the ground from the mouth of the piece into the first falling of the shotte, and y measure being known, divide those into five and forty equal parts, and every one of these parts of measure, shall be the falling
The Arte of Shooting

falling shorter of the shot, at the mounting of one degree. As for example, a shotter piece, that shooteth a 80, paces at the best of the Rande, shall shoot at the mounting of every degree a certain pace shorter: and so from degree to degree, till that the mouth of the piece standeth directly upright with your Zerjord. Now, to shoot with your shotter piece, do this: first lay the rule E crosse the mouth of the piece B, then take your Quadrant and set your square place G oppon the rule E, then put downe the table of the peiece A, till that the plummet line F fall at the corner of the Quadrant C, then shooting off your shotter piece that is the best of the Rande, and putting downe the table of the peiece A, till that the plummet line fall at sene degrees towards the middle line of the Quadrant D then that shotter piece that shooteth a hundred and eigthie paces at the best of the Rande, the shotte shall fall foute paces shorter, that is, at a hundred and foute paces from the peiece, then at the mount of twenty degrees, the shotte shall fall 80, paces shorter, that is to lay, at a hundred paces from the peiece, then at thirte degrees the shotte shall fall a hundred and twenty paces shorter, that is to say, theke the pace from the peiece, then at the mount of forty degrees, the shotte shall fall as a hundred and three-score pace shorter, that is, at twente pace from the peiece. And thus it may be seen, that from the mounting of every degree the shotte shorter, shorter pace, and thus, by deviding the best of the Rande into line and solde equal paces, you shall know the mount of every degree, at what distance the shotte shall fall from the peiece, as by these figures following it both appear.
The Arte of shooting

of them can not doe it very well, for that cause they will say, they neede not disparte their Ordnaunce. But if they do not disparte their great Ordnaunce, and especially those new pieces that be nowe asape made for the Spanish, they shall do but simple seruice, besides the gree charge in waight that they shall put them to that beare the charge thereof; for one shotte of the great Ordnaunce, is twenty times the charge of the small pieces; and many of the small pieces in a manner nevertho not disparte, but the great pieces; for the mettal of the etape of the piece is a great beale bigger than the mouth of the piece: And this is generall, for ever, looke howe muche that the mettal is thicker upon the one side at the etape of the piece than it is at the mouth of the piece, then looke howe manye times that the length of the piece is unto the marke; so many times the thickness of the mettal is thicker at the breech of the piece, than it is at the mouth: So many times the quantity shall the shotte flye over the marke, if to bee that the piece be shotte without disparting, and the marke within point blanke, or the righte line of the piece: as for example thus; by a piece of Ordnaunce, that the mettal of the breech of the piece is thicker by three ynches on the one side, than it is at the mouth of the piece, and the piece is just twentie foote longe, and the marke is just twentieth from the piece: Nowe the piece being twentine foote longe, there is just like times the whole length of the piece in every shotte, so that a shotte is little foote, and fire times tenne is little shotte, then the mettal of the breech of the piece, being three ynches thicker than it is at the mouth of the piece, a piece shal cast over the marke at the ende of every shotte eighteen ynches, so that the piece shooteth three ynches over the marke at every tyme the length of the piece, and then shcynnes three ynches, make the eighteen ynches; so that it must necess

in great Ordnaunce,

be cape, that at the ende of twentie shotte, the piece must needes caste twentie tymes eighteene ynches over the marke, and twenty times eighteenth ynches, make the three hundred and sixtie ynches, and that containeth thoughe yott, so that I doe conclude, that the piece which is but twente yott longe, and the mettal three ynches thicker on the one side at the breeche of the piece than it is at the mouth, and the marke twentie shotte from the piece, thes piece being shotte without anye disparting, being shotte against an upright wall, then bringing the middle of the mouth of the piece, and the myndle of the etape of the piece, and the marke, all three bynne one righte lyne, and then the shotte shall keepe the wall in the myndle foote right over the marke, and this shall be true without anye faile. Then this being true, what mad men be those Gunners, that will be of such an opinion, that they neede not to dispart their Ordnaunce.

Howe to make a perfect shotte

with a piece that is not truly bored: that is to say, that the core or hollowness goeth not right in the middle of the mettal.

CHAPTER 8.

S't chanceeth many times thorough negligence or default of founders, that some pieces be not truly boyled: it is to say, that the core or hollowness of the piece runneth not right in the middle of the mettal, but the core or concavitie declineth or leaneth more unto the one side, than it doth on the other, for although at the mouth of the piece the metal be round about of one line thicknesse, yet at the breech of
The Arte of Shootinge

of the pcece the mettall may bee thicker on the one side, than it is on the other, and then that pcece will neuer shote righte upon the marke; and also, this pcece is very daungerous to shote in for feare of breaking: And this is generally soe: For to knowe, looke at that side that the mettall is most thicker at the breech, from that sidewarde the pcece both cast, and then righte against the thickest parte of the pcece. There is the thinnest side of the mettall, so that the mettall be perfit rounde on the out side of the pcece, and also the hollowe parte within the pcece, and towards the thickest side of the mettall of the pcece, towards that side the pcece casteth. And so to knowe howe much, you may easily perceve: looke howe much the thickest side of the mettall is thicke, than the thynner side, looke howe many times the hollowe of the pcece is into the marke, to many times halfe the thicke of the pcece, then is thicker on the one side, than it is on the other, to many times that proportion that the hot side vide of the marke, towards that side that the mettall of the pcece is most thicke. As for example this, there is a pcece, the mettall is thicker on the one side, than it is on the other side by two ynches, and the caze of hollowesse from the tutchhole, unto the mouth of the pcece, is 10. ynche longe, and the marke that the pcece is shot at, is 20. skoe from the pcece: now there is, 6 times the length of the hollowesse of the pcece in every skoe, and the pcece casteth one pynche a -ynge at every time the length of the hollow of the pcece, so 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 ynche, and add unto the other side that one ynche, then it will fer the hollownesse of the pcece righte in the middle of the mettall, as it is, 5. ynches thick on the thicker side, and but 3. ynches thicke on the thynner side, then take from, 5. ynches one ynche, and there deth remain but 4. ynches, and then add unto 3. ynches one ynche, and then it makes 4. ynches.

In great Ordinance

pynches, & then both the sides be of one like thickeenes: then (as before is said) ther is, 6. times the length of the hollow
neste of the pcece in every skoe, so that the pcece casteth
away in every skoe, 6. ynches. Tho it must needs be said, that at the ende of 20. skoe, the pcece casteth before
the mark. 20. times, 6. ynches, and it makes, 120. ynches,
and that is 10. skoe at. And furthermore, so to make a
pere shote with this kind of pcece, it is a strange matter
unto Gunners, and they had neede to be very circumspect
for feare of overcharging, for you must not give this kind
of pcece powder according unto the weighte of the mettall,
for that the haly too much mettall on the other side, when
it doth noe good. And now so to make a shotte with this
kind of pcece, so you first search the pcece with those kind
of instruments that you haue spoke of in the 2. Chapter, then
if the thickest part of the mettall be upon the upper side
of the pcece, that is to cose, at the tutchhole, the pcece
being as before is declared, 2. ynches thicker of mettall there,
than it is on the lower side, when that you haue dispers
furtherly poute pcece truly, as though the hollowesse of
the pcece ran right in the middle of the mettall, sette by your
disper upon the mouth of the pcece one ynche moare, for
that the mettall is thickest upon the upper side thereof by 2.
ynches, and halfe 2. ynches is on ynche; then hinging
the middle of the tutch hole of the pcece, and the top of your
disper, and the marke, all three upon one righte line, by the
righte of your eye, the pcece being shote off you shall
make a perfe shote upon the righte line. Then if the thickest
part of the mettall by 2. ynches be under the pcece, that is
to say, that at the tutchhole, the mettall is at the thinnest,
when you doe sette by poure true dispenser upon the
mouth of the pcece, relate one ynche of the lengthe
of the dispers, yf else the pcece will take the shotte under
the marke, so that the thickest side of the mettall is
downewardes. And furthermore, if that the thickest parte
The Arte of shooting

of the mettall chaceeth in any other place, howsoever that
it chaceeth, then at the thickest side of the pece make all-
tle marke, as you may do it with a little ware as bygge
as a pumes head upon the very brecche of the pcece: then
when you have diisparted this pcece truly, as though the
hollownesse of the pcece did rume right in the middle
of the mettall, sett by your diisparte upon the side of y mouth
of the pcece, as right as you can make it, with a line a-
against the little ware that is on the thickest side on the
brecche of the pcece, and then make the dispart one puch
the more, for that it is somewhat little side, and then bring the toppe
of the dispart and the little ware and the marke, all three upon one right lyne,
you shall make a perfect shotte: And furthermore, if that it
chance so, that the thicke side of the pece be somewhat unneath
neath the pcece, then let by your disparte upon the thinner
side of the pcece, and also the little ware upon the brecche
of the pcece, and then you must rebate one puch from your
true disparte, and this by consideration, there can bee no
pcece, but by you may make a perfect shotte, for he that
can by Arte lay the hollowe or concavite of the pcece agaiste the marke,
must needs hitte the marke, so that the marke be not farther off than the pcece can reach upon the right lyne: and this is true without any rale.

How to give leuell at a marke upon
a hill or valley, with the Quadrant.
CHAPTER 13.

In the shooting at a hill or valley to give
leuell with the Quadrant, there is two
principal things to be considered, one
especially if that the marke be farther
than the pcece will reach upon the right lyne.
First, when they doe knowe the distance
unto the marke, and the marke more then that the pcece
will reach upon the right line, then mount the pcece so
many degrees, till that the pcece be able to reach the
marke, then take your Quadrant, and looke through the
two lightes of the Quadrant, the plummet hanging at li-
bertie, till you may see the marke justly upon the hill,
winking with one of your ightes, then looke upon what de-
gree and place the plummet line both eyne upon, then
mount the pcece so many degrees more as that light
come unto, for the height of the hill, then that being
done you shall make a perfect shotte: as for example
this: by a marke that stand upon the side of an hill, and
by Geometric perspective, the distance is found to bee
little skope from the pcece, and now the pcece is a Culler-
ning, such a one as shooeth thirthie skope upon the right
line of point blanche. How the marke is thirthie skope
more then the pcece can reach upon the right line, there-
fore you must mount the pcece, till it be able to reach the
marke, and that is, at the mount of foure degrees, as it
doth appeare by the examinng of the severall Chapter,
and there you shall finde it to appeare to be at the mount
of foure degrees, nowe that being knowne, take your
Quadrant, and take the number of degrees that the hill
is in height, higher then the ground that you stand upon,
and that is done (as before is delected) and then you finde
that the marke is five degrees higher then the ground
that your pcece lyeth upon, then add that number unto
the other, and that makes in all nine degreees ful, for that
the pcece is molted foure degrees to reach the marke:
and nine degrees for the height of the marke, which is
higher grounde then that the pcece both lyte upon, then
laying the pcece right upon the marke, there is no doubt
but that you must needs make a perfect shotte, and to
lay the pcece right upon the marke, the pcece being moum-
red
in great Orndaunce.

that it is to the hill, you must rebate line degrees. Wherefore you may conclude, that the piece, must bee levelled with the Quadrant, one degree under the point blanche, that is to say, lower then the Horizon by one degree, for that the perpendicular of the valley is the cause thereof. Wherefore in mine opinion, it is better for Gunners to be to give level with an exact rule, as I do aforesay declare in the eight Chapter, for I doe know, that this is the cause that hath deceived a great number that are meanly sworn in those matters, and for lacke of considering of those causes that may happen to chance, hath discouraged many that would have been well sworn in those matters.

Howe to make a persite shotte vp

on the lands, as the bide side of a Shippe that

is under seale, and

going.

CHAPTER 24.

Furthermore, for the making of a persite shotte upon the lands, as a shippe that is under seale in a River, the chiefest matter is, to have good Powder, that the piece may goe off to home, as her hath been given unto her: and to shotte at her bide side, do this: First before the commeth to you, doth at what proportion the commeth, that is to say, whether that the commeth in the middle, or else unto any of the sides, or unto any other proportion, then your pieces being truly distributed, lay your piece against some mark that is further side of the River, that being done, then koyne by the bide of the piece, till the top of the dispart standeth with that proportion which the ship commeth upon: that thence being
The Arte of shooting

being none, then it is good for you to have another imagined mark, somewhat nearer the Shipphe, believe that mark which the piece lyeth upon, like unto a twenty foote, according unto the way of the Shipphe, for if that the Shipphe have fresh way, then giue fire untill to the piece of pieces, twenty or thirtie foote, before that the Shipphe commett unto your thwart markes, that the piece lyeth right against, and this being discreetly done, there is no doubt but you shall make a perfect shot. And furthermore, if it be upon the Sea coast, where there is no land scene upon the further side, then take a thwart mark by some Clowde that is found near the Horizon. And furthermore, if that any shippe doe goe directly from you wards, or else come directly to youwards, then it is a small matter to make a perfect shotte, that is to say, if that her head ore steere be towards your Ornaunce.  

Howe to make a shotte out of one

Ship unto another, that although the Sea be wrought, or out of a Galley so Shipphe.

CHAPTER 1s.

For Gunners that do serve by the Sea, must observe this order following. First that they doe see that all their great Ornaunce be fast breeched, and so see that all the gear be handfome and in a readinesse. And furthermore, that they bee very circumspect about their Powder in the time of service, and especially beware of their Limelockes & candels for fear of their Powder, or their fire-works, or their Gun-sun, which is very dangerous, and much to be feared. Then furthermore, that you do keep your pieces as near as you can, by within, and also, that you keep their tutch-holes clean, without any kind of wood falling into the. And furthermore, it is good for the Gunners to view their pieces, and so to know their perfect disparte, and make it uppon the piece, or else in some Booke or Table, and name every piece what it is, and where the both lye in the ship, and name how many yntches, and half yntches and quarters of yntches the disparte commett unto, and then in time of service, although that you have no time to set uppe your disparte you may consider of it, and doe it well enough. And furthermore, if they were vsiue to make a shot upon a goudyne, and know not what disparte would serve the piece, yet this you may doe, and speede well enough: first looke all alonge by the side of the piece as neere as you may at the middle of the breach of the piece, unto the middle of the mouth of the piece, and so by the light of your eye, lay it right against the mark, and then layne by the toppe of your piece fast, so that giue the piece the true height of the marks: then take the nearer light aloke upon the piece, from the breach of the piece, unto the mouth, and so laye the piece right uppon the mark. But you would judge by the light of your eye, that the piece lye a great deal, under the mark: so that the metcall of the piece is a great deal thicker then the metcall of the mouth of the piece, and therefore the light of the side of the piece, giue not the true height of the mark, and then laying the piece right with the Ship that you doe mean to looke at, looking well to your Steering, Furthermore, if the Sea be wrought or grown, or the Shippes do both heave and set, then you would make a perfect shot, so this: first choose your piece between the Laffan, and the mayne Mast, upon the lower Dipples, if the Shippes may kepe the poete open, and so this cause you that doe it, so that the Ship with least labour there: so any Shipphe that both heave, and ye never
The Art of shooting

soe, doth hang as though he were upon an Arbre, thare labouring least, except the both feel a route. But if any Ship hang any thing by the wind, it will not lightly feel a route. Then if you doe make a shotte at another Shippe, you must bee sure to have a good helme-man, that can fire steadie, taking some marke of a Cloude that is above by the Horizon, or by the shadowe of the Sunne, or by your standing still, take some markes of the other Shippe through some hole, or any such other like. Then he that giuer freell, must observe this: first consider what disparce his pcece must have, then lyp the pcece directely with that parte of the Shippe that be both meane to shoot at: then if the Shippe bee under the lee side of your Shippe, shoote your pcece in the comming downe of the Gale, and the beginning of the other Ship to rife upon the Sea, as vvere as you can, for this caute, for when the other Shippe be aloft upon the Sea, and bee under your Lee, for the Gale maketh her too to head, and then it is lykely to doe much good.

Now furthermore, if the Shippe you doe shoote at bee the weather gage of you, then your pcece that you doe shoote at her, must necesse bee on the weather side of the Shippe: then giue fire into the pcece in the righting of both the Shippes. When that the Gale is oner, you must awake when the other Shippe doth beginne too to arise upon the Sea, and especially that part of the Ship that you doe meane too to shoote at too this caute, for when that the Gale is oner, then both the Shippes doe righte, for if that you should shoote in the heeling of your Shippe, then you oullbe shoote ouer the other Shippe. And furthermore, if you shoote when the other Shippe is aloft on the topp of the Sea, you have a bigger marke then when the is in the rough of the Sea. Therefore there is no better time too to giue fire.
The Art of Shooting

most good, then furthermore, if you doe mean to enter him, then give leuel with your Fowlers and Footpee-
ces, where you doe see his chiefest sight of this Shippe is, and especially be sure to have them charged, and to shoo,
ten off at the first hooing of the Shippe, for then you
shall be sure to shooe. And furthermore, mark where
his men have most recourses, there discharge your Fow-
lers and Bales. And furthermore, for the annoyance
of your enemie, if that at the hooing that the Shippe yee,
therefore you may take away their steerage with one of
your great pieces that is to shooe at his Roche, and fur-
thermore at his mayne mast, and so forth. Thus muche
have I laid as touching Sea Gunners, for that I doe
know they do meddle with no other fite, and therefore
it is meete for them to seeke as much as in him yee, for to
annoy the enemie with firewoks and Dynamaunce.

And furthermore, if the Shippe be at a joyful rowe, then
the best place of the Ship to make a shooe, is out of the
head of steere. And furthermore, to make a shooe out of
a Galley, and especially the Cannon that yee in the
Cale, or Prow, he that giveth the shooe, must be rule of him
that is at the helme, because he can neither knowe bet nor
downe, for that the yee in the cale, for he that dire-
cteth, must give the leuel. And furthermore, the Cannon
that yee in the cale, can not lightly shooe a Shippe under wa-
ter, neither betweene the wind and the water, where that
it is not on the Sea, and especially if the Ship be at hand,
for that the yee leuell, for looke how high the piece
is above the Sea, so high shall the shooe inhe any thing
about the water, as farre as the piece can cast upon the
right line. And to make a shooe out of a Galley unto
a Shippe, to strike him under the water, or betweene
the wind and the water, first waught the Shippe lying
in the trough of the Sea, when the wind begin to rise upon
the

in great Ordnaunce.

the Sea, and then in lyke manner, when you do see that
the Galleyes head doth beginne to descend, then give fire
unto the piece, and you shall make a pestic shooe. Fur-
thermore, if the Galley be in fight with another Shippe
in a calm, then the Shippe will stande waere or stirre, and
then the Galley may play off and on at his pleasure: and
then to make a shooe at hande, is some matter, for in a
calm, the Shippe doe neither rye nor fall, but a little,
in comparison of any thing to the purpose: neether dothbe
the Galleyes head either heare not set to any purpose, if the
Shippe be at hand, to the intent of purpose to shooe a
Shippe under the water. Therefore when you mean to
strike a Shippe under the water with a Galley, dare
not lay them aboord, then coppe your Cavells towaerd,
with the remaining leuwarde of your weightie grace into
the Galleyes head, so loute, till it shall strete your turne,
by bringing also your men towaerd; then by y steerage
with your Dees, or with your Piline, you may shooe aga-
in that part of the Shippe you will, and so shooe the
under water at your pleasure.

In what order to place Ordnaunce

in Shippe.

CHAPTER XVI.

No furthermore, I do think it conve-
nience to shew you how to be sh place
Ordnaunce in any Shippes: this is
to be considerd, first that said cariage
be made in such sort, that y piece may be
right in the middle of the post, so that
the trocheres or wheetes be neit be ygth, so if y trocheres
be too high, then it will kepe the cariage that it will not
goe close unto the Shippe's side, and by that means the

piece
The Arte of shooting

Pece will not sorne go out of the poote, excepte that the
terce be of some reasonable length: and also, if the
Shyppe be holden that waye, the Trockes will always
tume close to the Shyppes side, so that if you have any
occasion to make a shorthe, you shall not bring the Trockes
off from the Shyppe side, but that it will rume too again.
And the wheele of Trocke being very hysg, it is not a
small thinge under a Trocke to lay it but that it may
rume over it, so.

And also, if that the Trocke be hysg, it will cause the
pece to hawe the greater reuerie or recolte, therefore, the
lower that the wheele of Trockes be, it is the better and
so forth.

Alwayes prouiding, that the pece be placed in the
wrepe middyle of the poote, that is to saye, that the pece
lying leuell at pounte biancke, and the Shyppe, to bee
uyprighte, without anpe hyldeing, that it be as many inches
from the lower lyne of the poote beneath, as it is unto the
upper part above suftely. And the deser of hysghe, that y
poetes bee up and downe, it is the better to make a shor,
for the hyldeing of the Shyppe, whether that it be the
Lee lyne, or the weather lyne of the Shyppe, for if you have
anpe occasion to shooe either forwarde or backwards,
the hyldeage of the Shyppe will serue the turne, but if
that the Shyppe dothe helle muche, then if that the
pece be letter by the lower partes of the poote, then you
muste nevres shooe the hylde of the mark, and if it be letter
by the upper lyne of the poote, then you shall shooe
lazette of the mark, so. Wherefore, when that the
Carpenters doche cutte out anpe poates in a Shyppe,
then cutte them out barep yough lype and
downe, so.

And also, it is barep ever, so to have the Dyllope

in great Ordnaunce.

pe Deke too lowe under the poote, so then the car-
rriage muste bee made barpe bygh, and that is bar-
pe still in bypers respectes, so then in the hoo-
ysong off the poete, it is apte to overthrowe, and also
by the labouer and the lychyng of the Shyppe, and so
soone.

And furthermore, you muste have a considera-
tion for the tryng of poure Dylnaunce in the Shyppes,
as thys, the shorte Dylnaunce is bette to bee placed
out of the Shyppes lyne, so two or three causes,
as this.

first, the caste of the Shyppe, so they shorten-
elle they are the lyghter: and also, if that the Shyppes
shoulde belee wyth the hearyng of a Sage, that you
muste shute the pootes, especialy if that the Dylnaunce
be hypon the lower Dylappe, and then the short pece
is the calver to bee taken in, both for the shortenelle and
the wyglye also.

In lyke manner, the shorte that the pece ly-
cre oute of the Shyppes lyne, the lute it shal
anoyn them in the tackyng of the Shyppes Sapes,
sor if that the pece doe lyce barpe farre oute of the
Shyppes lyne, then the Sheetes and Tackes, so the
Dylynes wyll always bee soule of the Dylnaunce,
whereby it maye muche annoyn them in soule weather, and
so soonce.

And it is barep very good for you to have long Dylnaunce
to bee placed righte oute of the Sterne of the Shyppe
for two causes: the one is this.

The pece muste lyce barpe farre oute of the poete,
so else in the hooysong, it may blowe up the Counter of the
Shyppe Sterne.

And also, the pece had neve be very large, so else it

A 2 will
The Arte of Shooting

will not go very farre out, for the woode of a ships sterne hanged very farre outwards from the decke of Olloppe by to the poete, so that the carriage may be close belowe, but not aloft, &c. And also if you have any chassing pieces to shoot right forwards, then they must be long Ordnance in like manner, so that you must site your Ordnance, according unto the place that it must lie in, and also (as is before rehearsed) that it is not good for to have the mountance or carriage to high. Therefore, if the Olloppe or decke be too lowe under the poete, then it is good for you to make a platforme under the poete, that the trockes of the carriage may stand upon. And also, when you doe take the measure of the poete, from the decke of Olloppe, to the end to site the mountance or carriage in height, that the piece may liye right in the middle of the poete, then you viewing the decke of Olloppe, and considering what height you will have the wheels of Trokke, and also marque whether or how that the Ships line both hang inwards, or outwards, and also the Cambering of the decke of Olloppe, and then you perceiving where the foremost trockes both or must stand, when that the carriage both go close to the poete. Then where as the very middle of the foremost trockes both stand, there take the true measure in height from the Decke of Olloppe, upwards, and so shall you knowe truly how many voxches will make the piece right in the very middle of the poete: so if you doe take the measure of the heighth of the poete from the poete downe unto the Decke of Olloppe, therby the means of the Cambering, the Decke of Olloppe, and also the wheels of Trockes both not come to stand right under the poete, so by that means the Decke of Olloppe is higher inwards, and that shall cause you to make the mountance or carriage too high, for that the wheels of Trockes that the carriage lyeth upon, shall be a foot more

in great Ordnance.

more or less into the Shipwards, and then look into the Cambering of the Decke of Olloppe, that it riseth inwards more, than it is righte under the poete, you shall take the measure so much too high for the piece to lay her right in the middle of the poete &c.

CHAPTER 17.

A

My furthermore, to shoote at any movable marke up the land, either at Horsemen, or at footmen, when you doe see the comming, then place your Ordnance upon some marke in their way, as right upon some bush, or any other marke that is in the high way, that they must come by, or most especially at some place where there is a turning, for in a turning, there they doe take the longest before they be altered of the marke, and then it is best shooting off your Ordnance to do no people: and also upon the land, you may try what any piece will do at any marke, as touching the keeping of the length of the marke, &c. And furthermore, at touching this, to knowe what kind of shotte is most meetest to bee done to doe service in a field, or otherwise, with their greath Ordnance, as Cannon, or Eulcerings, at a great visance, to shoote the whole pion shot as you doe at battery, as they doe upon meere, then to shoote Facon shotte, and as they doe come nearer, Faconet shotte, or final bale shotte, and at hand all manner of spoiling shot, as chayne shotte, or cluer shot, and dille shot, and tuch other like. &c.)
The Arte of shooting

How you shal knowe if any pece of Ordnance bee sufficiently metalled, and also the cause that the Cannons do not occupie the weight in Powder that the shotte wreteth.

CHAPTER 18.

To knowe whether that any pece of Ordnance bee sufficiently metalled to bare her charge with Powder, then this is generally, that in the chamber before the ruch hole, so farre as the Powder both reach to it mouthwards, that the mettal be in thicke ines as high as the shot round about the sides of the pece, and somewhat thicker, and that the mettal be not in thicke ines as much as the height of the shotte, then he is too slenderly metalled, etc.

And furthermore, the cause why the Cannons and other great Ordnance both not choose so much Powder in weight as the shotte wreteth, although that the rule and order of the founders of Ordnance, is to cast the thickness of the mettal as much as the shotte is in height of al lootes of peeces, as well in Cannons, as in all other lootes of peeces, and yet the Cannon maye not have the weight in Powder that the shotte wreteth, as all small Ordnance hath.

And furthermore, the cause thereof groweth by this means, so in the doubling the thicke ines of the mettal of the pece, it doth but increas as a plaice in, or superficial, that is, so double measure, to bee foure times the quantitee. And as for the shotte in the doubling of the measure, it is eight times the quantitee, and so it is in all bodies

in great Ordnance.

bodies as Cubes, or Spheres, and such other like, as I use to name at large declare in the third part of my booke, called A treaure for Travellers. And yet you shal have this example here by a shotte of three yndes high, and that shot wreteth three pound three quarters, the pece being a Plinio, and the mettal is three yndes thick. And now I haue another pece that the shotte is double the height, that is, six yndes high, and the shotte will weigh thirteene pounde, and now the mettal being double, is but five yndes thicke, and the bigger shotte is euyght times the bignesse of the letter, and the measure but double, yet notwithstanding, the diueriteit is not so much as it semeth: for if both the pieces were cast of one length, and double in measure, in compasse in all places, then the bigger piece should have foure times the weight of the letter. And this is the cause, that the Cannons must not haue the weight in Powder that the shotte wreteth, for the weight of the pece, and the weight of the shotte must rule the matter, as I use plainly shew in the third Chapter of this booke going before.
In what order you shall giue
leuell with your Orndaunce. at
a batterie, to breake downe the waules of
any place, and also what to ob-
serve, in the giuing fire
unto them.

CHAPTER. 19.

As I doe thinke, it is not unnecesary to shew
by what order you shall giue your leuell,
and shoot off your Orndaunce at a Bat-
terie, that is to sake, to breake downe, or
shake downe the waules of any Towne
or fortresse: & for breating them down
in the giuing of your leuell, and shooting them off, so this:
after that you have placed your Orndaunce, either in two
places, or in three places, as the place both require, but in
my opinion, two places is sufficient, into one place, to beat it
downe, to the intent to make a breach, and if it be unto a
Collison point, then it is best to place your battrey but in
to two partes, and otherwise as the place both require, &
then in giuing of leuell, do this, First, when you do mean
to beginne to make the breach, and being but at one place
of your Orndaunce, giue leuell with one piece belowe, at
the bottome of the wall, and with the next piece a foote
higher right over that, and with the third, right a foote over
that, and so forth unto every piece at that part of your
batterie, seeing you neede not giue the leuell unto no piece,
more than three quarters the height of the wall, and then
in like manner, giue your leuell with your pieces at the oth-
er parte of your battrey, unto that place that the other
part was layd right against, within a fadome or more, at
yourse discretion, as the place requireth, so that the one
place

in great Orndaunce,
place may flanke of beate against the other, crossing in
the middle of the wall, and when you doe mean to spoute
them off, then giue fire unto 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 of shake it
downe the faster, and the bottome being heate away, the
coppes will fall away of it selfe, and so when that you have
broke downe the wall, and still do make it wider, then giue leuell
at your discretion upon the wall, obseruing the order be-
fore rehearsed, both in the leuell, and of the giuing of
fire unto the pieces, &c.

The weight of all manner of cast
peeces of Orndaunce, from the Cannon, unto the Fanconte,
and also the weight of the shot, and the weight of the
Powder that they doe occupy, with the height of
the shot, and length of the piece and all such
other like casues, according unto the
names of the pieces, &c.

CHAPTER. 20

And furthermore, I doe thinke it convenient, to shew unto thee the weight of the shot, and the weight of the Powder that
doe occupie, and the length and breache of the Ladel, and the weight and length of 2 peeces, according unto their names.

And first, for the Cannons, there be of sundrie sortes. The
elephant biggest piece of the double Cannons, the mouth of
them is in height, 8, punches and a quarter. The shot is in
height 8, punches, and weigheth about 70 pound of prou, and
the weight of the piece is about 5000, in length, about
23 foote more of lesse, and composeth in Powder...46,
pound Berpecine. The length of the Ladel is 24 punches,
The Ane of Shootinge

The breach of the Labell is 15 ychues &c.

The ordinarie double Cannons, the preece is 8 ychues high in the mouth, the shotte is in heighth 7 ychues three quarters, it waspet of 22 yon about 64 pounde, and the weight of the preece is about 7500 and in length were about eleven or twelve foot long, and occupied in Powder 42 pounde Serpentine, the length of the Labell is 23 ychues a quarter, the breadth thereof fifteene ychues & the compass of the shotte is foure and twentie ychues.

The French double Cannons, the preece is in the mouth seaven ychues three quarters, in heighth the shotte seaven ychues high and wepeth being of 22 yon about 58 pounde, and the preece wepeth about seaven thousand, and is in length as the other before rehearsed, composed in Powder were forty pounde Serpentine: the length of their Labells is but fifteene ychues, so that they doe lace there preeces with three Labells fullles, and we here in England but with two, and the breadth of the place of their Labell is fifteene ychues, &c.

Demy Cannons.

And first the Demy Cannons of the elde stote, the preece is five ychues three quarters in heighth, in the mouth, the shotte five ychues and a halfe in heighth: the shotte of 22 yon mayeth apphe and thritte pounde, and the weight of the preece is neere five thousand, and in length eleven of twelve foot long, and occupeth in Powder five and twenty pounde Serpentine, the length of the Labell three and twenty ychues, the breadth of the place of the Labell twelve ychues 1/2 partes, and the compass of the shotte is twentie ychues 1/2 partes.

In great Ordinance.

The ordinary Demy Cannons, the heighth of the mouth is five ychues and a halfe, the heighth of the shotte five ychues a quarter, the weight of the shotte in pion thirtie three pounde, and the weight of the preece is about 5500 and the preece is in length tenne or elyen foot soe, and her charge in Powder is foure and twentie pounde Serpentine, the length of the Labell is two and twenty ychues, and the breadth of the plate of the Labell is twelve ychues.

Some totes of Demy Cannons, the heighth of the mouth of the preece but five ychues, a quarter, the heighth of the shotte five ychues, the weight of the shotte of 22 yon thirtie pounde, and the weight of the preece five thousand, 92 5400, the length as afofe, her charge in Powder foure and twentie pounde Serpentine, the length of the Labell three and twenty ychues, the breadth eleven inches and a halfe.

The French Demy Cannon, and of some other foreign Nations, the heighth of the mouth of the preece but six ychues, the heighth of the shotte five ychues three quarters, the weight of the pion shotte five and twenty pound, and the weight of the preece five thousand more 92 lisse, their lengths of the ordinairie stote, and shottech in Powder two and twenty, of three and twenty pound Serpentine, the length of the Labell sixene ychues, and three Labells fullles to charge the preece: the breadth of the Labell eleven ychues.

Culuerings.

The elde stote of whole Culuerings, called of some Mothyow Culuerings, the heighth of the mouth of the preece five ychues and a halfe, the heighth of the pion shotte
The Arte of Shooing

shot. 5. pynches a quarter. The weghte of the shotte in 20. pound.
The weghte of the pece. 4800. moore of leffes, their lengths deuided, as 1.2.3.4.5.6.7.8.9. The shotte in Powder. 20. pound Serpentine, the length of the Ladell. 23. pynches, the breading of the Ladell, 99. pynches.

The ordinary whole Culerings, the height of the mouth of the pece. 5. pynches a quarter, the height of the shotte, 5. pynches. The weghte of the shotte of pyon. 17. pounde. The weghte of the pece about. 4500. moore of leffes, the length of the pece. 12. foote, and composteth in Powder. 18. pound Serpentine, the length of the Ladell 25. pynches, the breading 9. pynches.

Culerings, not so high as ordinary, the height of the mouth of the pece. 5. pynches, the height of the shotte fourte pynches three quarters, the weight of the shotte 1.5. pounde, the weight of the pece 40. leffes, 4300. the length of the pece, some 15. pynches, some other, wise, and occuppt in Powder. 16. pound Serpentine, the length of the Ladell 1 24. pynches, the breading 9. pynches.

Demy Culerings.

The eluer lost of Demy Culerings, the height of the mouth of the pece. 4. pynches three quarters, the height of the shotte. 4. pynches, the weight of the shotte. 12. 9. foote, of pyon, the weight of the pece. 200. the length of the pece. 2. 4. foote, moore of leffes, and their charge in Powder. 20. pound Serpentine, the length of the Ladell. 22. pynches, their breading 8. pynches.

The ordinary Demy Culerings, the height of the mouth of the pece. 4. pynches, the height of the shotte 4. pynches a quarter, the weight of pyon shotte. 10. pound, three quarters, the weight of the pece. 27. hundred of there.

Thereabouts, the length of the pece. 10. foote moore of leffes, and will compost in Powder. 11. foote, 2. pound Serpentine, the length of the Ladell. 21. pynches a quarter, the breading. 8. pynches.

Demy Culerings lower than ordinary, the height of the mouth of the pece. 4. pynches a quarter, the weight of the shotte. 5. pynches, the weight of the shotte being of pyon is moore of leffes, 9. pounde, the weight of the pece. 22. hundred of leffes, the length of the pece. 9. 0. 10. foote moore of leffes, and their charge in Powder. 10. pound. 10. pound Serpentine, the length of the Ladell. 20. pynches, the breading. 7. pynches, three quarters.

Sakers.

Sakers of the oldest foce, the height of the mouth of the pece. 4. pynches, the height of the shotte. 3. pynches, three quarters, the weight of the pyon shotte. 7. pounde a quarter, the weight of the pece. 1800. the length of some of those pecees. 10. foote, and composteth in Powder. 7. pound a quarter Serpentine, the length of the Ladell. 7. 7. pynches, the breading. 7. pynches a quarter.

Sakers ordinary, the height of the mouth. 3. pynches three quarters, the height of the shotte. 3. pynches a halfe, the weight of the shotte of pyon is moore of leffes. 8. pounde, the weight of the pece. 1500. the length of the pece. 8. foote, 0. 9. foote, and his charge in Powder. 8. pounde, 0. thereabout of Serpentine Powder, the length of the Ladell 15 inches three quarters, the breading. 6. inches, three quarters.

Sakers lower than ordinary, the height of the mouth of the pece. 3. pynches a halfe, the height of the shotte. 3. pynches a quarter, the weight of the shotte of pyon 4. pounde three quarters, 0. neere. 5. pounde, the weight of the pece. 1300-0. 1400. the length of the pece. 8. foote, 0. thereabouts, and composteth in Powder. 5. pounde.
The Arte of shooting

3. pounde or Serpentine, the length of the Ladell is 15. pynches, the breadth 5. pynches and a halfe.

Minyons.

The Minyon is, 3. pynches and a quarter high, in the mouth, the chrece is three pynches high, the wepyght be thereof of 3. pounde is three pound three quarters, the weighte of the pece, neere aboute 1.000. The length of the pece two pynches or therabouts, and shoteth in Powder three pounde three quarters, or were four pound Serpentine, the length of the Ladell thirteeene pynches, or the breadth 5. pynches and a halfe, some soaine pieces lower. The ordinarie Minyon, the mouth three pynches high, the chrece but two pynches three quarters, and wepyght of 3. pounde three quarter, the wepyght of the pece about nine hundred, the length of the ordinarie Minyon, or shoteth in Powder three pounde 0. thereabouts, the length of the Ladell 3. pynches, the breadth 5. pynches. &c.

Faucons.

The Faucon, the hepyght of the mouth of the pece, 2. pynches three quarters, the length of the flott, and a halfe, the wepyght of the 3. pynches, 2. and half a quarter of a pound, the wepyght of the pece seaven hundred, or seaven hundred and little pound, the length of the pece seaven pynches more 0. less, and occupyceth in Powder two pound and a halfe, and the length of the Ladell is twelve pynches and a halfe, the breadth of the plate of the Ladell is 4. pynches and a quarter, &c.

Some soaine Ordinance not so high as the Faucon, and the mouth of the pece, 2. pynches and a halfe high, the flott, 2. pynches and a quarter high, and wepyght neere one pound three quarters, and the wepyght of those pieces five hundred, or five hundred and little pound, the length is as the

in great Ordnance.

as the Faucon, and the charge is in Powder 0. two pounde, the Ladell is eleuen pynches and a quarter, the breadth four pynches.

A Fauconet, the pece is 3. pynches and a quarter high, in the mouth, the chrece two pynches high, and the 3. pounde therwith one pounde, and neere halfe a quarter of a pound, and the weighte of the pece is aboute 2. 60. 07. 400, and the length five or six pynches, and the charge is of Serpentine Powder, one pounde and a quarter, the Ladell 12. pynches long, and the breadth of the plate of the Ladell 3. pynches three quarters. And thus much I have said as touching all manner of pieces that shoteth 3. pynches, thinking this sufficient for instructions &c.

How many shottes of Powder ther is in a last of Powder, from the cannon, unto the Fauconet, and also, if that you are at any batterie, or in any Towne, Castell, or Shippe, how to know how much Powder will shotte all your Ordnance, &c.

CHAPTER 31.

And also, I doe think it necessary for all faires of Gunners, to know how manype shottes of powder they may have without in a last of Powder, as also in a hundred pounde of Powder according to the pieces, whereby they maye readily know, if that they have any charge of Ordnaunce in any Towne, Castell, Forte, or Shippe, that they maye know whether that they have Powder to last all their Ordnaunce throughout, or how oftentimes about they may shotte all their Ordnaunce to do much Powder. And also it is very necessary, if they there be any Ordnaunce placed a against any to towne or forte, if they have any other of great Ordnaunce,
The Art of Shooting

Dynamis, as Cannons such a number, and Denry Cannons such a number, to the Intente to batter downe the Walses thercf; and then it is Very necesary to know how much Powder will shooe all those Dynamis off at one time, and is forty, if that they would continue the batterie, to shooe, 40 or 50, times over all their Dynamis in one day, and to know how many last of Powder that the batterie will require to continue such a number of days: wherefore I doe thinke it convenient to shew unto you what a last of Powder is, and that is this. A last of Powder is 24 hundred weight, calke and all, and euerie hundred weight to containe. 12 pound, so that you may make your accompte, that you have 24 hundred pounds of Powder in euerie last, and is allowed 12 pound in every hundred weight, for the calke, which is in all allowed for the calke of a last of Powder, 88 pound.

And first this: the biggest sortes of double Cannons doe occupy at one shotte, 46. pound of Serpentine Powder, and you have 2 charges in 100 of Powder, and eighte pounds remayned over, so that you have 52. shots of Powder, in a last of Powder, and 8 pound remayned over. And if that be such a double Cannon, as doth occupy but 40. pounds of Serpentine Powder, then you have 2 shots and a half of Powder in every 100 weight of Powder, that is last. 60 shots in a last of Powder.

And also, those Denry Cannons that doe shooe, 24. pound of Serpentine Powder at one shot, they shall have foure shots in a hundred weight of Powder, and foure pound remayned over, and that is a hundred shots, in a last of powder last.

And also those Culterings that doe shooe eighteene pound of Serpentine Powder at one shot, then there is five shots in a hundred weight of Powder, and then there remayned over teene pounds, so that there is a hundred shots in a last of Powder.
The Art of Shooting

The above all your numbers together, that shall shew unto you how much Powder will shoot all your Ordinance off at one time. As for example this. There is a town, y hath 3 double Cannons, 6 Demy Cannons, and 14 double Culverings, 10 Demy Culverings, 30 Sakers, and 24 Fauconets, and 36 Foulers. By my belief is to know how much Powder will serve all these pieces; therefore first, the 3 double Cannons, they do shoot 40 lb. of Powder, and 3 times, 40 lb. = 120 lb. and then 6 Demy Cannons do shoot 24 lb. of Powder, and 6 times, 24 lb. = 144 lb. and then the 14 double Culverings, they do shoot 18 lb. of Powder, and 14 times, 252 lb. and then the 10 Demy Culverings, they do shoot 11 lb. of Powder, and 20 times, 220 lb. and now the 30 Sakers, and they do shoot 6 lb. and a half of Powder, and 30 times, 15 = 150 lb. and then 24 Fauconets, they do shoot 4 lb. of Powder, and 25 times, 120 lb. and then the 28 Fauconets, and they do shoot 2 lb. and a half of Powder, and 28 times, 2 lb. = 56 lb. and then the 36 Foulers, they do shoot 2 lb. and a quarter, and 36 times, 2 lb. = 72 lb. and now the 36 Fauconets, they do shoot 2 lb. and a half of Powder, and 36 times, 2 lb. = 90 lb. now this being done, then sume all your numbers together, as this.

<table>
<thead>
<tr>
<th>Names of pieces</th>
<th>Pieces number</th>
<th>Powder in pounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cannons</td>
<td>3</td>
<td>120 pound</td>
</tr>
<tr>
<td>Demy Cannons</td>
<td>6</td>
<td>144 pound</td>
</tr>
<tr>
<td>Culverings</td>
<td>14</td>
<td>210 pound</td>
</tr>
<tr>
<td>Demy Culver</td>
<td>20</td>
<td>195 pound</td>
</tr>
<tr>
<td>Sakers</td>
<td>30</td>
<td>100 pound</td>
</tr>
<tr>
<td>Minions</td>
<td>25</td>
<td>70 pound</td>
</tr>
<tr>
<td>Fauconets</td>
<td>28</td>
<td>15 pound</td>
</tr>
<tr>
<td>Foulers</td>
<td>36</td>
<td>90 pound</td>
</tr>
<tr>
<td>Summe total</td>
<td>174</td>
<td>1106 pound</td>
</tr>
</tbody>
</table>

And now by this you may conclude, that all this Ordinance both shoote at one time, to shoote the off round once over both require 1106 lb. of Powder, by this order you may know at all times, whether you are in any town, a fort, a castle, a ship, how much powder will serve all the Ordinance at your pleasure. And furthermore, if to be you have such a quantity of Powder, and if you would know how oftentimes it would shoot all your Ordinance, round about, then you knowing how much powder will shoot all your Ordinance once, and as by the order before is repeated, then divide your whole summe of Powder by that number of the weight of the powder that all your Ordinance requireth, and that summe that remaineth in the quantity line, shall shew you how oftentimes it will shoot all your Ordinance off. As for example, by the Ordinance in a town (as before is rehearsed) suppose you have 20 Last of Powder, and now to know how oftentimes it will shoot all your Ordinance off round about thorough the whole Town, as you did see that at the Ordinance did require 1106 lb. of Powder, one Last of Powder is 2400 lb. the 20 Last maketh, 48000 lb. wherefore divide 48000 by 1106 and then there will stand in the quantity line, 39 and 966 lb. will remaine over, so you may conclude, that twenty Last of Powder will shoot all the Ordinance before rehearsed, 39 times over, and three quarters of them more, that is to say, that it will shoot all the Ordinance off together, lacking almost a quarter of them, and also if there were any batterie laye against a Towne, and then is that you doe know how many Cannons or other pieces of Ordinance there is in the batterie, then you may know, (as before is rehearsed) how much Powder that they will occappe at once shooting them off, and also if that you will shoot them off rounde 30 time of fiftie times in one day, then
The Art of Shooting

You may know how much powder they will spend in one day: as this art (as before is rehearsed) Multiply all the Dynaunce of one foote together, by the weight of the shot of Powder, and to the other foote of Dynaunce, and add them together (as afose is laid) and that being known, then multiply that by the number of times that you have shot them off, and that shall theo onto you the number of pounds that the Dynaunce 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 choose, 40. pound of Powder a piece, therefore multiply. 24. times 40. and of that multiplication, there commeth 960. and then there is eighteene Demy Cannons, and they doe choose. 24. pound of Powder a piece, and therefore multiply eighteene times. 24. and that maketh. 576. pound, and then add both the numbers together, that is to say. 960. and 576. and there will make 1536. so that you may see, that the whole battery doth spende 1536. of Powder at one shooting thereof against the wall of the Towne: and then suppose, that in a day the Dynaunce hath beene shot off nine and ninety times, then how much Powder shall be spent that day, then multiplying 1536. by nine and ninety, and that will make 141240. so that you may conclude that the whole battery hath spent in one day, 141240. pound of Powder, and yt will be nine and twenty last and a halfe, and 432. pound of Powder, and then if that the battery shoule continue suchuy days in that order, the whole summe in Powder that should be spent, amounteth unto 448824. pound, and that maketh 176. Lasts, three 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 choose such a number of Dynaunce so many times off

How to knowe how many Shotte doth wey a Tunne.

CHAPTER.

No now in so much as I have shewed in the Chapter going before, to know how much Powder is occupied in Dynaunce: so in like manner, I doe thinke it convenient to shew unto you how many shots of every severall foites will wey a Tun weight, which is very necessary to be known, as well for them that have occasion to transport them either by Sea or by land. And first this, a Tonne weight is 200 hundred, and every hundred so to conteyne an hundred and twelve pound, so that a Tun is 2240. pound in weight: and first, the double Cannons shotte, and those that doe wey 64. pound, and then 35. shots both wey a Tun: and then the Demy Cannons shots, and those that doe wey 34. pound a piece, and then 62. or 63. of those shots do wey a Tun: and the Culteryng shot of canvantine pound a piece, and then 132. or 133. will wey a Tunne also the Demy Culteryngs, and those shots that do wey tenne pound a piece, and then there is 224. in a Tun. And furthermore, those Shooters, that the shot both wey fire pound, and there both 80.3.373. or 374. into a Tun: and in like manner the Pinions, and commonly their shottes doe wey three pounds three quarters, and 597. or 598. shots will wey a Tunne. The Fauncions shots both wey two pound & halfe a quarter, and 1054. or 1055. both wey a Tunne: the Fauncions shot weyeth one pound, and nerre halfe a quarter of a pound, and 1991. or 1992. both wey a Tunne. And thus much
The Art of shooting

I have said, as concerning how many shottes or every foulere foote, both wey a Tunne weyche, but if that you have a great number of shottes of every foulere foote, and you do desire to know how many Tunnes there is in all of them, multiply every foulere foote by themselves, according unto the weght, and so adding all the numbers together, and then divide that number by 2240, and it will shew 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 would know how many that there is of them, as first, that there is a thousand Cannon shottes, and a thousand two hundred Demy Cannon shotte, and two thousand Culuerings shotte, and three thousand Demy Culuerings shotte, and three thousand five hundred Bakers shotte, and four thousand Minion shotte, and five thousand Saucon shotte, and six thousand Sauconer shotte, and nowe for to knowe their weghte, and first for the Cannon shotte, and those that be seaven yntches three quarters high, and those both wey 54 pound a piece, and then being a thousand shotte, then therefore multiply a thousand times 64, and that makest 64000, and then there being 1200 Demy Cannons shotte, that are five yntches a quarter high, and those doe wey more and thirteen pound a piece, and therefore multiply 1300 times 34, and that makest 40800, and then there is 2000 Culuerings shotte, of five yntches almost in height, and they do wey 77 pound a piece, and then multiply two thousand times seaveneteene, and that makest 14000, and the there is three thousand Demy Culuerings shotte, of neere foure yntches and a quarter in height, and they doe wey tenne pound a piece, therefore multiply three thousand times tenne, and that makest 30000, and then there is 3500 Bakers shotte, that is three yntches and a halfe high, and that makest 64000, and then there is 600 Sauconer shotte, of two yntches high, and they doe wey one pound, and halfe a quarter; and that makest 6750 and nowe add all your numbers together, as by this example following.

<table>
<thead>
<tr>
<th>Names of pieces</th>
<th>Number of shottes</th>
<th>Weight in pounds</th>
<th>Tunnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cannons</td>
<td>1000</td>
<td>64000</td>
<td>18 3/4</td>
</tr>
<tr>
<td>Demy Cannons</td>
<td>1200</td>
<td>40800</td>
<td>18 1/4</td>
</tr>
<tr>
<td>Culuerings</td>
<td>2000</td>
<td>34000</td>
<td>15 1/4</td>
</tr>
<tr>
<td>Demy Culuerings</td>
<td>3000</td>
<td>30000</td>
<td>13 1/4</td>
</tr>
<tr>
<td>Bakers</td>
<td>3500</td>
<td>21000</td>
<td>9 3/4</td>
</tr>
<tr>
<td>Minions</td>
<td>4000</td>
<td>15000</td>
<td>6 3/4</td>
</tr>
<tr>
<td>Saucons</td>
<td>5000</td>
<td>10625</td>
<td>4 1/4</td>
</tr>
<tr>
<td>Sauconer</td>
<td>6000</td>
<td>6750</td>
<td>3 3/4</td>
</tr>
<tr>
<td>Summe totall.</td>
<td>23700</td>
<td>222175</td>
<td>99 1/4</td>
</tr>
</tbody>
</table>

And now, all those numbers being added together, both make 222175 pounds in weight. And now to know how many Tunnes there is in all them, divide the 222175 by 2240, and that being done, then there will stande in the quantitics line 99 and 415, will remaine over, so that you may conclude, that of all the shotte there is 99 Tunnes, and 415 lb, that is met 7/8 partes of a Tonne more, so that there lacketh little more than three quarters of a Tonne of 100 Tunnes, and by this order or means, you maye knowledge how many Tunnes of shotte there is in any number of shottes, &c.
How and by what order the shot
doeth graze or glaunce upon the
lande, or water.

CHAPTER 24.

To know by what order that the shot
both graze or trouble either upon the
land, or the water, it is to be noted, that
it dothe graze or trouble farthest, when
that the piece is laid point blanke, if that
you do choose the piece towards the wa-
ter, or aplaine or level ground, and then the shotte shall
rune or graze nere three quarters of the beste compasse
of the Randare, so that the shotte bee not strete by ame
chance by the way, and there is on great diversitie in
distance of the grazing or running of the shotte, betweene
the land and the water, so that the ground be a plane and
level ground, and the water of the Sea to be smooth. And here
is one thing to be noted, as touching the grazing of the
shotte, whether it be upon the water or the land, looke by
what proportion the shotte doth strike or hithe the ground
or water, by that proportion the shotte shall rise againe,
although that it speth not so farre in that proportion, as
long as the shotte hath force of strike in his flying, that is
to say, if the shot do strike or hithe any thing glauncingly
then it shall glance in that proportion from pou-
warde, and if do strike or hithe any thing directly, then
it shall be diuene directly backe againe, sic doe not enter
of strike fast in the thing that it hithe, even like the sha-
dowe of the Sunne, or any other thing in the water or
glasse, or such other like. As for example this: If you shoo-
te any piece of Ordnance towards the water, and lay the
piece as the popote blanke, and the piece he but little
higher in great Ordnance,

higher than the water, then shall the shotte runne grazing
in this form, to rise againe by that proportion that it both
hithe the water, and so to runne, tell that the great ge-
orce be decayed, as this example doth shewe.

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

And furthermore, if you doe shooe at any Shippe upon
the water, and you do choose in that piece that do the ve-
ry high, and the Shippe do marke nere hand, so that you
must give your leuell downwards, then if you doe give
your leuell hole of the shippe, the shot will fife over the
Shippe, by the meannes of the diere hitting of the water,
so that the shot doth glaunce from the water, by that pro-
portion that it doth hithe the water, as by this example.
Howe to batter the walles of any Towne as well by night as by day

CHAPTER 24.

Although it hath not beene commonly vsed, nor notwithstanding it may be easily done, so to plant their Divinace so, that they may batter or beat down the walles of a Towne as well by night as by day, although the night be never so darke. And also there is no light appearre unto the enimie, as thus.

First after that your Divinace is placed for your batterie, and you have begunne to batter, o then the peeces being made ready, so to shoote at the wall or place that you do meane to shoote at, and that you would continue so to shoote at the place all the night, then take a plummet of leade upon a line of string, the piece being right upon the marke that you do meane to shoote at, then with a plume

In great Ordinace.

met and the line, first plome the middle of the mouth of the piece downe to the grounde, and looke where the leade fallith to the grounde, there make a marke up the grounde, and then in like manner plome the very middle of the tale of the piece of the piece unto the grounde, and there make a marke also upon the grounde, and then draw a right line from the one place unto y other, as long as you list, then that right line will be right upon the mark, the take a large great Quadrante, set out with degrees, parts of degrees, o the Quadrante, so to have a rule sattuned unto is, and then the piece being laid ready so, to shoote at the marke, having the true height of the marke, that is to say, that the hollow or conceittie of the piece doth right upon the marke, neither higher nor lower : then put the rule into the mouth of the piece, and looke at what degree or place that the plummer line doth hang upon, then note that in some Booke or paper, and then when that the night is come, and that you doe meanes to shoote as well by night as by day, then first with your plummer of leade hang a line, then plome the mouth of the piece right upon the line that is under the piece, and that will make the piece right upon the marke, and then in like manner take the Quadrante, and parte the rule into the mouth of the piece, and then layne the piece upon and bowme till that the plummer line doth fall upon that degree and place that it did before, and then that in like manner will guide the piece the true height of the marke without any foile. And so to see whether that the plummete line doth hang upon the degree or place that it did before, and also to knowe by the line and the plummete with the lyne upon the grounde under the piece, so to make the piece righte upon the marke, there must be prepared a close Boste lyke a Lan-

tern,
The Art of Shooting

In great Ordnance.

they had charged all their pieces, they did this. first, they did plume the mouth of the piece, and likewise at the tail of the piece, right upon the line that was under the piece, right upon the mark, and then they took their quadrant, and put their rule into the mouth of the piece, they joined the tail of the piece up and to the tune, till that the plummeter line did fall upon that degree and place that it did before the night, and that was at one degree and a quarter at, and thus when they had laid all their pieces, then they shot them off, and charged them again, and so continued all the night long.

And so in this manner, they may in like ease handle the two line batteries, but and if that it chance that the battering pieces doe lie upon higher ground than the place that is battered, then the rule that is taken, must be vnto that place whereas the plummeter is made fall unto, for
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that the degrees goeth downe towards the lower ground as you maye see by these two figures.

How to plant Ordnaunce by night,

To better the walls of any Towne, or displaise any Ordnaunce in any Bulwarkes, or any such other like, as well by night as by day.

CHAPTER 15.

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

in great Ordnaunce,

place them by nighte neere as well as by daye both for to place youre Ordnaunce in the nighte, and also for to shoothe perfectly into the place in the nighte, although the nighte be never so darke: and soe if you doe see cause, when that you have beat or displaseth your Ordnaunce, you maye carpe awaye youre Ordnaunce before it is daye, as thus.

First prepare an Astrolabe, the larger the better, and then two stakes or pinnes of your like to a fote long, or thereabouts, according unto your discretion, and also a sledge or bate, to drive those stakes or pinnes into the grounde, and then viewing the grounde neere for the purpose a reasonable distance from the place that you doe mean to shoothe in the nighte, goe into that place in the daye tymes, and firste where you do meane fo to lay your Ordnaunce, there sette in one of youre stakes, and then in the manner goe backwardes about twentie fote, and stande so, that you maye see the marke that you doe mean to shoothe at over the toppe of the sticke that you have driven, and then there in that very place disse youre other stake, and then goe a little backwardes more, and vise whether that the two stakes stand as one right line into the marke, and if that they doe not, you maye amend them, and sette them righte, then take youre Astrolabe, and holde that younpon youre sticke by the ringe, and then turne youre Athillseydaye or Rule wyth the two sightes that is on the backe side of the Astrolabe; by the upright of youre Astrolabe, or in the place where you doe mean fo to place youre Ordnaunce that is betweene the two stakes, then looke upon the Athillseydaye or Rule wyth the two sightes, at
at what degree and place that the end of the pointe boute, then remember to write that degree, and place it in some Booke of Table, so that it be finisshed: then in the upheight you may bring your Odynaunce boute that place between the two stakes, and then place one of your pieces right between the two stakes, and then take a thread of line, and make that fall unto the two stakes, and that shall lay the piece right upon the mark. And then so to place the rest, they must doe this. First on the one side measure out till how many foot you doe meane to lay your pieces in distance alwayes, then from the line of the stake, measure it truly, and there make a marke, or define a stake: and then at the other end, at that certaine distance, there in like manner define another stake: then betweene those two stakes place another piece, and then make a line fall unto those two stakes, and that in like manner shall lay the piece right upon the mark, and then you may place another piece upon the other side of the piece, and so forth. And then when your Odynaunce is all charged, then plome the middle of the mouth of the piece right upon the line, underneath the piece, and then take the middle of the piece to be plomed, that it stand right over the line, underneath the piece, and then take your Quadrant with the rule saltined unto it, and put the rule into the mouth of the piece, and then keyne the piece up and downe, till the plommet line do fall upon that degree and place that the ATHILGEYD daye did pointe unto alwayes, the Astrolabe, and that shall give the piece the true height of the mark. As for example, suppose this after the breach in the wall of the Towne was made saucable, there the flankes lay so, that they could not come nere unto the breach, neither could they plant their Odynaunce so to dispale those flankes, but that they should be beaten from their Odynaunce to their great lost and hinderance, therefore
How to keepe a Hauen or Riuerv

on the Sea-coast, for to sicke a Shippe as
well by night as by day in all
points.

CHAPTER 26.

Ow for the keeping of a Hauen or Riuere, there maye be suche meanes to maye
wapes vble by industrie, that you maye
keep a Hauen or Riuere in this sorte,
so that there may no Shippe passe nev-
ether by night nor by day, but that the
Shall be sunk, or else be elscape very hardly, although ye
night be never so darke, so that the night be not Faggy or
Shitke, so that the Hauen or Riuere be not above a mile
broad or vver, as this. First, if the entrance of the Riuere
be therforwad, to have a watche therv, then as loone as the
watch doth perceiue the and their number, then they must
have a watchoken, and that must be a light of lights up
to the Castell or Bulwarke, and then the watchoken be
being to agreed upon that the Castells or Bulwarke
may know their number of the Shippes by the signe of the
lights of the Castells or Bulwarke, if they be on the
one side, & the other on the other side, & the at certaine
places appointed for that purpose, and at a certaine di-
fance from the Castells or Bulwarke towards the Sea
warves, each of the for to carry a light thither, to place
the lightes as were the water as may bee, and if that it
chance th
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chanceth so, that ther is but one Castell or bulwarke, and none upon the other side, then they having a hole or shiffe, or any other craft, they may rowe over the water, and place their lightes in that knowne place appointed, and then about nighte, that place being alwaies knowne unto them, they may place their Dynaunce right upon that markes upon the farther side of the water, the light shining alwaies to the Sea-waers of the marke that the Dynaunce is placed right against, like 10.01. 30.foote, & then the night being nearer to darkke the light is better seen: then must the shippes needes in their coming between the light and you, take away the lightes of your lightes, and then immediately, as soon as you do see that the light is shadowed, then give fire into those pieces that be placed against your imagined marke appointed, & then there is no doubt but you shall make a perifall shot at that shipp, being sure that the mouth of the piece be knowne long enough, least they shoulde choose other the shippes, especially if it be in a place where it doth ebe and sowe: so at the full sea, they must hony the pieces at one proportion, and at a low water, at another proportion: and this being handled discreetly, they shall not fail the hitting of your ship. And furthermore, as it is declared in the 2. Chapter going before, they may have a line drawn underneathe the piece upon the ground so to lay their pieces right upon their appointed marke at all times after they have shot off their pieces in the night, then in the night they may place the same, &c. So for example, their ship with vs at graves end, as there is a Bulwarke by one right against the other, the river of Thames running betwene them, and none they would keep the river so, that there shoulde no shipp passe, neither by night nor by day, but that they should be toke: then they must keep a watche at the Halle of port belowe, at the entrance of

c. Tillbery hope, and that is a mile and a halfe from the Bulwarke, and there alwaies they must needs see them, and their number of shippes, and specially by the help of a light upon the further side of the water, and then they being knowne unto the watche, the watche must make unto the shipp a token by a light of lightes that they have agreed upon before, and then through the watche token, the Bulwarke knoweth that there cometh such a number of shippes, but one or two as it changeth, and then each of the Bulwarke hath an imagined marke, twentie fote towards the Halle of sea-waers, they do alwaies plant their Dynaunce right against it, both by day and by night, and then as soon as they do see their watchoken then both the Bulwarke do place their lightes hard unto the water, like twenty fote to the Sea-waers of their imagined marke: then the pieces being planted and honyed, so that the doyart standeth underneathe the pointe blanke at the full sea one degree, and at the lowe water three degrees, then giving fire into the piece, or pieces, as soon as the ship taketh away of shadowed by light, they there no doubt but they do strike the ship very neere y water without any faile. And so that the lighte standeth to the Sea-waers of the marke appointed, the shote must have a time to come unto the ship, and the ship goeth away in the mean time. And furthermore, when that the pieces bee charged againe, then the line that is underneathe the piece, by plomming of hit at the mouth, and at the tyme of the piece, is laid right upon the marke agayne: and the furthermore, if the shipp chance to passe further, steaping both the Bulwarke, then they may have more imagined marke, and also lightes placed there, and in like manner, lines underneathe the pieces right upon those marke, &c. And furthermore, you may know by the lightes, which side of the water the ship commeth two waies, and one
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way is this, the sandle being higher than the water, and the lightens being placed hard unto the water, if that the ship commeth hard upon the further side of the water next unto the light, then the bold of the ship will shadwowe the light, and if the commeth on your side, then the tayles will shadwowe the lightens. And furthermore if the ship commeth right in the middle of the water of a river, then both the bullwarke shall have the lightes shadwowe at one time, and if the ship come on the further side of the water from you, then your lightes will bee first shadwowe, and if on the side you be on then your light will bee last shadwowe, and then furthermore for the making of a perfect shotte, if that the other bullwarke shotte before you, then take the mouth of the pece one degree lower, and that the shippe commeth upon your side of the water, and then for the neareness of her comming you must needs take the pece to much the lower, s:e.

FINIS.

Some deferece ere they deire,
And yet shall lacke when they require,
Some deferece never delerse,
And gers the gayne the other shall receve.