


87



The Arte of Nauiga- tion,

Conteynyng a compendi-
ous description of the Sphere,
with the making of certen In-
strumentes and Rules for Na-
uigations: and exemplified by
manye Demonstrations.

Wrytten in the Spa-
nysh tongue by
Martin Curtes, *Cortes*
And direc-
ted to
the Emperour
Charles the
fyste. *Charles*

Translated out of Spanysh
into Englysh by Ri-
chard Eden,

1561.



procurat. N. V. 21566

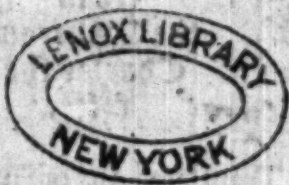
the printed title); this copy has the following plates,
the title page of Walter Pater's Heidelberg

the author's name

LIBRARY



Collected
70.



To the ryght worshypfull syr VVyllyam Garrerd
 Knyght, and Maister Thomas Lodge,
 Aldermen of the Citie of London, and Couer-
 nours of the honozable felowshyp oꝛ societie,
 aswell of certeine of the Nobilitie, as of
 Marchauntes aduenturers, foꝛ the disco-
 uery of Landes, Territories, Flan-
 des, and Seignories vnknown,
 and not befoze their first aduen-
 ture oꝛ enterpryse by Seas oꝛ
 Pauiations commonly
 frequented:

And to the right worshypfull the Consulles,
 Assistentes, and comminalltie of the
 same societie, Richarde Eden
 wytheth health and
 prosperitie.



That soeuer he was (ryght ho-
 nozable and worshypfull) that fyrste
 beleued that the frame and coaptacion
 of the bode of man, with the funci-
 ons, offices, and duties of the partes
 and members of the same, knytte to-
 gether in a certen vnitie to a common
 ministracion, dyd represent a lyuely
 Image and similitude of a perfecte common wealth: I
 thynke that he was a man of no vulgare iudgement oꝛ
 abiecte mynde, but rather of singuler wysdome and pru-
 dence in the contemplacion of Diuine and humane thyn-
 ges. Foꝛ he sawe, that as in the small native seebe of
 all growyng oꝛ lyuing thinges, is conteyned the fourme
 that byngeth them to theyꝝ perfection: so in certeyne
 small and obscure members of the common wealth, con-
 sisteth no small increase to the perfection of the whole.
 He sawe lykewyse that herein, as in the bode of man
 representyng the partes and members of the worlde (as
 I haue sayde) are dyuers partes of dyuers and sundrye
 actions and motions, greatly dyfferyng in fourme, num-
 ber, and

The Preface.

ber, and quantitie, yet all the same to be so knytte together, and so to consent in one vniformitie to the common profite of the whole, that a greater concord and harmonye can not be imagined, then is proportioned by the friendly unitie of dyuers and contrarie. We saue lyke wyse in the same, such a mutuall compassion of parte to parte, and member to member, by one common sence existent in them all, that no one part or member can feele eyther ioye or payne, but that in maner all the other are parttakers therof more or lesse, yf they be lyuely members, and not wythered or otherwyse vnsensate by reason of dead fleshe, which onely by cutting and burning ought to be deuyded from the sounde and whole. But as in man (whom Plato calleth the lesse world) the vigour and agilitie of the immortall soule and mynde, neuer ceaseth from continuall mouyng, but is euer exercised in excogitations and inuentions of great thinges (here, in resemblyng God, whose caracte it beareth) by prouidence foreseing, and by intelligence vnderstandyng and deuyng what is to be done, and what to beeschewed, both immediatly moue & rayse by the faculties, powres, and members of the body to execute the same: Euen so in the greater world, the prouidence of God, and vniuersall counsaile and consent of men, hath elected and appoynted certen principall men, to beare lyke rule and auctoritie in the bodye of the common wealth, as hath the intellectuall soule in the members of our bodye to moue and commaunde the same. To Princes therefore counsaylours, rulers, gouernours and magistrates, as to the most intellectuall and sensitiue partes of the societie of men, hath God and nature geuen preeminence & gouernaunce of the common wealth, that by theyr prouidence, wysdome, and ayde, it may vniuersally floorysh, not onely by iuste administration of good lawes, with due correction of malefactours, but also by lyberall rewardeyng of suche as haue well deserved: and especially by maintenannce of suche artes and sciences, as the common wealth can not well be without. And to drawe nearer

The Preface.

you expect the type of greater psychological changes, and I think that's the type of change that's needed.

The Preface.

Wherein, what great charges you haue sustented, and howe lyberall and constant you haue ben in furtherynge the same, doth well declare that hitherto you are rather losers than gayners therby. The whiche thyng doubtlesse is the moze to your commendation, in that it maye hereby appeare that you haue attempted the same rather for knowledge and vertues sake, then for conetousnes of gaynes: as is furthermoze well knowne by your fyrste viages of discouerye attempted to Cathaye by the Northeast seas, vpon certen losse and detriment, for vncerteyne hope eyther of gaynes, or of any such way to be founde, otherwyle then by certen lykely coniectures: not muche vnlyke to the shynnyng flowres of Sparchasites, which outwardly appearyng in minerall mountaynes, are signes and token wherby is coniectured what metal is conteyned therein, and whether the same is to be folowed or not. And although it sometyme so chaunce that such signes are fayleable, shewyng moze in appearaunce then they conteyne in substance: yet are not such signes tokens, or shewes to be contemned, but rather earnestly to be folowed, forasmuch as it hath ben often proued and founde by experience, that by folowynge the same, haue ben founde great and riche mynes of metalles: as Georgius Agricola in his booke Derebus metallicis, doth largely declare and proue by manye examplis. But to wyte at large what greate thynges haue proceeded of small and obscure begynnings, and in maner mere coniectures: it woulde so farre excede the measure of an Epistle or Preface, that it woulde rather increase to the full quantitie of a booke. For in maner all the late discoueries both of the Spanyardes & Portugales, had they begynnynge of such small coniectures, with vncerteyne hope (as it were preter spem sub spe) vntyll God and good happe, by the constant trauayle and valiaunt mynde of such as fyrst attempted the same, gaue them to enioye that they hoped for. But whatsoeuer they haue obteyned and do enioy, this maye I boldly say in your behalf (right honorable and worshipfull) that there hath not lacked in you eyther the lyke or greater promptnesse of mynde, forwarde

The Preface.

forwardnes in attemptyng, magnificence in expences,
and liberall in rewardes. For besyde the great charges
and losses that you haue ben at other wyse, what should
I speake of the great gyftes that you haue sente to the
Emperour of Russia: What of your last chargeable vy-
age of discouerye among the innumerable Rocks, I-
landes, and moueable mountaynes of Ice in the frozen
sea, by innumerable landes and Ilandes vnknownen to
the Antiques, euen vnder and farre within and beyonde
the circle Arctike, where they thought that no lvyng
creature coulde bryue breath or liue for extreme colde:
wheras neuerthelesse the same hath ben by you discou-
ered euen vnto the myghtye ryuer of Ob, that falleth in-
to the Scythian Ocean, or Oceanus Hyperboreus, not farr
from the mountaynes called Hyperborei, so named be-
cause they are situate almost vnder the North pole, and
thought therfore to be inaccessible. A vyage doubtlesse
of such difficultie and in maner impossibilitie, that con-
sydering the infinite daungours therof (as I haue lear-
ned by thynformation of Steuen a Burrough, that was
then the chiefe Pilote of the same vyage) it may seme im-
possible that they shoulde euer haue escaped, excepte the
myghtye hande of God, by the experte skylfulnesse of so
excellent a Pilot, had deliuered them from those daun-
gers. And although in dede (as religion byndeth vs) it
is conuenient in all thynges to gette all honour, gloire
and thanks to God, yet are we not thereby restrayned
to be thankfull to such men, as by theyr arte, ingenious-
nes, trauayle, and diligence, haue deserued both iuste
commendation and large rewardes. And therfore refer-
ryng the rewardes to you (ryght honorable and worthy
full, to whom it apperteyneth) yf I should not here gent
hym at the leaste suche commendation, as in my iudge-
ment he hath well deserued, I myght seme both to de-
fraude hym of his worthy desertes, and also to forgette
the frendshipp and good wyll I beare hym, onely for his
vertues and excellencie in his profession. For certeynly
when I consider how indigent and destitute this Rea-
m is of excellent and expert Pilottes, I can do no lesse of
conscience

The Preface.

and Wynterton nesse, and the sandes about Lemmes mouth, then they do suche excellent Pilotes as are able without any Rutter or Carde of Nauigation, not onely to attempte longe and farre viages, but also to discouer vnknowne landes and Ilandes, as haue doone of late yeares many excellent men, to the great honour and enrychynge of their Prynce and countrye. But as touching Steuen A Bozrough, the chiefe Pilote of your viages of discovery, it may hereby well appeare y he is neyther malicious nor enuious of his arte & science, in that he desireth y same shoulde be comon profite to be comen to al mē: And so for the same intent was the sytt that moued certaine worshypfull of your company, as Syr William Garverd, Maister William Pericke, Maister Blase Sanders, and Maister Edward Castle, to haue this worke translated into the Englyshe tongue. Who of their own good nature fauourynge al vertuous studies and the professors of the same, did sone incline to his honest request herein; and therewith not only desired me, but also with liberall rewarde entertained me, to take in hande the translation. Whiche being nowe finished as well as my pooze learnynge may perfourme, I desyre your honours and worshyppes, to accepte in as good parte as I haue ment herein to gratifie you, and doe suche service as my abilitie may suffice. Nowe therfore this worke of the art of Nauigation, beyng published in our bulgar tongue, you may be assured to haue more store of skylful Pilotes. Pilotes (I say) not Pirottes, Rulers, not Mouers, but suche as by their honest behauiour and conditions loyned with arte and experience, may doe you honest and true service: whiche is not to be looked for of suche as beyng destitute as well of the feare of God as of all mozal vertues, superbounde in all notozions bytes, accountynge desperatnesse for boldnesse, rashnesse for hardinesse, impudencie for stoutnesse, and crueltie for manhod. What other thyng (I say) is to bee looked for of suche, then of suche trees suche frutes, Et mali corui malum ouum. But

CC. l. for as
many a goodly word and many a goodly
word

The Preface.

for as muche as these haue no place appointed them in the bodie of our common wealth, whiche we haue here before compared to the members of the bodie of man: therefore are they no otherwise to bee esteemed then as excrementes of the bodie, to whom nature hath appointed no place in the same, but laboureth continuallye to cast them forth byners wayes, leaste by theyr filthynesse they should infecte the other members, such as the poyse of the shippe if it be not anoyded, is noyous to the shippe and all that are therein. But the wise and honest Pilot, first hauyng before his eyes the feare of God, and puttynge his chief trust in hym, shall secondarily trust to his arte and science, without any suche vayne obseruations as the superstitious Horoscopers (Astrologiers I meane, and not Astronomers) are accustomed to vse in the elections of houres, tymes, and dayes, by constellations and asperities of the Starres and Planetes, as many sonde menne haue doone, theyr skynge thereby to haue escaped suche dangers, as they haue thereby the rather fallen into, throughte contempte of arte and science by folyshe confidence in superstitious Astrologie: which for the vanitie and vncertaintie thereof, the ryght waye shypfull and of singular learnynge in all sciences, by Thomas Smyth, in my tyme the flour of the Vniuersitie of Cambridge, and sometyme my Tutor, was accustomed to call Ingeniosissimam artem mentiendi. (What is) the moste ingenious arte of lpyng. Omytting therefore the superstitious and phantasticall obseruations of the iudicials of Astrologie, it shalbe better and more necessary for all Pilotes that desyre to excelle in theyr profession, to learne and obserue the principles of this booke, wherby they may haue suche knowledge of the Sphere, as may instructe them the makinge and vse of byners goodly Astronomical instrumentes pertynyng to the arte of Nauigation, by knowledge of the mouynges of the Sunne and Moone in their Spheres, and the other Planetes and sixte Starres: thereby to attayne to the true knowledge of houres, tymes & tydes, with the variation of the Compasse, and many other goodly naturall obser.

The Preface.

observations of weathers, tempestes, & calmes, by certain
infaileable signes and tokens of the same, very necessa-
ry to be obserued. And this by the true principles of A-
stronomie and not of Astrologie. And this is the true A-
stronomie wherof the Diuine Philosopher Plato hath
wrytten so diuine a sentence, that I haue thoughte the
same here worthy to be alleaged, that by the auctoritie
of so famous an aucthour, we maye knowe what is true
Astronomie, with the vse and commoditie therof. Ther-
fore in his booke intituled Timeus vel De Natura, these
are his wordes, Rerum autem optimarum cognitionem,
nobis oculi attulerunt. Nam hæc quæ de mundo disputantur,
nunquā inuenta fuissent, si neq; sydera, neque Sol, neq; Cœ-
lū, suspici potuisset. Cognitio vero diei ac noctis, ab oculis or-
ta, fecit vt dimensione quadam, mensium ætorumq; ambitus
metiremur, tempus cognosceremus, ac vniuersæ naturæ ordi-
nē scrutaremur. Quibus ex rebus, philosophiā adepti sumus.

That is to saye. Our eyes haue brought vnto vs the
knowledge of moche excellent thinges. For what so euer
is disputed of the worlde, had neuer bene inuented, yf
neither the Starres, neither the Sunne, neither beaue,
coulde haue bene seene. For the knowledge of the daye &
nyght, takyng beginning at y eyes, caused vs as it were
by certen limites and boundes to measure the circuittes
of monethes and yeaeres, wherby we came to the know-
ledge of tymes and the order of vniuersall nature. And
hereby also we obteyned the knowledge of Philoso-
phy. &c. And thus by the auctoritie of Diuine Plato
(whome for his excellencie Cicero called Deum Phi-
losophorum (that is) the God of Philosophers) we maye
vnderstande that the true Astronomie, is the perfecte
knowledge of the miraculous mouinges of y Planetes,
Starres, and beauens (and especially of the Sunne and
Moone) wherby is caused the varietie of times and dy-
uersitie of all naturall thinges, by naturall causes: as
by the qualities of Elementes, as heate, colde, moyste
and drye, whiche are augmented or diminished by the
more or lesse influence of these twoo Luminaries, as
they comme nearer vnto vs at some tymes, or de-
parte

The Preface.

part further from vs at other tymes, with diuers motions
in diuers climates whiche causeth not onely varietie of
tymes in sundry climates, but also the varietie of diuers
complexions, formes, and dispositions of all creatures
vnder the face of heauen, none other accidentall contin-
gent, volutarie or violent cause to the contrarye not with-
standinge. And this is it that Plato meaneth by those
wordes. *Vt tempus cognosceremus ac vniuersæ naturæ ordi-
nem. &c.* That is, to knowe the tymes and vniuersall
order of nature. And doubtlesse, who so well considereth
the marueilous effectes that are caused, especially by the
variable moving of the Sunne in the Zodiac, must nee-
des acknowledge it to be the chiefe instrument & meane
that God useth in the generation, preservation, and alte-
ration of all creatures that are conteyned in the worlde
of generation and corruption. And for this consideratiō,
certen of the auncient Philosophers called it the soule of
the worlde: Other the eye, and other also the heart of the
worlde. Plato also affirmeth that the soule of the worlde
is in the Sunne: And that all other liuing thynges, re-
ceyue lyfe from thence. And hereof commeth the sayinge
of the Philosopher, *Sol & homo generant hominem:* (that
is) the Sunne and man, begette man. And therefore (as
wryteth Marcellus Ficinus) of all Idolaters they are most
tollerable that honour the Sunne for God. The whiche
although it bee not, yet vndoubtedlye are his effectes so
greate and wonderfull in this inferiour worlde, that it
may seme in maner to be Gods Vicegerent, Lieutenant
and Viceroy in al the woorkes of nature, excepte where
and when it pleaseth hym in any thyng myraculouse,
otherwysse then by the common order and course of na-
ture, to commaunde the contrarye.
And yf it may not be tedious vnto you (ryght honorable
and worshipfull) it shalbe a pleasure vnto me, for the
better declaracion hereof, to make a brieve discourse of
the marueilous and straunge effectes that are caused by
the Sunne: whiche perhappes selwe haue done, other-
wysse

The Preface.

wyse then dispersedly here and there, as occasion hath
serued. First therfore let vs consider what it hath done
ouer the Equinoctiall line, and vnder both the poles at
one instant, yet diuersely and contrarily the one to the
other. For so hath the infinite wysedome of the greate
God of nature, the supreme Architecture of the vniuer-
sall worlde, disposed all thynges in such perfecte order,
that to them that are vnder the Equinoctiall, and haue
theyr Horizon passing by the two Poles, the daye is of
xii. houres and the nyght as much, and theyr yeare also
is deuyded into xii. monethes: But they that dwell iust
and perpendicularly vnder our pole, and that haue their
Horizon passing ouer the sayde line, haue the daye of
syre monethes. What is to saye: begynnyng from the
tenth daye of Marche, when the Sunne commeth ouer
the sayde Horizon, vntyll it returne to passe vnder the
same at the tenth of September. And contrarywyse one
nyght of syre monethes haue thynhabitauntes vnder the
Pole Antartyke: whose yeare (that is to saye, all the
course that the Sunne maketh by the. xii. signes of the
Zodiac) is accomplished in one daye and one nyght. A
thyng doubtlesse moste wonderfull and marueylous.
Lyke wyse, when we haue Sommer, they that are vnder
our Pole haue the daye of syre monethes, and they of
the opposite or contrary Pole, haue theyr nyght of the
same length. Agayne, when it is wynter with vs, then
vnder our Pole is the nyght of the sayde syre monethes:
& vnder the opposite Pole, is the daye of the same length.
So that as it were course by course, when we haue the
night, they haue the day: And contrarywyse, when we
haue the day, they haue the nyght. The which although
it be so longe and of so great space of tyme, yet is it not
continually obscured with darkenesse. For the Sunne
maketh his course in such order, that the inhabitauntes
of that parte, lyue not duringe that tyme altogether in
darkenesse, as Moles lyue vnder the grounde, but as
other creatures that lyue vpon the globe and face of the
earth,

The Preface.

earth, they haue suche lyght as maye suffice to sustayne and mayntayne theyr lyfe. For the bodye of the Sunne declineth no moze eyther beneath the Equinoctiall line, eyther aboue the same line (which is the Horizon to both the Poles) then. 23. degrees: That is to saye, no lower or hygher then the Tropikes, whiche are no moze then 23. degrees or there about from the sayde Equinoctiall that is theyr Horizon, as is aforesayde. And yet in these 23. degrees he maketh not his course by the opposit Diameter, but gooth continually rounde about in circuit: so that his beames reuerberatyng heauen, representse suche a manner of lyght, as we haue in Sommer two houres before the Sunne ryse. And this example which we haue taken of the diuersitie of the Positions of the Equinoctiall and vnder the two Poles, is to demonstrate the marueylous effecte that the Sunne maketh departyng from the. xii. houres of the Equinoctiall (that is to say, from Aries to Libra) and commyng by lyttle and lyttle, illuminatyng the globe of the earth, and so reduceyng the yere of. xii. monethes, into one onely day and one nyght, as is sayde before. Under the infinite varietie of the which course, sometyme with long dayes and sometyme with shorte, all the inhabitauntes of the worlde are fourmed and disposed of suche complexion and strength of body, that euery of them are proportionate to the Climate assigned vnto them, be it hotte or colde: And may dwel & abyde there, as in theyr natural place and temperament, not lamentyng or despyng to dwell elswhere, so greate a loue resteth in them to their natieue situation. But not to departe from the byage whiche the Sunne maketh in one whole yere, as sometyme appocheyng neare vnto vs, and sometyme departyng from vs. I saye that at one selfe same tyme in dyuers partes vpon the rounde globe of the earth, it causeth the Spryng, Sommer, Autumne, and Wynter. And neuerthelesse at the same instant and punct of time it maketh day and high noone in one place, and nyght at mydnyght on the opposite part. The which varietie although

The Preface

though it appeare incomprehenſible to the ſenderneſſe of our wyttes; yet beholdynge the ſame with the eyes of vnderſtandynge, and therewith conſiderynge the vnumerable moouynge that the ſunne maketh continually, we ſhall ſynde it to be true; haupng reſpecte to the dyuers ſituations of the earth; as it is continuallye illuminate moze or leſſe by the ſunne. And this varietie is made with ſuch a Harmonye and conſonancie, and ſuch a lawe perpetuall and immutable, that yf any poynnt or pſicke therof ſhoulde fayle, it is to be doubted leaſt the elementes ſhould be confounded together, and returne to their fyrſt Chaos.

And to haue ſayde thus muche of the wonderfull eſſectes of the courſe of the ſunne, it maye ſuffice for an example to proue howe neceſſary a thyng it is, not onely for all Pilottes and Sea men to haue the knowledg hereof, but alſo for all other ſuch as ſhall attempt great and farre viagies in vnknown landes and ſtraunge countreyes, as dyd of late maſter Jenkynſon a woorthye gentleman, ſette ſoozth by you and mainteyned at your charges, moze lyke an Ambaſſatoure ſente from anye Prince or Emperour, then from a companye of marchaunt men. Wherein, what commendation you haue deſerued, to the encrease of your perpetual fame and honour, I referre it to that I haue ſayde befoze. And as touchyng maſter Jenkynſon, what trauayles, paynes, and daungers he hath ſuſteyned, and hardely eſcaped, and what diligence and art he hath vſed in the ſearching of ſtraunge countreyes, and in the deſcription of thoſe his viagies, it were but in vayne for me to wyte much vnto you, vnto whom the ſame is better knowne then to me. And therfoze to conclude, with rendyng iuſt commendations both vnto you and him, I can ſay no moze, but as Plato wytteth in his booke De Legibus. Decens eſt eos ciues laudibus ornare, qui corporis vel animi viribus, res arduas preclarasq; geſerunt, & legibus libenter paruerunt. What is to ſay: It is decent to commende thoſe Citifens that by theyr induſtry of bodye or mynde, haue done greate aſſayes, and haue wyllingly obeyed good lawes.

And

The Preface.

And thus efflones desyring your Honours and W^{or}shippes to accept in good parte whatsoeuer I haue saide of good wyll and affection towarde you and your p^{ro}ceedings, readynges, and with your shielde of Justice and auctoritie, to defende me agaynst the asaultes of such as are enemies to vertue, and captions of other mens doinges:

I reste at your commaundement to the uttermost of my power, to do you what service I maye.

()

THE EPISTLE DEDICATO.

rie of Martin Cortes, to the moste mightie
and victorizous Monarch Charles the
Emperour, the fyfte of that
name, Kyng of
Spaine. &c.



So greatly were esteemed thynuen-
tours of terten artes and sciences in an-
cient tyme (as wyrteth S. Augustine in
his booke De ciuitate dei) that they tooke
them not for mortall men, but honoured
them as immortall Gods. His arryuyng

The first in-
uentours of
artes.

311.

in Egypt, ordeined common wealthes with iuste gover-
naunce, gaue them lawes and knowledge of letters: &
taught them also the vse of Plaxe. In consideration
wherof, she was honozed of such as then knewe her, &
reuerenced of them that came after her: In so much,
that they establisshed a capitall penaltie or punishment
of death agaynst all such as vtter in sport or in earnest
affirmed her to be an earthly woman, and not rather a
diuine Goddess.

Ceres.

The Cicils
and.

Ceres bring of lyuely wytte & cleare
vnderstandyng, beholdyng in the Cicilians humaine si-
militude and shape to the outwarde apparence, and in-
wardly the fiercenesse of brute beastes: bydeled they
customes, and reformed them with newe statutes, tea-
chyng them to tame Oren to beare the yoke, to sow
wheate for they great commoditie, to grynde in the
myll, to kneade in the house, and to bake in the oven.
In recompence wherof, they made sacrifice vnto her, &
builded many sumptuous temples in honour of her. Sa-
turnus comyng from Creta, gaue lawes vnto the Latines
wherby they myght gouerne them selues, & prescribed
them maners of lyuyng, teachyng them to plll and ma-
nure the grounde, and sowe cozne, and to gather rype
fruites in due season. And yf Saturne were profitable
to those nations, and they not vnthankfull vnto hym
in that they builded hym alters, celebrated vnto hym
festiuall dayes, and accounted hym in the number of

Saturne
gaue lawes
to the Latine
men.

Tillage of
the grounde

THE EPISTLE.

The golden
woulde and
reigne of
Saturne.

The worthy
factes of
Charles the
fyrste.

Sicilia.

Spayne re-
newed.

The returne
of Charles
the fyrste.

the heavenly goddess, namyng him also the father of the
Goddess. And yf (I say) he was to them so profitable, &
that woulde iudged so happy and prosperous for haunyng
so valiaunt a kyng, and so iust a lawe geuer, that it was
therefoze by the mouthes of all men called the golden
woulde and raigne of Saturne: Certes except I greatly
deceau my selfe, this our tyme is nothyng inferiour to
that. For we knowe certaynly that your Maiestie hath
ben moze profitable to Spaine, then euer was Saturne
to the Latines: And also a moze excellenter lawe giuer
in maner to all Europe, and further to the newe world
lately discouered, then he that gaue lawes but only to a
lyttle corner of Italy. Wherby I consider that the fel-
icitie of your Maiesties tyme hath ben no lyttle commen-
dation to your doynge, in that you haue banysed vice,
honored vertue, punished offenders, and fauoured inno-
centes: so that the quiet haue thereby liued moze peace-
ably, the vnquiet restrayned, the good exalted, and the
euill chastysed. In so much that now, by reason of iust
ministracion of good order in your Maiesties dominions
they that walke in the nyght go in safetie, whereas we
knowe that in other prouinces, such as walke in the day
go in daunger and peryll. And therfoze in the most hap-
py tyme of your Maiestie, it appeareth that Spayne is
renewed, not onely in thercellencie of mechanicall or
handy craftes, but also in the knowledge of letters and
discipline of warre: In so much, that she that sumtyme
lacked her selfe, maye now abundantly minister to her
neighbour that haue neede. And wheras to your Im-
perypall Maiestie, it should not suffice to ordeyne lawes,
yf power and armes shoulde fayle to defende & punyssh,
who comparable to your Maiestie enioyeth the one, and
wanteth not the other, haunyng triumphed ouer kynges
and kyngdomes, enlargyng also the name of Spayne in
many vnknownen and barbarous landes and nations:
Greater ducie therfoze owe your subiectes vnto you,
then euer dyd the Egyptians to Isis, or the Cicilians to
Ceres, or the Latines to Saturne: soasmuch as they haue
receaued of your Maiestie moze common and profitable
benefites

benefites. It is not long sence your Maestie hath for-
 bydden and abolsyshed the vse of Mules, and restored a-
 gayne the exercyse of armes so long out of vse, that the
 one with the other hath ben no small profite and com-
 moditie to your subiectes and dominions. For by taking
 awaye the vse of Mules, is so increased the number of
 hoxses and hoxsemen, that such as befoze neyther durst
 nor could in maner lyght vp vpon a hoxse, can now easely
 & apely manege the. So that you seme to haue reuyned
 the dayes of Bellerophon the sonne of kyng Glaucus, and
 lyke wyse the tyme of Saturne, when men had fyrste the
 knowledge how to make hoxses to abyde the byrdle, and
 to bring them vp to serue for diuers vses and necessities
 of men. And ryght sure I am, that by reason of suche
 laudable statutes and ordinaunces, in your dominions
 shall fayle neyther hoxses nor hoxsemen, as well for the
 court as for the campe. Who knowe in maner howe to
 girde a sword befoze y^e your maestie permitted weappons
 and armure to be woyn euen in your courte, and that
 elswhere all men might do the lyke. Befoze which time
 dexteritie fayled where courage abounded. Ouer and
 besyde the profite & commoditie that hath rysen hereof,
 what honour you haue obteyned by the same is manifest
 by Fraunces the French kyng, who by your Maestie
 being taken prisoner in the parke of Pavia, was brought
 to Madrid in the yere. 1525. Where seying many young
 men in maner without beaydes, and yet laden with ar-
 mure and weappons, sayde: Oh happye Spayne that
 byngest foozth and nourysheth men of warre. In your
 most happy dayes also, the Christian faith is amplified:
 and in maner whole Spayne floreyeth dayly more and
 more in sumptuous buildings, & is abundantly enriched
 in treasure brought fro your Indies, farre surmounting
 the riches of Salomon brought fro Ophir. Wea & to say
 the trueth, considering the hauses of gold & siluer which
 haue ben ordinarily brought fro thence to your maestie,
 this time may rather bee called the golde age, then that
 of Saturne. Not omitting also that by your prosperous
 attēptes, haue ben discovered so many landes & Ilandes
 heretofore so unknowen to y^e Cosmographers, Geographers,
 & Histor

Mules.

Hoxses and
hoxsemen.

Bellerophon.

Wearing
of weappons
and armure.Fraunces
the French
kyng taken
prisoner.The Christy
an faith is
larged.The sumptu-
ous buildin-
ges and ry-
ches of
Spayne.The Indies
haues of
golde and
siluer.Newlandes
and Ilandes
discovered.

THE EPISTLE.

e Historiographers that they neuer harde of their names.
 Which neuerthelesse are nowe so well knowne to your
 subiectes, that they haue troden them with theyr feete,
 and measured them by pases. Who before this tyme
 euer harde any mention of the ryche and large prou-
 uince of Peru, or of the straghtes of Magalians, or of
 the ryuer of Syluer, called Rio dela Plata. They in
 tyme paste seemed to haue done no small thyng when
 they hadde knowledge of the fortunate Ilandes, the
 whiche sence they were conquered by your Maiesties
 graundefather, haue ben called the Ilandes of Canaria.
 And yf it is and hath ben muche to discover and subdue
 this newe worlde: it is doubtlesse no lesse glory to your
 Maiestie, not only to possesse and enioy it, but also that
 you dayly procure to sende thither Iudges to gouerne
 with lawes, and preachers to instruct in doctrine, to
 byrnyng those Indians to the knowledge and honouryng
 of the true God. And therfore considering your Maie-
 sties godly desyre and purpose as touchyng these nau-
 gations, and the dangers of such as go to discover this
 newe worlde (although it be not newe to the Spany-
 ardes to trauayle into farre countreys: forasmuch as in
 the dayes of Caius Cesar the sonne of Augustus, were
 founde broken pecies of Spanyshe shippes lost in the
 golfe of Arabie, as also Celsus Antipater affirmeth, that
 xerten shippes of Spayne were accustomed to sayle for
 marchaundysse to the east partes of Ethiopie) in conside-
 racio hereof haue I the more wyllingly publyshed these
 my trauayles for the furtheraunce of all suche as shall
 hereafter attempt the lyke nauigations. And here do I
 not saye that nauigation is not a thyng of antiquitie.
 For we read that in olde tyme, the Argonauts sayled to
 Colchos, and Danaus brought the firste shippe from E-
 gypte to Crete. But I saye that I am the firste that
 haue brought the arte of nauigation into a briefe com-
 pendiousnesse, geuyng infaylable principles and euident
 demonstrations, describyng the practyse and speculati-
 on of the same, geuyng also true rules to Mariners, &
 the wyng wayes to Pilotes, by teachyng them the ma-
 king and vse of instrumentes, to knowe and take the al-
 titude

Peru.
 The straigh-
 tes of Maga-
 lianes.

Rio dela
 plata.

The fortun-
 ate Ilandes
 of Canaria.

Religion in
 the Indies.

The Spani-
 ardes haue
 euer trauay-
 led into farre
 countreys.

The antiqui-
 tie of nauig-
 ation.

Argonan-
 ti.

Colchos.

The arte of
 nauigation.

Thynges
 pertainyng
 to nauiga-
 tion.

The arte of
 nauigation.

Thynges
 pertainyng
 to nauiga-
 tion.

The arte of
 nauigation.

Thynges
 pertainyng
 to nauiga-
 tion.

The arte of
 nauigation.

Thynges
 pertainyng
 to nauiga-
 tion.

The arte of
 nauigation.

Thynges
 pertainyng
 to nauiga-
 tion.

The arte of
 nauigation.

Thynges
 pertainyng
 to nauiga-
 tion.

The arte of
 nauigation.

titude of the sunne, to knowe the tydes of ebbing and
 flowing of the sea, howe to order theyr cardes and co-
 passes for nauigations, geuing them instructions of the
 course of the Sunne & motions of the Moone: teaching
 them furthermore the making of Dialles both for the
 day and for the nyght, so certen, that in all places they
 shall shewe the true houres without defaute. And haue
 likewise declared the secreete propertie of the lode stone,
 with the maner and causes of the Northeastinge & South-
 westinge (commonly called the variatio of the compasse)
 with also instrumentes therunto belonging. And that,
 that whiche I shall saye or do, be not accounted to bee
 presumptuouslye done or spoken, I acknowledge that
 whatsoeuer I haue well done or witten, it is from a-
 boue by the helpe of the diuine grace, and by the fauoure
 and prosperous fortune of your maiestie. And thus shall
 they that now liue, and lyke wise they that shal succede
 vs, se and perceaue, howe much moze the worlde oweth
 and is beholding to your Maiestie, then were the auncient
 Egyptians to their Isis. She gaue them letters to
 reade, but your Maiestie hath geuen rules and orders to
 sayle on the seas. The profite of Isis, was onely for one
 prouince. But the commoditie that ensueth of your do-
 ynges, is vniuersall for all prouinces and nations, and
 for all seas, aswell to go to places discouered, as also to
 discouer landes and regions yet vnknown. If they of
 auncient tyme had reached that we haue obteyned, the
 Indies had not now bene to discouer: neyther should it
 be esteemed a miracle vnto vs as at the tyme when Car-
 thage flooyshed, that one Agnus went soorth from the
 baye of Cadiz, and sayled to thende of Arabie. Neyther
 woulde Cornelius Nepos haue witten it for so famous a
 thyng, that a certayne man flyinge from kynge Latinus,
 came from the goulfe of Arabie: Whereby it is manifest
 that aswell nauigation as other artes, doth from day
 to day increase, and by lytle and lytle is come to perfec-
 tion. For in those dayes they had neyther compasse nor
 carde of saylyng whereby to gouerne themselves. They
 lacked the consideration of the starres, vntill the Phenici-

The lode
 stone, falsly
 called in
 Englysh the
 Adamant, is
 in Latin cal-
 led
 Magnes.

Charles the
 fifth geuen
 then the ves-
 sel of olde
 tyme.

Vniuersall
 benefites

Comparatō
 with the an-
 tiques

Plinie.

Nauigatio
 one of olde
 tyme

The perfec-
 tion of
 artes at this
 day.

THE EPISTLE.

The rudeness of the
antiquers.

Angurii.

The North
starre.

The viages
of Salomon
to Tharlis
and Ophir.

The first in-
uentours of
Navigation

Commodi-
ties and dif-
ficulties of
Navigation

tians founde the knowledge thereof, and were the fyrste
that vnderstode (that to such as shoulde trauaile by sea)
it shoulde be necessary to lyfte by theyr eyes to heauen,
and consider the motions therof. They that sayled to
the Ilande of Taprobana (which in olde time was called
Anticono) carped for theyr vyages luyng byrdes. And
when they thought good, let certeyne of them flee: and
by the flyght of their wynges, directed the helme and
sayles of theyr shippes. They sayled onely thre mo-
nethes in the yere. To them therfore it was necessarye
to obserue and tarpe the tyme vntyll they founde it to
serue with a forewynde. They knew not howe to helpe
them selues with the bowe line or syde wynde: neither
saue they the North starre, or sought it, or had any
knowledge thereof. And I beleue verely that this was
the cause of so long a vyage whiche the shippes of Salo-
mon made, saylyng to Tharlis and Ophir, wherin they
spent thre yeres: although in deede that was no short
vyage whiche they made, compassyng about India and
many other prouinces. And wheras before I sayde that
Navigation by lyttle and lyttle came to perfection, I
fynde by auncient hystories, that Tiphon fyrst founde the
gouernall or rudder, Dedalus the masse and shroudes,
and Icarus the sayles. The Thirreni founde the vse of
the anker of one graspe or flooke, and Palamius brought
it to perfection, addyng the other. And thus may it ma-
nifestly appeare that in these prosperous and fortunat
dayes of your maiestie, it hath pleased God to bring the
knowledge of Navigation to perfection, with this my
briefe discourse as touchyng the same, aswell profitable
and necessary for them that trauaile by lande as by sea.
What can be a better or more charitable dede, then to
bring them into the waye that wander? What can be
more difficulte then to guyde a shippe engoulfed, where
only water and heauen may be seene. One of the foure
most difficult thynges wherof Salomon maketh menti-
on in his Proverbes, is the vyage of a shippe by the sea.
The which Galfiede expoundyng, saith that in humayne
thynges, none is more fearefull or more daungerous,
then

then to auenture lyfe in a weake & thynne piece of wood,
or for a man to commit him selfe to the rage of furious
wyndes amonge the tempestes of the sea, and there to
hazarde that he loueth so well. Oh howe muche more
should the same seeme difficult to Salomon, yf at these
dayes he should see that fewe or none of the Pilotes can
scarsely reade, and are scarsely of capacitie to learne.

The igno-
rante of
Pilotes.

And wheras in the first Chapter of this booke, I haue
made mention, that the gouernall or sterage ought to be
committed to expert men and of good vnderstanding, he
should see that nowe a dayes the ignorant presume to
gouerne other, which were neuer able to rule or gouern
them selues. I mosse humblye besyze your maiestie to
receaue in good parte this my pooze service. Which al-
though it be lytle, yet being dedicate vnto the greatnes
of your regall person, it shalbe much more then greate.
The profite and commoditie thereof is notozious: and
the benefite that therby may be receaued, is vniuersall.
If therfore when your maiestie shall fynde your selfe re-
leased from greater affayres, it may please you to reade
your eyes with these my traуayles, you shall fynde

The gouern-
nall.

The igno-
rante of
Pilotes.

The igno-
rante of
Pilotes.

therin many newe, delectable, & wytty thynges

with also many profitable and certen rules

both to reade and vnderstande. To con-

clude, I estones make humble

petition vnto your imper-

riall maiestie, not so

muche to con-

der what I

wryte,

as to respecte the intent of my wrytyng: and

not the gyfte, but the affection and

good wyll that remayneth

in me to serue your

maiestie.

(.)

(.)

(.)

(.)

(.)

**The first parte of thys Woozke
which entreateth of the composition**

**of the worlde: And of the vniuersall
p:inciples for the arte of
nauigation.**

**The first Chapiture of the generall distinction
of creatures.**



The infinite god, the begin-
ning and cause of the hole vniuersall,
created thze orders of creatures, diffe-
ringe in kynde: That is to say, corpo-
rall, as the Clementes: Spiritual as
Angelles: And compounded of these
two, as man. The corporal nature is
deuided into bright and shining bodyes, as the starres,
a: into darke and thicke bodyes, as earth and metalles:
Cyther into Diaphane o: transparent bodyes, as ayze
and water. Of these creatures (as sayth S. Gregory)
some haue onely beyng, as stones, some lyue as trees,
and other haue sence, as beastes, other vnderstanding,
as man: who in holy scripture is called al creatures, ac-
cordinge to the sayinge of Christ to his disciples, where
he sayth: Go and preach the gospell to al creatures. And
therefoze not without good cause was man called of the
greke philosophers Microcosmos (that is) the lesse worlde.
In the which we contemplate thynges of no lesse admi-
ration, then in the greate worlde. The similitude be-
twene them both, is that euen as the great worlde, and
the hole Globe o: sphere thereof, is moued by the volun-
tarie motion of an intellectuall substance, o: an Angell:
euen so is this. For (as Aristotle writeth) what so euer
is moued, is moued by vertue of an other: as man is mo-
ued by the internall o: inwarde forme that is within
him: (That is to say) by the intellectuall soule that is pro-
per vnto hym. In lyke maner in the great worlde are
founde dyuers mouable thynges: All whiche are reduced
to one immouable mouer. So in man are founde many
thynges

There diffe-
rences of
creatures

Corporall
creatures,

Man is cal-
led all crea-
tures & the
lesse worlde

Man compa-
red to the
worlde

All that mo-
ued, is mo-
ued by an o-
ther immo-
uable

The intell-
ectiue soule

thynges moued by diuers motions, which are all refer-
red to his intellectuall soule. The great worlde conteyneth the creatures within it selfe: And consequently is all really, as havyng nothinge without it. Euen so man by knowledge is all, and knoweth all thynges, and no-
thyng naturally is hyd from hym or vnknown to hym. Agayne, in thys lesse humayne worlde are two motions, intellectuall, and sensuall. Then consequently the great worlde hath two locall motions. The one wherewith the fyrst mouable is moued, & draweth with it all the other spheres from the East to the West, and is called Ratio-
nall mouing. The seconde is the mouynge of the other spheres fro the West into the East: And is called Irra-
tional mouing. But now leauinge to speake of the lesse worlde, we will procede to speake further of the greater.

Man knoweth
eth part of
all thynges

Two moti-
ons in man

Primum
mobile,

Rationalis
motion.

Irrationalis
motion.

The seconde Chapter of the defini- tion of the worlde.



The worlde (as sayth Isodorus) is heauen and earth, and the other woorkes of God that are contened therein. It is compoun-
ded of thinges visibill, and yet vnsearche-
ble. Moyses and S. John the Euangelist, witnesse that it was made by God. The
Philosophers called it Mundus a mouendo, because it is in continuall mouinge and neuer in rest. The Grekes
called it Cosmos, which signifieth faire or beautiful, and so named it because of the meruailous ornament therof, and diuersitie of Elementes, with the resplendence or
shining of the sonne, moone, and starres. And doubtlesse nothinge maye bee sene with the corporall eyes of man more bewtiful then it is. In so muche that the diuine
Philosopher Plato, affirmed that eyes were geuen to men to beholde the bewtie therof, and to take pleasure
in the contemplation of the heauenly bodies, and round-
nesse of the worlde, which also for the roundnesse therof, is called sphericall, because that Sphera in the Greeke
tonge, signifieth a rounde body.

what is the
worlde.

Or Mun-
dus a Mou-
ditie,

that is cleas-
ren or sayes-
ren.

Eyes were
geuen to me
to beholde
the faynes
and beantes
of the worlde

The round-
nesse of the
worlde.

The

The third Chapter of the definition of the Sphere.

Definition
of the Sphere



Heodosius saith that the sphere is a whole and corporal figure under one superficial: in the middest wherof is a point or p[ri]cke, from the which all ryght lines drawen directly to the circumference are equall.

The center
of the Sphere

This poynt or p[ri]cke is called the center of the Sphere. Accordyng to Euclide, it is the passage of the circumference of halfe a circle, whiche beyng fixed, the Diameter is turned rounde about, vntyll it returne to his owne proper place.

The axis &
poles of the
woylde.

By the center of the Sphere passeth a ryght line, and thertremities or endes therof, touche in the circumference. And this line (imagined) is called the Axis or Criltre of the Sphere, and the endes therof are called the poles. Upō this Axis, is the sphere of the woylde moued.

The.iiii. Chapter of the di- uision of the woylde.

Quinta Es-
sentia.
Aristotle cal-
leth it the .v.
element.



It is to be presupposed that there is difference betwene element and elementate, and the fyfth being, called Quinta Essentia: The quint essence or fyfte substance, is a body of it selfe, differing from all elementes and thinges elemental, aswell in mat-

The .v. es-
sence is in-
corruptible.

ter as in fourme, and no lesse in nature and vertue. And haupng in it selfe no contrarietie, is certainly without corruption. And hereof commeth it that the Philoso-

What is es-
sential.

phers called the heauens and heauenly bodyes, the fyfte substance or fyft essence, by reason of the incorruptibili-
tie therof. Element is that wherof any thyng is com-

The inferi-
our elemen-
tes are not
pure nor sim-
ple.

pounded. It is the firste of compositions: & of it selfe is not compounded. Therby it foloweth, that neither the earth, the ayre, the water, nor the fyre, that are nere vnto vs or about vs, are pure or simple elementes. For these elementes do sometymes myngle them selues one with

with another: and especially where they are nere together and touch one an other. Of these elementes, every part is named by the name of the whole. As every part of fyre, is called fyre, and every parte of earth is called earth, and so of the other. They are called simple bodies in respecte of other compounde and mixt bodies. They are diuisible into partes of diuers fourmes: and of the commixtion of them, are made and engendred dyuers thinges of sundry kindes. These foure (that is to meane earth, ayre, water, and fyre) although they are named simple but in respecte as aforesayde: yet are they the Elementes (that is to say) begynnynghes and principles of al other compoundes and mixtes. A pure element can not be sene, forasmuch as that that is pure, lacketh colour: and that hath no colour is not visibill. The elementes (as saith Hodoros) were deuoyded by the hande of God. The Emperfall heauen was replenished with Angels, the aire with byrdes, the sea with ffishes, and the lande with men and other beastes. Clementate, is every body compounded of the foure elementes. Not that they are elementes formally, but vertyually in mixt bodies. This knowen, we wyll shewe howe the woylde is deuided into two regions: Celestiall, and Elementall. The region Elementall, which is continually subiecte to alteracions, is deuided into foure elementes: Which are, earth, water, ayre, and fire. These elementes, the Grekes call Yctogia, for the communion and concozde that they haue betwene them selues. The heauenly or ethereal region (called Quinta Essentia) compasseth and contepneth the elementall woylde within it.

The elementes are diuisible into partes.

The commixtion of elementes.

None of simple elementes can not be sene.

The diuision of elementes.

What is clementate.

Diuision of the woylde into celestials all and elementall.

Quinta Essentia.

The.v. Chapter of the number,

order, and propertie of the elementes
and heauens.

The order of
elementes

earth.

water.

Ayre.

fyre.

The founte
of the water

The Ocean
sea.

psal. 107.

Job xxxviii
The will of
god is the
cause of
causes

Nature ab-
horreth emp-
tines

The earth
is not perfect-
ly rounde



The earth (after the Philosopher) is a
p[ri]cke o[er] poynt in the myddest, called
the center, to the which they assigne
the lowest place. Pert vnto the earth
and about it, the water occupieth the
seconde place, and the Ayre the thirde.
The fyre is hygher then any of the o-
ther elementes. And it is to vnder-
stand that the water hath two superficialis. One, which
is called concaue o[er] hollo[w]. The other, conuer o[er] em-
bolyng. You maye compare the inward parte of the
concaue to a dyshe o[er] a bolle, whose outwarde parte is
called conuer. As touchyng the concaue, the water com-
passeth about the earth, leauyng discovered that parte
that serueth fo[er] the respiration and lyfe of men, and o-
ther beastes. As concernyng which, some thynke that
the Ocean sea is hygher then the earth: and aske the
question why the sea couereth not the whole earth, and
why the earth is not sonke in the water. To this it may
be a sufficient aunswere, that it hath so pleased the wyl
of God acco[rd]yng to the saying of the Prophete Dauid:
Terminum posuisti quem non transgredietur: Neque con-
uertetur operire terram. That is: Thou hast appoynted
limittes which it shal not passe, neyther shal it retorne
to couer the earth. Besyde the wyl of God whiche is
the chiefe and sufficient cause therof, we say that nature
sayleth not in her necessities. Fo[er] she sometyme ad-
mitteth a little inconuenience, to auoyde a greater euyl:
as when heauy thynges which naturally shoulde descend,
do not onely not descende, but ryse vp: And as also som-
tymes it chaunceth that fyre descendeth and water arri-
seth to fyll the voyde o[er] emptye place, least any where
shoulde be found voyde o[er] emptye, which nature so great-
ly abhorreth. To this purpose, nature fo[er]seeynge the
kyndes of many thynges that coulde not els where lyue
then on the earth, neither be conserued within the wa-
ter (as men and other earthly beastes) determined be-
fo[er]e to make the earth not perfectly rounde contrary to
the nature therof: wherof it foloweth, that it is not al-
together

together couered of the water. And (as sayth Origen) the earth remayneth discovered of water, that it might bring forth frutes, trees, and plantes. As touching the conuer aforesayde, the water and earth discovered, are conteyned vnder the concavitie of the ayre, which is deu-
 uided into thre regions, as the lowest, highest, & middlemost. The lowest is hot by reason of the reflection of reboiuyng of the beames of the sunne striken backe by the earth. The highest also is hot by participation of the fyre and nearenesse therunto. The myddle regyon is colde, as is manifest by the snowe and hayle engendred in the same. The ayre neare vnto the region of the fyre whiche is pure heate, both neyther burne nor lighten, because it hath no combustible matter, & so hath it power and not act. It is neare vnto and reacheth the circle of the moone whiche compasseth it about. The heauen of circle of the moone is next vnto the heauen of Mercurie: And Mercurie vnto Venus: Venus vnto the Sunne, the Sunne to Mars: Mars to Jupiter: Jupiter to Saturne which is next and reacheth vnto the heauen of the starres, called the firmament, because that in it are all the starres (except the planets) firme and fixe as a knot in a table. The knowledge of the planetes was had by seuen sundry motions they haue amonge themselves, and by their course not vniforme to that of the starres of the eyght heauen, because that sumtymes the planetes appeare vnto vs ioyned together, and sumtymes deu-
 yded. The Crystalline heauen, compasseth aboute or conteyneth within it, the heauen of starres. This Crystalline heauen, is transparent & perspicuous as cleare water or glasse that maye bee sene throughe by reason of the cleannesse and pure substance therof. It is by another name, called the heauen of water, whereof holie scripture speaketh, saying: Aqua quæ supra celos sunt, laudent nomen Domini. That is to say: Let the waters that are aboue the heauens, prayse the name of the Lorde. It was created for the conseruation of corporall thynges, and to temper the heate engendred of the mouing of the first moueable, which beinge so great of body that it not
 onely

Deuision of
the ayre into
three regi-
ons

The highest
ayre is in-
combustible

The order
of the hea-
uens

The firmament

The plan-
ets

The Crystalline hea-
uen

The heauen
of water

psalm. 148
Daniel. 3.

The mou-
ing of the
first moue-
able

The cold-
nes of the
Cristalline
heauen.

The swifte
course of Sa-
turne.

The heauen
of the fyrste
mouable.

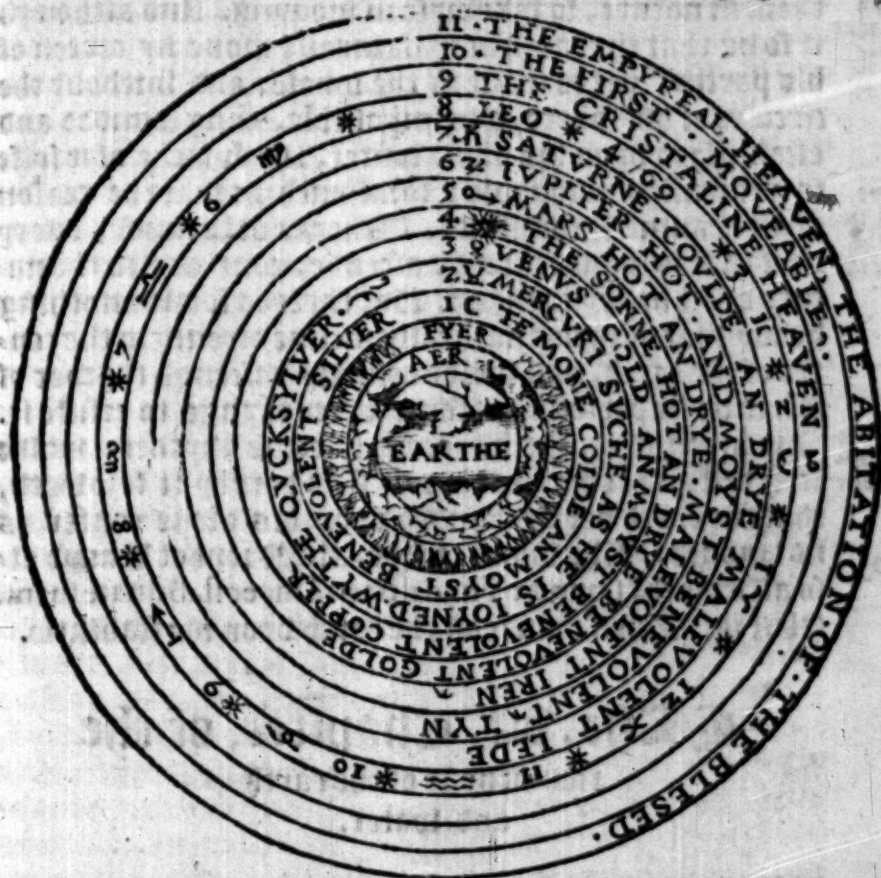
The heauen
called Empe-
rium, is not
moued, & is
the habitaci-
on of angels

The huma-
nitie of
Christ in the
Emperyall
heauen.
The orders
of Angels.

The imperial
heauen pre-
serueth all
the other
heauens.

only compasseth all the elementes, but also all the infe-
riour heauens is moued so swiftly, that it dayly perfect-
ly moueth all the aforesayde spheres. And least by rea-
son of the great heate therof caused by his swift motion,
it shoulde consume inferioꝝ thynges: God ordeyned this
Cristalline heauen that the coldenes therof myght tem-
per thextreme heate of the other. And this appeareth by
Saturne, which beyng the hyghest of all the planettes,
shoulde be seruent hotte more then any of the other, be-
cause it hath a swyfter course and moueth faster then a-
ny of them, and maketh dayly a greater circuite. But
soasmuch as it is nearer vnto the sayde Cristalline hea-
uen, the heate therof is tempered by the naturall colde-
nes of this wateryshe heauen, wherby (as I haue sayd)
the seruour therof is qualified and restrayned from the
hurte it myght otherwyle doo. This Cristalline heaue
reacheth to the fyrste moueable heauen called Primum
mobile. And this reacheth to the Imperial heaue which
is the twelfth, called Empirum, by reason of his cleare-
nes and resplendence. This is not moued, and is mosse
perfecte. The Philosophers had no knowledge hereof.
But we beleue by holy Scripture that suche a heauen
there is, and the same to be the habitacion of Angelles
and spirituall creatures. It is also called Cælum celorū.
That is: The heauen of heauens, because it conteyneth
and includeth within it all the other heauens. It is of
greater clearenesse then all the other heauens, and was
created immediatly with the Angelles. In this also re-
mayneth the humanitie of Iesu Christe our God, and in
dignitie aboue it. It conteyneth thzee holye orders oꝝ
pꝛincipalityes called Hierarchias. Wherof, the fyrste is
called supercelestiall, and hath in it also thzee orders: as
Seraphins, Cherubins, & Thrones. The second is cal-
led Celestiall, and conteyneth Dominations, Pꝛinci-
pates, & Potestates. The thyrde called Subcelestiall,
conteyneth Virtutes, Archangels, and Angels. And to
conclude, it hath aboundaunce of all goodnes and per-
fecte felicitie, with pꝛination oꝝ wante of all euyl.
This heauen also geueth influence of constancie, sted-
fastnes,

fastnes, and durabilitie to thynges, agaynst the fluctu-
bilitie and inconstancie of the other heauens : the order
wherof doth appeare in the demonstration folowynge.



The. vi. Chapter of the immu- tabilitie or immobilitie of the earth.

The Pithagorians & other aun-
cient naturall Philosophers (as saith
Aristotle) were of opinion that the
earth dyd moue. Yet not by a ryght
soyth motion, but circularly about, in
the myddest of one place. The whiche
error, both Aristotle hym selfe and
the

Opinion
that the
earth mo-
ueth.
Molus in
loco,

The earth
is immou-
ble

All heauy
thynges in-
cline to the
center of the
earth

The earth is
founded vpon
his owne
center

Psal. 103.

the Astronomers do confute and reproue by euident cau-
ses and manifest demonstrations: For circular motion
is proper to the heauens. And as the earth dyffereth fro
them in nature, so lyke wyse in mouyng. And although
it so be that the earth may naturally moue by certen of
his partes, yet to moue in the whole, and without the
circuite of his sphere, it is impossible, being founded and
establisshed vpon his owne center, the whiche of it selfe
is naturally immouable: forasmuch as in it the reason
of all heauinesse consisteth. Wheras other wyse, every
part that is moued shoulde ascende, contrary to the na-
ture of all heauy thynges. But there is founde nothing
heauy that doth not naturally incline directly to the cen-
ter of the earth, and wolde actually descende thither yf
it had no impediment of some other thyng to resiste it.
And when it toucheth there or is come thither, wolde
styll rest and remayne there. And hereby it foloweth,
that the earth beyng founded vpon his owne center, is
not moued. The which thyng, the Prophet Dauid al-
so affirmeth, saying: Fundasti terrā super stabilitatē suam.
(that is.) Thou foundedst the earth vpon his stabilitie.

The. vii. Chapter, of the roundenesse of the earth and water.

The round-
nes of the
earth

The rysyng
of the sunne

The Eclipse
of the moone



That the earth is rounde, it appeareth
by manifest euidence. For yf it were
playne or flatte, the dawnyng of the
day or day spryng, shoulde equally &
at one tyme appeare to them in the
West, as to them in the East. But
we see the contrary, that it ap-
peareth fyrst to them that dwell in the East,
and afterwarde to them in the West. This is proued by
the Eclipse of the Moone, which begynnynge at one in-
stant: they of Jerusalem see it begyn at foure a clocke
of the nyght, and we of Andalusia in Spayne, at one a
clocke

clocke of the nyght. It foloweth hereby that to them it
nyghteneth thre houres soner then vnto vs in Spaine.
And this is caused by the roundnesse of the earth. It is
also aswel known to be rounde from the pole Artyke to
the pole Antartike: for by the roundnesse therof, is cau-
sed the equalitie and inequalitye of the dayes & nyghtes.
The same is lyketwys known by the raysynge of the
pole aboue our Horizon. And that the superficiall parte

The equalitie
of dayes
& nyghtes.

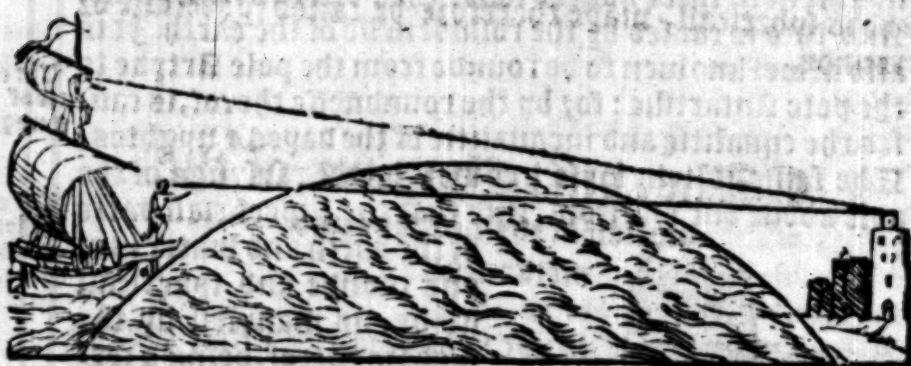
The earth &
the water as
one rounde
globe.



of the earth and water is al
one rounde and sphericall
globe, is manifest by the
shadow therof, being a cer-
taine darke body reflected
fro the earth in the Eclipse
of the Moone. For by this,
as by playne demonstrati-
on, may we know that the
earth is rounde, as maye
more manifestly appeare by
this figure. It is also pro-
ued y the water is a rounde
bodye, as is sene by experi-
ence. For yf you erecte a
marke vpon the sea banke
of a porte, and a shyppe de-
parte from that porte a cer-
taine space: then standing
in the poupe or sterne of y
shyppe, you shall not see the
marke aforesayde. But yf
you stande in the toppe of
the shyppe, then maye you
see it. Whereas notwith-
standing (yf that portion of
the bendynge arke of the
earth byd not hynder the
syght) you should see it bet-
ter beyng in the poupe: for
asmuche as it is nearer to
the mark then is the toppe

The water
is a rounde
body.

of the shyppe, as by this demonstratton appeareth.



Howe the
earth is
rounde.

But here some may moue a doubte: saying that on the earth we see many mountaynes, and consequently many greate valleyes and playnes, with many diuersities of sundry other depe & vnequall places, by reason wherof the earth can not truely be called rounde. To this I say, that in two maners the earth is called and vnderstode to be rounde. As after one maner speakyng p[re]cisely, it is called rounde as a circle or a sphere whiche we call rounde, because that all ryght lines drawen fro the center therof to the circumference, are equall. The other roundnesse is considered without this p[re]cisenes: And is such, as not by all his partes is equally distaunte from his myddest or centre, but hath some partes hygher and some lower: yet not in such quantitie as may destroy the roundnesse of the whole. As if in a bowle there were certayne clyftes or holes, it shoulde not thereby leaue to be rounde, although not perfectly or p[re]cisely round. And so this cause saith Auerrois: that although both the heauenly bodyes & the elementes are of rounde fourme, yet dyffer they in this, that the heauenly spheres haue perfecte roundenesse, and the elementes not: As the earth by reason of his mountaynes and vales, the sea by his encreasyng and decreasyng, the Ayre also for his nearenesse to the fyre, and by his contrarietie, doth sometyme do and sometyme suffer (That is to saye) is sometyme actiue and sometime passiue. So that folowynge the one it fleeth the other, by reason wherof, it also lacketh

The ayre is
actiue & passiue,
and not
perfectly
rounde.

lacketh perfecte roundnesse. But the syze, soasmuch as it is neare to the concaue of the circle of the moone, whiche is sphericall, maye therfore be called sphericall or rounde.

The syze is rounde.

The. viii. Chapiter, of the

motion of the heauens and
elementes.



It is not to be forgotten that all the elementes are wholly moueable by local motion, excepte the earth. The water is moued by the motion of the Moone, or tolled by the wyndes. The syze (as saith Aristotle) is moued circularly by the motion of the daye, and is drawen of the circles that embrace

Howe the syze is moued.

it or compasse it about: As is manifest by the Cometes or blasynge starres, and other fierie exhalations conteyned and engendred in it: Which being caried with this motion, conclude that the syze moueth in lyke maner.

Howe the syze is moued.

And with this motion is the superioz parte of the Ayre violently caried about, as the other impressions therein do shewe. The inferioz parte is moued by dyuers motions: (That is to meane) laterally, as by experience we see when the wyndes blowe. The Moone with her heauen or sphere, by her proper motiō geueth her turne from the Weste to the East in. xlviii. dayes and seven houres, with. xlv. minutes. Venus, Mercury, and the Sunne, in a yere: whiche is the space of thye. C. lxx. dayes, with. v. houres and. xlii. minutes. Mars in two yeres. Jupiter in. xii. yeres. Saturne in. xxi. yeres. The. viii. heauen which is the firmament or starry heauen, by his owne proper motion is moued by the. ix. heauen vpon the begynnyng of Aries and Libra, and vpon these two poyntes accomplysheth his reuolution in seven thousande yeres.

The Moone

Venus.
Mercury.
The Sunne
Mars.

The starry
heauen or
firmament.

The Crisall
line heauen.

First moue-
able.

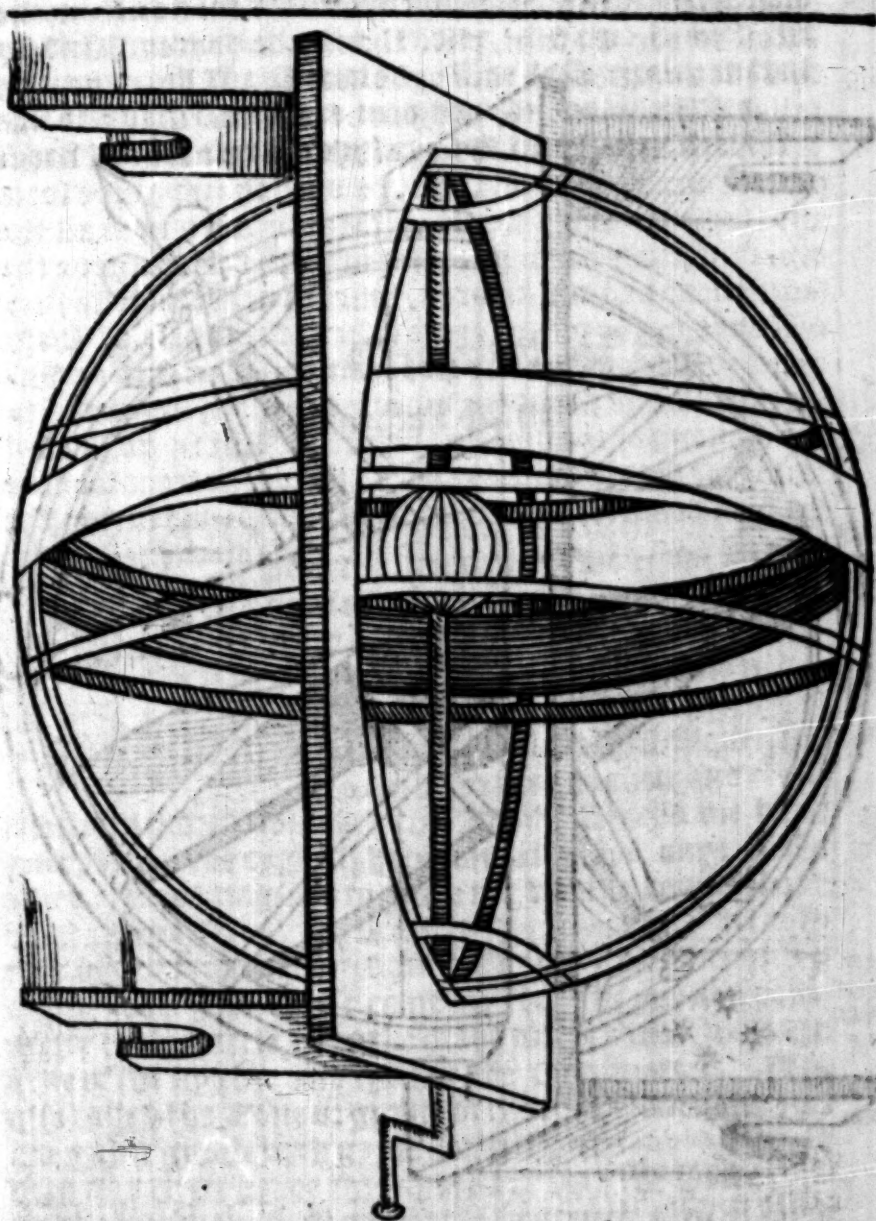
Howe the
first moue-
ble dyuerty
the other hea-
uens.

This motion is called *Motus crepidationis*, (that is to say) the tremblyng motion, or motion of accesse and recesse. The ninth heauen endeth his motion from the West to the East in. xlii. thousande yeaeres. And by this motion moueth the eyght heauen. The. i. heauen called *Primum mobile* is moued from the East to the West: And in. xliiii. houres (which is a naturall daye) perfourmeth one reuolution, & with the myghtye force and swyftnes of his motion, carryeth with hym all the other inferiour heauens, and maketh them to geue the same turne in. xliiii. houres, wheras neuerthelesse they cease not in the meane tyme to kepe the course of theyr owne proper motion: as (for example) if an Ant or Wismer shoulde go about the wheele of a myll, contrary to the mouyng of the wheele: befoze the Ant in goyng syl forwarde shoulde come agayne to the poynt from whence he fyrst departed (which is once about or one turne) the wheele shoulde in that space make many turnes.

The. ix. Chapiter, of the diuision of the Sphere into formall partes.

The right &
crooked or
oblique
sphere.

The Sphere of the woꝛlde is diuided in two maners. (That is to saye;) by substance and by accident. By substance into. i. Spheres, as we haue sayde. By accident, into a ryght Sphere, & oblique or crooked sphere. They haue the ryght sphere that dwell vnder the Equinoctiall line: and is called ryght, because to the poles are equally in the Horizon, as appeareth by this figure folowynge.



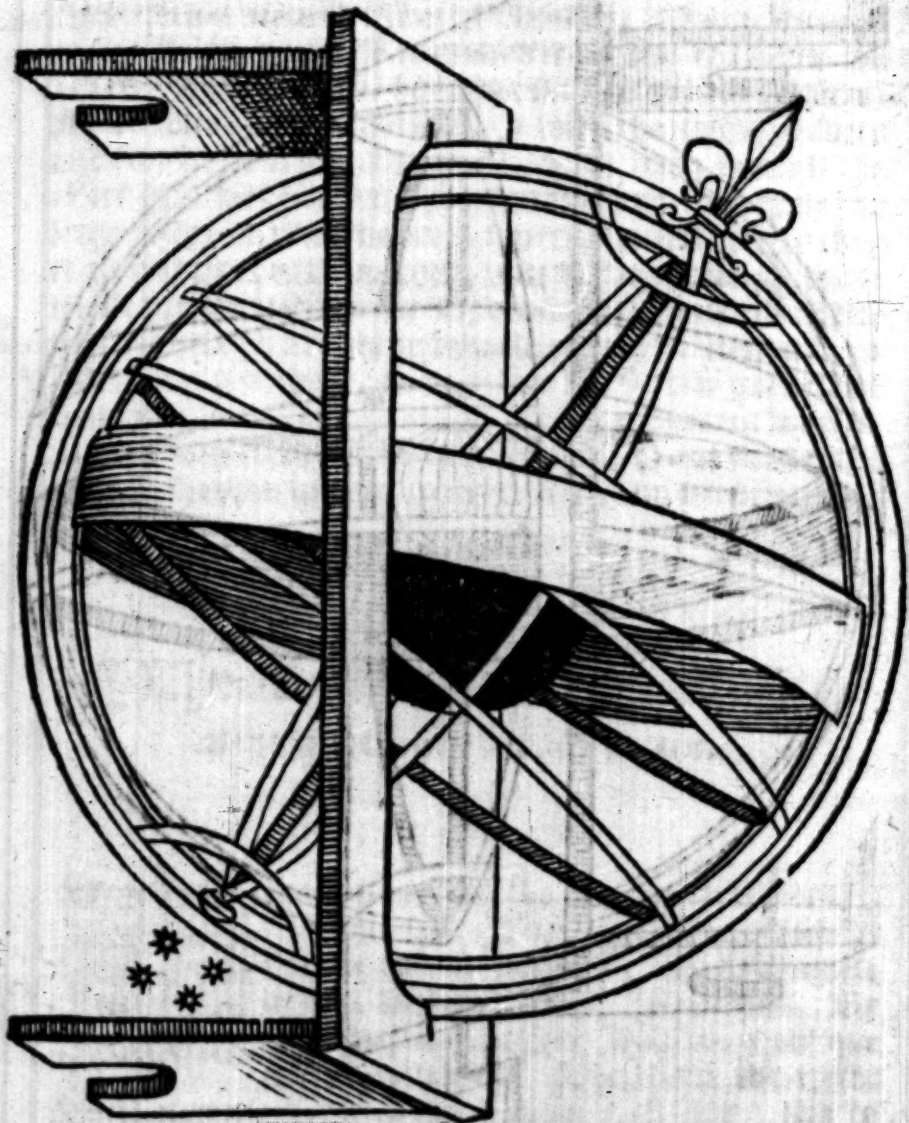
They haue the oblique sphere that dwel either on this
syde or the other syde of the Equinoctiall : vnto whom

B iii

is

The oblique
or crooked
sphere,

is ever one of the poles above the Horiz^o, and the other
under it, as appeareth in this figure.



The. 2. Cyp
cles of the
Sphere.

The sphere is compounded of .x. circles imagined. And
(as saith Iohn de sacrobosco in his booke of the sphere) like
medal round : *Ille enim dicitur sphaerice figura esse quod
in ea*

of them are greater, and foure lesse. The greater circle, is that which deuidenth the sphere into two equall partes, and hath his center with the center of it. These are the Equinoctiall, the Zodiac, the two Coluri, the Horizon, and the Meridian. The lesse circle, is that that deuidenth the sphere into two vnequall partes. These are the two Tropicke, and two Polar circles.

The .x. Chapiter, of the Equinoctiall Circle.



The Equinoctiall is a circle that deuidenth the sphere into two equal partes and is by every part equally distant from both the Poles. It is the greatest circle among the other, and is described in the sphere by the motion of the Primum mobile or first moueable.

The Equinoctiall.

This circle for his equalitie and regularitie, is more noble then the Zodiac whiche we haue described in the eighth sphere, and also then anye of the other. It is imagined to gyde the worlde round about by East and West. It is called Equinoctiall, because this worlde Equinoctium signifieth equalitie of nyghtes and dayes: wherof the cause is, that the Sunne coming to this circle, the arke of the day is equall with the arke of the nyght: and then is the Equinoctfall. It is also called the Zone or gyde of the first moueable. For euen as a gyde both gyde a man by the myddeste, so both this circle gyde the myddeste of both the Poles, vpon the which the first moueable is moued. One of these imagined on our parte of the Sphere, is called polus Arcticus, because is neare vnto certaine starres which the Astronomers call Arcturus, which is the great beare.

The equalitie of the day & nyght

The first moueable.

The pole arctic.

Septentris.
on.The hoine
North StarrePole Antar-
tyke.The crosse
made vnto
the pole
Antartyke.

It is called Septentrionall or Septentris, because that round about it are moued the seven starres, which make the lesse Beare commonly called Bozina, (that is) the hoine. The principall and chiefe of these, is the North starre, which is neuer sene to vs although the nyght be neuer so cleare: And (as the Poet Homer saith) doth moue lyttle or nothyng, because of his lyttle distaunce from the Pole. The other Pole is imagined on the other contrary part, and is called Polus Antarcticus of the worde Ante, which signifieth agaynste, contrary, or opposite, because it is on the contrary parte from the pole Artyke. It is also called the South pole, because that from that part of heauen commeth the wynde commonly called the South, and is lyke wyse called Meridional because it is ryght South from vs. This is neuer sene to vs. They that dwell vnder the Equinoctiall, or come nearer vnto this pole Antartyke, haue for a signe or marke to knowe it foure starres in foume of a crosse. And when the greatest of these is lowest in the foote of the crosse, they say it is. xxx. degrees aboue the pole. And as we can not see the Pole from hence, so can they not see our Pole from thence.

The. xvi. Chapiter of the Zodiacke Circle.

Zodiack



The Zodiack is defined to decline or bende it selfe from the Equinoctiall. It is a great circle which deuidenth the Sphere in two equall partes, cutting the Equinoctial by oblique or crooked angles: So that beynge thus cutte or deuyled by it into equall partes, one parte thereof declyneth towarde the South, and the other towarde the North. This circle is called the Zodiack of this worde Zon, whiche in the Greke tongue signifieth lyfe, because that accordynge to the mouynge of the planettes vnder it, is the lyfe of inferiour

inferiour creatures: **Z** is so named of Zodion whiche signifieth a lypung beaste. And is therfoze deuyded into xii. equall partes, wherof every part is called a signe, and every signe hath an especiall name of some beast, in respecte of some p^{ro}pertie agreable to the same: **o**z for the order and disposition of the fyfte starres in those partes somewhat representing the similitudes of suche beastes, it is called **Zodiack**. The Latins called this circle Signifer (that is) the signe bearer, because it carryeth these signes in it, **o**z is deuyded into them. Aristotle called it an oblique **o**z crooked circle, affirming that according to the comming nere **o**z departing of the Sunne from the oblique circle, are caused generations and corruptions in inferiour thynges. The xii. partes into the whiche this circle is deuyded, are called the xii. signes. That parte which declyneth to the North, conteyneth. vi. signes Septentrionall, and the other that declineth to the South conteyneth other fyve called Meridionall. Furthermoze, it is to consider that the **Zodiack** may be deuyded in two maners. One by longitude **o**z length into the xii. signes aforesayde, and every signe is deuyded into. xxx. degrees, which make. CCC. lx. degrees. Lyke wyse every degree is deuyded into lx. minutes, and every minute into. lx. secundes, and every secunde into. lx. terces, and so to tenne. The other deuision of the **Zodiack** is by latitude **o**z breadth. By latitude it is deuyded into. xii. degrees, and in it we imagine a line that deuydeth his latitude by the myddest hauyng. vi. degrees on euery parte **o**z syde. And this line which diuideth into two equall partes the breadth **o**z latitude of the **Zodiack**, is called the **Ecliptike** line, because that when the Sunne and Moone are directly vnder this line, eyther ioyned together by coniunctio, **o**z deuyded by opposition, then is the Eclipse of the Sunne **o**z of the Moone. Under this **Zodiack** the seven planets are moued. The Sunne also passeth by the myddeste of the sayde **Zodiack** by the ecliptike line, not inclynynge moze to the one part of it, then to the other. But the other planettes do sometyme go towarde the North, and other

The thirde
signes of
the zodiack.

Howe the
sunne is
cause of ge-
neration &
corruption.

Deuision of
the xii. sig-
nes.

Deuision of
signes into
degrees.

Deuision of
the zodiack
by latitude.

The Eclipse
of the sunne

The mouing
of the sunne
& the other
planets in
the zodiack.

What the
xii. signes
are.

The Figu-
res of beas-
tes & other
thynges
imagined
in heauen
besyde the
xii. signes.

other wayes toward the south, & sumtymes also thwart
or tranverse the Eliptike. It is lyke wyse to be noted,
that these signes whereof we haue spoken, are not the
constellations or starrs that make those figures which
the auncient Astronomers dyd appropriate to certayne
beastes and other thynges. For these figures are mo-
ued accordyng to the motion of the eyght sphere, and
passe from one signe of the Zodiac to an other. As we se
that the starre called Oculus Tauri, (that is) the Bulles
eye, is in two degrees of Gemini. And the two starrs
that are the head of Gemini, are in. xiii. & .xvi. degrees
of Cancer. And Spica virginis (that is) the spyke of the
Virgin, is in. xvi. degrees of Libra. And the harte of
Scorpio in two degrees of Sagittarius. And by this or-
der do they passe from one signe to an other: so that we
may not vnderstande the signes by these starrs, but for
the. xii. partes of the arke of the Zodiac, takyng the be-
gynnyng of the Equinoctiall of Aries. The names of
these signes with theyr charactes and qualities, are descri-
bed in this table here folowynge.

Numbers	Names	Charactes	Qualities	Num. names	Char	Qualities.
1	Aries.	♈	hot & dry.	7	Libra.	♎ hot & moist.
2	Taur.	♉	cold & dry	8	Scorp.	♏ cold & moist
3	Gemi.	♊	hot & moist	9	Sagit.	♐ hotte & dry.
4	Cancer	♋	cold & moist	10	Capri.	♑ colde & dry.
5	Leo.	♌	hot & drye.	11	Aqua.	♒ hot & moist.
6	Virgo.	♍	cold & dry.	12	Pisces.	♓ cold & moist

The. xii. Chapter of the Circles called Coluri.



Here are two Circles in the Sphere, cal-
led Coluri, so named of the Greke worde
Colon, which signifieth a member: And
of Vros, whiche signifieth a wyld Dre.
The tayle of this beaste, maketh a semp-
circle

circle or halfe circle, not perfecte. And as this beast moueth his tayle laterally or syde wayes, and not by longitude: euen so do the Coluri moue to vs, and are cutte in ryght sphericall angles vppon the Poles of the worlde. The one passeth by the Poles of the worlde and by the Equinoctials, and is called the Equinoctiall Colure: The other lyke wise passeth by the Poles of the worlde, and also by the Poles of the Zodiac, and by the Solsticials, and is called the Colure Solsticiall, called Solstitium, as Solis stacio (that is) the standing or staying of the Sunne: because that when the Sunne commeth to this poynt, it declineth no more, but returneth towarde the Equinoctiall. These circles deuyde aswell the Equinoctiall as the Zodiac into foure equall partes by the poyntes of the Equinoctials and Solsticials. In the Colure Solsticiall are the greatest declinations of the Zodiac: which are two arkes of this Colure, contained betwene the Equinoctiall and the Zodiac. And these arkes are equall to the other two of the same Colure, included betwene the Poles of the worlde and the poles of the Zodiac.

The Equinoctiall Colure.

The Solsticial Colure.

The greatest declination of the Zodiac.

The .xiii. Chapiter of the Meridian Circle.



The Meridian, is one of the great circles, imagined to traaverse the sphere by the poles of the worlde, cuttingge the same in two equall partes by the Zenith or verticall poynt. It is called Meridian for this effect: that whersoener a man becometh, and at what soener tyme of the yeare, when the Sunne (by the mouyng of the fyrst moneable) shal come to his Meridian: to hym shal it be hygh noone, at mydday, and is therfore also called the circle of the mydday.

Definition of the Meridian circle.

The mydday or noon.

It is

Diuers Meri-
dians.

It is also to be noted, that there are as many Meridi-
ans or Meridian lines, as are differences or habitacions
by longitude: so that they that dwell in the East, haue
other Meridians then they that dwell in the West. And
hereby is iudged the distance from one citie to an other,
and from one region to an other: So that the interposi-
tion of the arke of the Equinoctial betwene the Meridi-
an of one citie, and the Meridian of the other, is called
the difference of longitude from one region to an other,
and from one citie to an other, as we wyll further de-
clare hereafter.

The .xiii. Chapter of the Horizontall Circle.

Definition
of the Horiz-
on



Hemispheri-
cal Horiz-
on

Diuers Ho-
rizonts

The ryght
and oblique
Horizon

The Horizon (after the Astronomers) is a circle that deu-
ideth the hemispherie or halfe circle superiour from the
halfe circle inferiour: Or that deu-
ideth that part of heauen which we see
from the parte we see not, as the pro-
fessers of perspective affirme, and is
also called *h* Hemisphere (that is) the
half sphere, as the word signifieth in the Greke tongue,
and therfore eyther of these halves is called Hemisphere.
This Horizon is moueable to them that moue. And
hereof it cometh, that howe many places are vpon the
earth and the circumference therof: it is possible there
should be so many Horizons. The Astronomers deuide
the Horizon into ryght & oblique or crooked. The ryght
Horizon, is to them whose Zenith or verticall poynt is
directly in the Equinoctiall: And this ryght Horizon
passeth by the Poles of the worlde, and deu-
ideth the Equinoctiall in ryght and sphericall angles. The other
oblique or declined Horizon haue they vnto whom the
Pole of the worlde doth ryse aboue their Horizon. This
Horizon is also called oblique, because it deu-
ideth the Equinoctiall in vnequall and oblique or crooked angles.

Also

Also it is to be vnderstoode, that the pole of the Horizon is called Zenith or the vertical point of heauen, perpendicularly or directly ouer our headde. Whereby is inferred, that as muche as is the eleuation of the pole of the worlde aboue the Horizon, so much is the distance of the Zenith from the Equinoctiall. For the Zenith by all his partes, is distant from the Horizon by 90. degrees. And all other impedimentes excluded, we maye euer see halfe the heauen. And in as muche as anye shall passe from the Equinoctiall towarde the North or from the South, so muche falleth his Horizon vnder or beneath the pole towarde the course he intendeth, and likewise as muche shall it bee rayled aboue the contrary pole, as shall appeare by a demonstration in the ende of this Chapiture. This horizon diuideth the Meridian in two partes. That is to say: into East & West. The East is that part of heauen where the starres which the earth hydeth from vs, beginne to aryse to vs and appeare to our sight. For those which we saw not before, seme as it were to be newly bozne vnto vs. The West is where the starres come not to our sight, beinge hyd and couered from vs vnder the horizon. It is not fro my purpose to declare howe the East is in two maners, as the one true & the other not true. The true East is the point where the sunne ryseth, the Equinoctiall beyng in the Horizon: Lyke wyse is the West in two maners, one true and the other not. The true West is the part where the sunne falleth or goeth downe at the time of the Equinoctial. The vnttrue East is variable accoꝝdyng as the sunne ryseth dayly in dyuers pointes of the Horizon. And so consequently is iudged of the West or Occident.

Distance of
the Zenith
from the
Equinoctial

Howe the Ho-
rizon diuis-
eth the Me-
ridian.

The true &
vnttrue east
and west.



The .xv. Chapter of the foure lesse Circles.

The lesse
circles.

Having intreated of the. vi. hyggeste Circles, it
remayneth to speake of the foure lesse Circles.
A lesse Circle (as we haue sayde before) is that
whose superficiall deuydeth the Sphere into vnequall
partes

equall partes, not passing by the centre thereof. And of these, two are named Tropicke, so named of Tropo, the Greke woꝛde which signifieth conversion: because the Sunne commynge to any of these Tropicke, is converted, and turneth towarde the Equinoctiall. These Tropicke are descrybed by the motion of the fyrst moueable with the points of the Solstitials. The one with the begynnynge of Cancer, and this is called the Tropicke of Cancer oꝛ Estiuall oꝛ Sommer Tropicke. The other is descrybed with the begynnynge of Capricorne, and is called the Tropicke of Capricorne, oꝛ Hiemall oꝛ Wynter Tropicke. These two Tropicke and the Polare circles (wherof I wyll saye moze hereafter) are called Paraleles: so named soꝛ that they are equally deuyded by theyꝝ circumferences one from an other, and aswell fro the Equinoctiall. The Polar circles are descrybed in this maner: so that as the Zodiack declineth from the Equinoctiall, so do the poles of the zodiack decline from the poles of the woꝛlde. And as the eyght sphere is moued at the motion of the fyrst moueable, so shall the Zodiack moue, which is part of this sphere. And the Zodiack beyng moued, his poles shall lyke wyse moue about the poles of the woꝛlde. And as the poles of the Zodiack are distant from the poles of the woꝛlde. xxiij. degrees and a halfe (whiche is as much as the greatest declination) they shall descrybe certeyne circles deuyded from the poles of the woꝛlde, in the selfe same. xxiij. degrees and a halfe. These Polare circles take theyꝝ name oꝛ domination of that pole of the woꝛlde that is moſte nere vnto them: And therfoze is the one called Artyke, and the other Antartyke.

Tropicke

Paraleles

The Polare circles

The poles of the 8 spheres and of the woꝛlde

The greatest declination of the sunne

Pole Artyke and Antartyke

The .xvi. Chapter of the ſeue Zones.

The

The sphere
deuyded in
to .v. zones



gones habys-
table and
vnhabitable

The diuision
of the earth
accorpyng
to the fyue
zones of hea-
uen

An errorre of
Ptolome &
the Astrono-
mers

The auncient Astronomers deu-
yded the sphere into. v. Zones. The fyrste
from the pole Artyke to the circle Ar-
tyke. The seconde from the circle Ar-
tyke to the Tropyke of Cancer. The
thyrde from the Tropyke of Cancer
to the Tropyke of Capricorne. The
fourth from the Tropyke of Capri-
corne to the circle Antartyke. The fyfth from the circle
Antartyke to the pole Antartyke. Of these. v. Zones
they had certayne knowledge that the two of the poles
were vnhabitable for extreme colde: and also that the
burnt zone called Torrida zona whereby the Sunne pas-
seth by the myddest of them, shoulde be vnhabitable for
extreme heate. That from the Tropyke of Capricorne
vnto the circle Antartyke, they called deserte, because
they knewe not that it was inhabited. And this our
Zone, that is, from the Tropyke of Cancer to the cir-
cle Artyke, they called inhabited or habitable. And to
haue moze perfecte knowledge hereof: It is to imagine
that the earth is deuided proportionally into. v. regions
or portions, which aunswere directly to the sayde fyue
Zones, as saith the Poete Ouide in this verse.
Totidemq3 plag3, tellure pr3muntur. That is. And so
many regions are on the earth beneath.
Euery of these regions or portions of the earth, is situ-
ate vnder one of the. v. Zones aforesayde. But wheras
certain men of auaritie haue moued the question, whe-
ther the earth vnder the Zone fr3m the Tropyke of Can-
cer to the circle Antartyke, is desert or no: Ptolome &
the Astronomers affirme that it is vnpeopled. But Ari-
stotle, Ouide in the seconde of his Metamorphoses, Pli-
nie also, and Ihon de Sacro bosco affirme the contrarie:
As for the moze certentie therof, we knowe by therperi-
ence of suche as go and come daylye from those partes.
Mozconer then this, we know that that land is not on-
ly well replenished with people of good co2pozature, &
of whyte colour, but y same to be also very ryche in gold.
For they that sayle to the East Indies, touch in y cape of
Buena

Buena speranza or Caput bonæ Spei, which is in this zone. Likewyse the lande of Brasile, and the confines of Rio de la Plata, with al the coaste vnto the straighes of Magalianses, euen vnto the. liiij. degrees of the South parte. This land was discovered by Magalianses, in þ yeaere. 1520 or. 1521. Wherby that is nowe well knowen by sight, wherof Ptolomie had no knowledge by hearesaye. The burnt zone (cauled Torrida zona) they also discribed to be vnhabitable by reason of the great heate therof, as Aristotel, Pline, and in maner all other ancient autours as firme: wherof the Poet Virgil writeth thus.

The land of Brasile.

The straighes of Magalianses.

Quinque tenent Coelum zonæ: quarum vna corrusco
Semper sole rubens: et torrida semper ab igne.
Whiche in the englishe tonge, is thus muche to saye in effect.

In zones fīue the heauens contained be,
Wherof the one with burning sunne is red,
Scorching so the earth subject to his degree,
That for the heate therof it is vnhabited.
Likewyse Ouide in his Metamorphoseos, toucheth the same, saying.

Quarum quæ media est, & torrida semper ab igne. &c.
Yet that the burnt zone is inhabited and well replenished with people that liue there, we knowe so certainly by the number of them that daily passe to and fro the Indies of your maiestie discovered in your most happy daies that to say any thing to the contrary it should bee a manifest errour. And therefore is it greatly to bee marueyled, that certayne wyse menne haue asseymed these partes to be vnhabitable: where as neuerthelesse they had knowledge of Arabia Fœlix, Aethiopia, Taprobana, and diuers other Regions situate vnder the burnt zone. Plinie writeth that a shippe came from the Sea of Persia by the Ocean rounde about Ethiope, and came to the pillars of Hercules: whiche is nowe the citie of Cadiz, where at this present I wyte this brieft treatyse. They of Guinea, Calicut, Gatigara, and Malaca, liue all vnder the burnt zone: and many of the liue very long. And that, that part is inhabited, S. Isidore saith that Paradise

The west Indies.

People of long life vnder the zone.

terrestriall is a place situate in the East, very neare vnto the circle of the Moone: moste temperate, and full of al pleasure and delite. And doubtlesse many thinges ought to perswade vs, that vnder the burnt zone, the earth is furnished with al thynges pertyning to the life of mā. First for that in that region or portion of the earth, is in maner continuall equinoctiall: and the coldnesse of the nyght doth sufficiently temper the heate of the daie. Secondly, bycause Saturne, Mercury, and the Moone, whiche are colde and moyst Planetes, are of great force in regions vnder that Zone & passe directly ouer them. Againe, they y inhabite vnder that zone haue two sommers & two wynters in the yeaere. Wherby is concluded that y aunciet autours erred, not only in affirmyng this zone to be vnhabitable by reason of y great heate thereof, but in lyke maner erred in affirming the zone that is betwene the circle Articke & the pole Articke, to be also vnhabited by reason of great colde. The contrarie wherof we may well affirme, knowyng as we knowe, that Islande, with parte of Gothlande, Norwaye, Russia, and diuers other landes are inhabited and well peopled.

Colde and moyst planetes, temper the heate of the burnt zone.

Colde regions habitable.

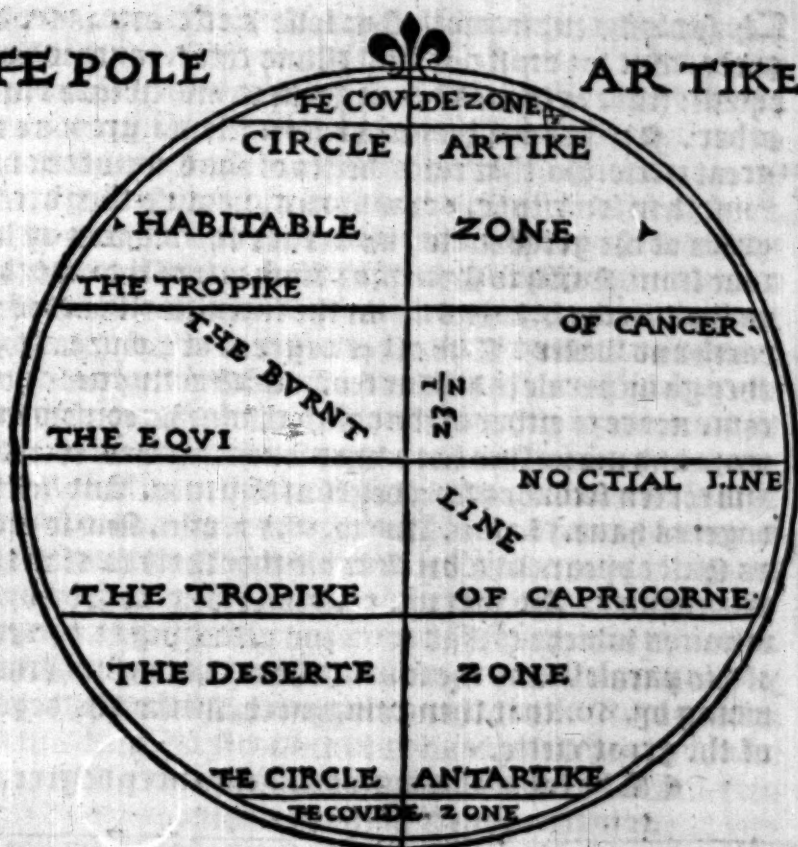
Islande.
Gothlande.
Norwaye.
Russia.

This is the figure and demonstration whiche foloweth.

The

TE POLE

AR TIKE



THE POLE

ANTARTIKE

The.xvii. Chapter of longitude and latitude: and of the propoztion whiche the lesse circles have to the great Circle.

The Sphere is devided in Latitude by degrees in this maner: So that from the Equinoctiall to either of the poles, is. 90. degrees. And in longitude by the Equinoctiall, it is devided into thze hundzeth and thzee scoze, as is sayde in the division of the Zodiack. And from these degrees, passe certain great circles (called Meridians) to the poles of the world.

C. ii.

These

The division
of the sphere
by longitude
and latitude.

These diuide every paralell or lesse circle into. 360. degrees. But we must not vnderstand these degrees to be equall: (that is to meane) as great in one circle as in another. Neither are they in a lesse circle as great as in a great circle. So that every degree of the Equinoctiall, containeth in longitude. 60. minutes, because they are degrees of the great circle, as are all the degrees of latitude from North to South, or from one pole to another, as well in the heauens as on the superficial part of the earth and water. The other degrees of Longitude, as they go by paralels distant from the Equinoctiall, and come neare to either of the poles, diminish consequently more and more: And haue vnto seven degrees. 59. minutes and certen secondes for a degree of longitude. And vnto. 12 degrees haue. 58. min. And to. 16. 57. min. And so furth, as shall appeare in a briefe table that shall folowe after this chapter. So that multiplying every degree by the minutes whiche it shall containe according to the circle of his paralell: and the sum of them that yse therof diuiding by. 60. that then remaineth, shalbe the degrees of the great circle.

1	59	59	16	57	41	31	51	25	46	41	41	61	29	5	76	14	31
2	59	58	17	57	23	32	50	53	47	40	55	62	28	10	77	13	30
3	59	55	18	57	4	33	50	19	48	40	9	63	27	14	78	12	28
4	59	51	19	56	44	34	49	45	49	39	22	64	26	18	79	11	27
5	59	46	20	56	23	35	49	9	50	38	34	65	25	21	80	10	25
6	59	40	21	56	1	36	48	32	51	37	46	66	24	24	81	9	23
7	59	33	22	55	38	37	47	55	52	36	56	67	23	27	82	8	21
8	59	25	23	55	14	38	47	17	53	36	7	68	22	29	83	7	19
9	59	16	24	54	49	39	46	38	54	35	16	69	21	30	84	6	16
10	59	5	25	54	23	40	45	58	55	34	25	70	20	31	85	5	14
11	58	54	26	53	56	41	45	17	56	33	33	71	19	32	86	4	11
12	58	41	27	53	28	42	44	35	57	32	41	72	18	32	87	3	8
13	58	28	28	52	59	43	43	53	58	31	48	73	17	33	88	2	5
14	58	13	29	52	29	44	43	10	59	30	54	74	16	32	89	1	3
15	57	57	30	51	58	45	42	26	60	30	0	75	15	32	90	0	0

The. xlii. Chapter of the circuite of compasse of the earth and water, according to the opinions of the ancient and later Antours.



I may here appeare to make so: our purpose to declare how the auncient wynters counted the degrees of the earth and water. First the Latines counted by myles. *myles.* The Grekes by furlonges. *furlonges.* The Spaniards and Frenchemen by leagues. *Leagues.* The Egyptians by signes or markes: and the Persians by saguas. But they all agree that foure graines of barley make a synger: foure fingers a hande: foure handes a foote: fyue feete a geometrical pase (so: two simple pases make fyue feete) Also, 125. Geometrical pases, make a furlong. viii. furlonges one myle, whiche is a thousand pases: And thze myles one league. In Germanie they make leagues of moze feete: and in some places moze then in other. In Fraunce they count. xv. leagues to one degree. The Spanyardes counte. xvi. leagues and two terces: and. xvii. and a half so: a degree of the great circle. This difference that one league is bigger then another, may come hereof, that one barley coine is bigger then another. But to our purpose, let vs gyue to euery league, thze thousand pases, and to euery pase fyue foote, and so shall euery league haue fyue thousand foote. In the cardes of the sea that haue their degrees of. xvi. leagues and two terces, we say that of these, the roundnes of the lande and the water containeth sixe thousand leagues. And in the cardes that haue. xvii. leagues & a halfe so: a degree, of these we say that it containeth sixe thousand and thze hundzeth leagues. And who so desireth to knowe how much is the Diameter of the earth and water, may knowe it by multipling the circumference by seven: So that diuiding the summe that riseth therof by twenty and two, the parte that riseth of that calculatio, shalbe the Diameter: and the halfe therof shalbe the semidiameter.

Scayn
Synger.
Foote.
Pase.

The begyn
of the Sea
cardes.

The Diam
ter of the
earth & wa
ter.

The. xix. Chapter of the seuen Climates.

Division of
the earth and
water by cly
mates.



Diversity
of things
in diuers cli
mates.

What is a
climate.

Difference
of dayes.

The space of
the seuen cli
mates.

The quanti
tie of the les
circles.

The annient autours diuided the su-
perficiall of the earth and water from
the Equinoctiall towarde the part of
the North, into seuen climates, with
eyght lynes equally diuided from the
Equinoctiall. In these climates are
dyuers condicions and customes of
men, and dyuersities of beastes and
other naturall thynges. And for y^e the parte of the world
whiche they counted habitable, is comprehended vnder
the. 180. degrees of longitude: and. 37. degrees and. 45.
minutes of latitude, we force not to assigne the climates
in this maner: but compassyng about the whole vniuer-
sall lande and sea, diuiding the paralelle circles. A clime
or climat, is a space of lande in the whiche the greatest
daye maketh difference of halfe an houre. So that in se-
uen climates, shalbe the difference of thzee houres and a
halfe. The greatest daye is from the begynnyng of the
first climate. xii. houres and. 45. minutes. And in the
ende of the seuenth climate, the greatest daye shalbe of.
xvi. houres and syue minutes. These climates do not be-
gynne in the Equinoctiall. But the begynning of the
first climate, is distant from it. xii. degrees and. 45. mi-
nutes: And the ende of the seuenth climate, is distante.
50. degrees and. xxx. minutes. So that the space whiche
the seue climates do occupie, shalbe. 37. degrees and. 45.
minutes. In lyke maner is to bee vnderstoode, that
the longitude of the first climate, is greater then the lo-
gitude of the seconde: and that of the seconde then that
of the thirde: and so of the reste. For the lesse circles in
howe muche they are nearer to the Equinoctiall, in so
muche are they greater. And in howe muche nearer to
the pole, so much shal they be the lesse, bicause the sphere
is narrower and narrower towarde the pole, and conti-
nually wareth straighter at the concourse of the Peri-
dians.

dians. In lyke maner shall you vnderstande, that greater is the breadth of the fyrst climate then of the seconde: and the seconde then the thyrde, and lyke wyse of the other. For in howe muche the more from the Equinoctiall you come neare to the pole, so muche the more is the sphere oblique or crooked, and consequently the daye encreaseth more. By reason wherof, in lesse space is found thyncrease of halfe an houre, in whiche the climate maketh difference and doth varie. Whiche thyng shall be more manifest to hym that beholdeth the latitude of the all, as may appeare by the Table here following: In whiche you may se the houres whiche the greatest days conteyneth of every climate in his begynning, myddest, and ende: with also the eleuations of the pole, or distaunce from the Equinoctiall: and also the degrees of latitude whiche every climate conteyneth.

The latitude
of climates.

Climates.	Beginning			Widdest			Ende			Beginning			Widdest			Ende			Latitude.		
	Ho.	Q.	Ho.	Q.	Ho.	Q.	Ho.	Q.	Ho.	Q.	Ho.	Q.	Ho.	Q.	Ho.	Q.	Ho.	Q.	Ho.	Q.	Ho.
First.	12	45	13	0	13	15	12	45	10	40	20	30	7	45							
Seconde.	13	15	13	30	13	45	20	30	24	15	27	30	7	10							
Thirde.	13	45	14	0	14	15	27	30	30	45	33	40	6	10							
Fourth.	14	15	14	30	14	45	33	40	36	24	39	40	5	20							
Fifth.	14	45	15	0	15	15	39	40	41	20	43	30	4	30							
Sixth.	15	15	15	30	15	45	43	30	45	40	47	15	3	45							
Seuenth.	15	45	16	0	16	15	47	15	48	40	50	30	3	15							

The first climat, is called Diameroes. Meroe is a citie of Aphyrike vnder the burnt Zone on this syde the Equinoctiall. xvi. degrees. Diameroes.

The second is called Diasyena. Syena is a citie in the confines of Ethiopie: where there is a well that sheweth the Summer solstitial: because that place is vnder the circle of the Tropike of Cancer, and the Sunne semeth to stande directly ouer that place at midday of the solstitial. Wherby the well is then very cleare, and hath in it no shadowe at all: as the Poet Lucan maketh mention in Farsalia, where he saith.

Diasyena

Vmbras nusquam flectentes.

That is to say: shadowes no where reflecting.

C. llii.

The

**Dia Alex
andros.**

**Dia Rho
dos.**

**Knights of
the Rhodes.**

**The Rhodes
taken by the
Turke.**

**Dia Ro
mes.**

**Dia Bori
sthenes.**

Dia Rifeos

**The ryuer
Tanais.**

Stoflerine.

**The Grek
dian of four
climates.**

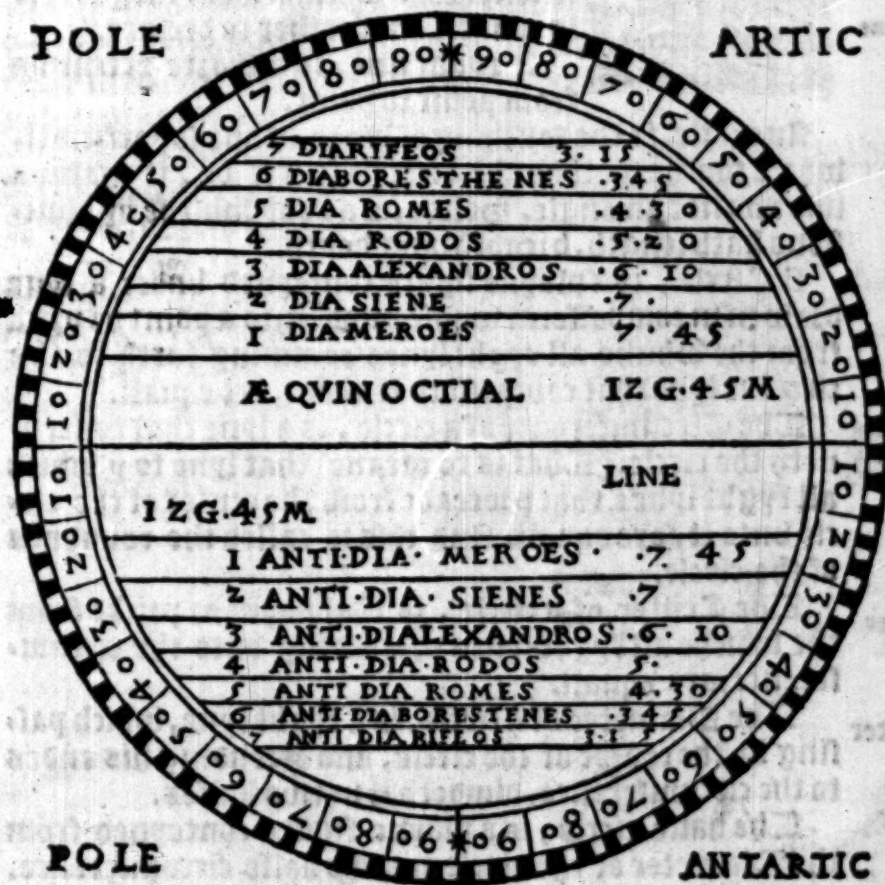
The third is Dia Alexandros. Alexandria is a famous ci-
tie in Aphrike, buylded by great Alexander: and is the
chief citie of Metropolis of Egypt. The fourth is Dia Rho
dos. Rhodes is an Island of Asia the lesse, where were sum
time the knightes of the Rhodes, called the knightes of
the order of S. John, of knightes of Jerusalem. Who
were driven from thence when the Island and citie was
taken by Soltan Suliman the great Turke, in the years
1522: Philippe Vlerio Frenche man, being then graund
maister of the Rhodes. Within this fourth climate, is the
citie of Jerusalem within the holy lande called Palestina
and also a great part of Spayne, with many other pro-
uinces.

The fift is Dia Rome, Rome is the most famous citie
of Italie, and most notozious of all Europe. Sumtyme
the head of the world, dominatrix of nations, and now
the see of the bishop of Rome.

The sirt is Dia Boristhenes. Boristhenes is a great ryuer
of Scythia: the fourth arme of the ryuer Istro. It fauleth
into the sea Euxinum. And where as all other ryuers of
Scythia are troubled, this is cleare and faire. Also hol-
som to be dronke, and full of fysh.

The seuenth and last climat, is called Dia Rifeos. The
mountaines called Rifei, are famous in the parte of Eu-
rope cauled Parmatia: and are continually couered with
snowe. Out of these, springeth the ryuer Tanais, well
known in the world by fame. When it is wyttē with
ph. it is the name of certen mountaines of Archadia. And
here ought we not to be ignorant, that wheras the aun-
cient autours assigned only seven climates, they myght
haue made many more. And for that they iudged the
part of the pole Antartike not to be inhabited, they as-
signed no climates therto. Stoflerine added the eight cli-
mate, counting from thende of the seuenth climate vnto
57. degrees: and other added more. In like maner descri-
bing Meridionall or South climates, we caule them by
the selfe same names as we did the aforesayd Septem-
trionall or North climates: sauing that it is necessary to
put before euery of them this Greke preposition Anti,
whiche

whiche in the Latin tongue signifieth Contra, or Contra-
rium (that is) contrarie or against. So that as we named
the first North climat Dia Meroes, we must to the first of
the south, adde this worde Anti: & so shall the first south
climate be named Anti Diameroes: The seconde Antidia
syenē, and so furth of the other, as is scene in the figure
here folowng.



The. xx. Chapter of certen principles that ought to be knowen for this science.



Drawing of the Sphere, we haue spoken of Circles, Circumferences, Centers, Diameters, Lines, with such other wordes appropriate to this science. The whiche: what they are, it is conuenient further to declare.

A ryght line, is a shorte extention from point to point.

A ryght line

An angle.

An angle, is the touching of lynes in one superficiall, whose touche shall not be direct: so if it be, it shall be a line and not an angle. Solide, is a body whiche by dimensions hath length, breadth, and depth.

Solide.

A Circle.

A Circle, is a playne figure conteyned vnder a lyne drawn in compasse: in whose middelt, is a point or prick from the whiche all ryght lynes comming furth to the circular lyne that compasseth it about, are equall.

The circumference of a Circle.

The Circumference of a circle, is a lyne that conteyneth the circle. (That is to meane) that lyne to which all ryght lynes that proceade from the center of the circle vnto it, are equall. And this is called the roundnes of the circle.

The center of a circle.

The Center of a circle, is that poynt or pricke from the whiche all ryght lynes proceading vnto the circumference, are equall.

Diameter

The Diameter of a circle, is a ryght lyne, which passing by the center of the circle, and extending his endes to the circumference, diuideth it in two halfes.

Semicircle.
Zenith.

The halfe circle, is a playne figure conteyned from the Diameter of the circle and the halfe circumference.

Zenith is a point or pricke imagined in heauen directly ouer the top of any thyng. As if we should imagen a ryght lyne to passe by the center of the earth, extended from thence directly to heauen, and passing through the feete and head of a man standing by ryght, so that the extremities or endes of this lyne should reache vnto the
che the

che the circūference of heauen : then the imagined point
 oꝝ pꝛicke of heauen where the ende of the lyne toucheth,
 is called Zenith, oꝝ poynt of the head, oꝝ verticall point.
 The same is to be vnderſtoode of a citie oꝝ any other thing
 when we ſpeake of ꝑ zenith therof. Eccentricke, is a circle Eccētricke
 which hath his center diſtant oꝝ diuided frō the center
 of the worlde: and is deſcribed in the heauen of the ſunne
 imagining a lyne from the center of the Eccentrike to
 the center of ꝑ Sunne: And is moued one whole reuolu-
 tion at the proper motion of the Sunne. In the other
 heauens, imagining a lyne from the center of his Eccen-
 trike to the center of his Epicicle: & is moued a whole re-
 uolution at the proper motion of the Epicicle.

The Epicicle, is a circle oꝝ litle roundel ſit in the depth Epicicle
 of the Eccentrike: In whiche the Planet ſired and nere
 to his center, is moued circularly.

The Auge, is a poynt in the circumference of the Ec- Auge
 centrike, very neare to the firmament. Oꝝ it may bee
 ſayde, that the Auge is a poynt furtheſt diſtant from the
 earth. Aux in the Greke tongue, is as muche to ſaye as
 the largeſt lōgitude, oꝝ greateſt eleuation frō the earth.

The Opposite of Auge, is an other poynt in the cir- Opposite of
 cumference of the Eccentricke: neareſt vnto the
 earth, and furtheſt diſtaunt from
 the firmament.

Here endeth the firſt part.

THE SECONDE PARTE

intreatyng of the Motions of the Sunne,
and the Moone: And of the effectes
caused thereby.

The first Chapter of the course of the Sunne in the Zodiac: And of the effectes caused by the same.



The sunne
is the guide
in navigation

The moving
of the sunne
vnder the 30:
diack.

Equinoctial.

The summer
Tropike.

Declination
of the sunne.

We haue briefly spoken of
the Sunne and of the other beauiens.
But so; as muche as the Sunne must
be our marke, gyde, and gouernour in
navigation, whereof we intende to
gyue perfect instructions, it shalbe ne-
cessary especially and pzeisely to de-
clare the course and motions therof. Therfoze (as we
haue sayd) the Sunne is moued vnder the Zodiac, and
vpon his poles by the line Eclipse, passing by the. xii.
signes, beginning in the first degree of Aries, where he
maketh the Equinoctial, when the dayes and nyghtes ar
equall to all. And passeth by this signe to vs that are
on the North parte: wherby the length of the dayes are
encreased with vs, and the length of the nyght are sho-
tened. Then entreth he into Taurus. And passing by it,
entreth into Gemini. Then passing by it and enterpyng
into the first degree of Cancer, he toucheth in the Summer
or estiuall Tropike: and then are the dayes longest with
vs, and the nyghtes shortest. Then declineth he no fur-
ther from the Equinoctial: but returnyng towarde it,
passeth by this signe, shorTENyng the dayes to vs & leng-
thenyng the nyghtes. From this signe of Cancer, it en-
tereth into Leo: and passeth by it into Virgo. And by it
entereth into the first degree of Libra in the Equinoctial:
and there maketh the other Equinoctial, when to all,
the nyght is equall with the daye. And passing by this
signe, goeth declining from the Equinoctiall towarde
the

the pole antartike: increasynge the nyghtes to vs & shortenyng the dayes: and so entreteth into Scorpio: and from thence into Sagittarius. And passynge by it, entreteth into the fyrst degree of Capricorne to the Hyemal or wynter tropicke. And then are the longest nyghtes vnto vs, and the shortest dayes. From hence he retourneth towarde the Equinoctiall, shortenyng vnto vs the nyghtes and lengthenyng the dayes. He passeth by this signe of Capricorne and entreteth into Aquarius. And passing by it, entreteth into Pisces. And passing from thence, retourneth to his fyrst poynt of the equinoctial of Aries where he began. Hereby it soloweth, that as the Sunne goeth the half of the zodiack on this part of the equinoctiall, & the other halfe on the other parte of it, & in these halfes hath diuers declinations, is caused the increasynge or decreasynge of the dayes and nyghtes to one moze and to an other lesse, accoꝝdyng as euery one with his Horizon discovereth of hys course of the Sunne by hys litle or much that he is departed or distaunt from the equinoctiall, or as the pole is raysed aboue his Horizon. So that, when as to them that are on this parte of the equinoctiall, is the longest daye and the shortest nyght: euen so to them on the other part, is the longest nyght and shortest day. And contrariwise, when vnto vs is the shortest day, vnto them is the longest. Whiche shall further appeare by euident demonstration in the last chapter of the thyrde parte.

The wynter tropicke.

The cause of increasing & decreasinge of the dayes and nyghtes

The discrete reader shall here note that the Sunne is moued regularly in the center of his sphere: whose center is without the center of the worlde towarde the part of Cancer. Wherby the sunne passing in his Septentrionall sygnes, is moze distant from the earth: and hath moze to go then in the south signes. And for this cause it tarieth nyne dayes moze on the part of the Auge then on his opposite. And hereby it soloweth that by reason of the obliquitie or crookednesse of the zodiack, certen dayes of wynter with their nyghtes, are longer then certayne other of somer with their nyghtes.

The mouing of the sunne in the center of his sphere

The

The. ii. Chapter of the true place of the Sunne in the Zodiack.

To finde the
true place of
the sunne,



The equatis
of the yeare,

The true place of the Sunne, is a point or prick in the Zodiack, which is thus founde: That drawyng a ryght lyne from the center of the worlde to the center of the Sunne, and carryng the same continually ryght furth vnto the Zodiack where this line sheweth or toucheth, that is the true place of the Sunne. This place is founde in thre maners. One waye by a table. An other waye by an instrument: And the thyrde waye by a certaine rule to be bozne in memorie. To fynde the true place of the sunne by a table, seke in the table folowynge, the moneth that you are in, in the fronte or head of the table: And the dayes of the moneth, on the left syde of the table. Then directly against the dayes, vnder the title of the monethes, you shall fynde two numbers which are the degrees and minutes of the signe whiche you shall fynd fynde-named ouer the head or above the sayde numbers. Then to the degrees and minutes whiche you shall fynde, you shall adde the equation that is directly of the yeare in the whiche you are, or seeke to knowe. And this shall you seeke in the table of equations whiche is after this. And that whiche doth amount or arise therof, shall be the true place of the sunne. And here is to be noted, that in the comō yeares, (whiche are they that haue not the bisertile or leape yeares,) fro the ende of Februarie vntill the ende of the yeare (I saye of December), shall euer one degree be diminished or taken away. And the degrees and minutes that shall remaine, is the true place of the sunne. Howe to knowe this by an instrument and by me, moze, shall be sayde in the seuenth Chapter.

The Table of the true place

Mo- neths.	January		February		Marche.		Aprill.		Maye.		June.	
Sig- nes.	Capric.		Aquarius		Pisces.		Aries.		Taurus.		Gemini.	
Dies	☾	☿	☾	☿	☾	☿	☾	☿	☾	☿	☾	☿
1	20	22	21	53	20	55	21	24	20	21	19	55
2	21	24	22	54	21	55	22	22	21	18	20	52
3	22	25	23	54	22	54	23	21	22	16	21	49
4	23	26	24	55	23	54	24	19	23	13	22	46
5	24	27	25	55	24	53	25	17	24	11	23	43
6	25	28	26	56	25	53	26	16	25	8	24	40
7	26	30	27	56	26	52	27	14	26	6	25	37
8	27	31	28	56	27	52	28	12	27	3	26	34
9	28	32	29	57	28	51	29	10	28	0	27	31
10	29	33	0	57	29	50	0	♈ 8	28	58	28	28
11	0	35	1	57	0	♋ 49	1	6	29	55	29	25
12	1	36	2	58	1	48	2	4	0	♊ 52	0	♊ 22
13	2	37	3	58	2	47	3	2	1	50	1	19
14	3	38	4	58	3	46	4	0	2	47	2	16
15	4	39	5	58	4	45	4	58	3	44	3	13
16	5	40	6	58	5	44	5	56	4	41	4	10
17	6	41	7	58	6	43	6	54	5	38	5	7
18	7	42	8	58	7	42	7	52	6	36	6	4
19	8	43	9	58	8	41	8	49	7	33	7	1
20	9	44	10	58	9	39	9	47	8	30	7	58
21	10	45	11	58	10	38	10	45	9	27	8	55
22	11	46	12	58	11	37	11	43	10	24	9	52
23	12	47	13	57	12	36	12	40	11	21	10	49
24	13	48	14	57	13	34	13	38	12	18	11	46
25	14	48	15	57	14	33	14	36	13	15	12	43
26	15	49	16	56	15	32	15	33	14	12	13	40
27	16	50	17	56	16	30	16	31	15	10	14	37
28	17	51	18	56	17	29	17	28	16	7	15	34
29	18	51	19	56	18	28	18	26	17	4	16	31
30	19	52			19	27	19	23	18	1	17	29
31	20	52			20	25			18	58		

Of the Sunne.

No. meths. Sig- nes.	June.		August.		September.		October.		November.		December.	
	Cancer.		Leo.		Virgo.		Libra.		Scorpio.		Sagitta.	
Dais	☿	♊	☿	♊	☿	♊	☿	♊	☿	♊	☿	♊
1	18	26	18	2	18	4	17	39	18	49	19	24
2	19	23	19	0	19	2	18	39	19	50	20	26
3	20	20	19	58	20	1	19	38	20	51	21	27
4	21	17	20	55	21	0	20	38	21	52	22	29
5	22	14	21	53	21	58	21	38	22	53	23	30
6	23	11	22	51	22	57	22	38	23	54	24	31
7	24	8	23	48	23	56	23	38	24	55	25	33
8	25	5	24	46	24	55	24	38	25	56	26	34
9	26	2	25	44	25	54	25	39	26	57	27	36
10	27	0	26	42	26	53	26	39	27	58	28	37
11	27	57	27	40	27	52	27	39	28	59	29	39
12	28	54	28	38	28	51	28	39	0	0	0	40
13	29	51	29	36	29	50	29	39	1	1	1	42
14	0	48	0	34	0	49	0	39	2	3	2	43
15	1	46	1	32	1	48	1	40	3	4	3	45
16	2	43	2	30	2	47	2	40	4	5	4	46
17	3	40	3	28	3	46	3	40	5	6	5	48
18	4	38	4	26	4	45	4	41	6	8	6	49
19	5	35	5	24	5	45	5	41	7	9	7	51
20	6	32	6	22	6	44	6	42	8	10	8	52
21	7	30	7	21	7	44	7	42	9	11	9	54
22	8	27	8	19	8	43	8	43	10	13	10	55
23	9	25	9	17	9	42	9	43	11	14	11	57
24	10	22	10	16	10	42	10	44	12	15	12	58
25	11	20	11	14	11	41	11	45	13	16	13	59
26	12	17	12	13	12	41	12	45	14	18	15	1
27	13	15	13	11	13	41	13	46	15	19	16	2
28	14	12	14	10	14	40	14	47	16	20	17	3
29	15	10	15	8	15	40	15	47	17	22	18	5
30	16	07	16	7	16	39	16	48	18	23	19	6
31	17	5	17	5			17	49			20	7

The Table of the Equations of the Sunne.

The peres of our lozd		The equatio to be added		The peres		The E quation		The peres of our lozd		The equatio to be added	
6	9	6	9	6	9	6	9	6	9	6	9
1545	1	0	1581	1	16	1617	1	32	1653	1	48
1546		45	1582	1	1	1618	1	17	1654	1	33
1547		30	1583		46	1619	1	2	1655	1	18
1548		15	1584		32	1620		47	1656	1	3
1549	1	2	1585	1	18	1621	1	33	1657	1	49
1550		47	1586	1	3	1622	1	18	1658	1	34
1551		32	1587		48	1623	1	3	1659	1	19
1552		18	1588		33	1624		49	1660	1	4
1553	1	4	1589	1	19	1625	1	35	1661	1	51
1554		49	1590	1	4	1626	1	20	1662	1	36
1555		34	1591		49	1627	1	5	1663	1	21
1556		19	1592		35	1628		51	1664	1	7
1557	1	05	1593	1	21	1629	1	37	1665	1	53
1558		50	1594	1	6	1630	1	22	1666	1	38
1559		35	1595		51	1631	1	7	1667	1	23
1560		21	1596		37	1632		53	1668	1	9
1561	1	7	1597	1	23	1633	1	38	1669	1	55
1562		52	1598	1	8	1634	1	23	1670	1	40
1563		37	1599		53	1635	1	8	1671	1	25
1564		23	1600		39	1636		54	1672	1	10
1565	1	9	1601	1	25	1637	1	40	1673	1	56
1566		54	1602	1	10	1638	1	25	1674	1	41
1567		39	1603		55	1639	1	10	1675	1	26
1568		25	1604		40	1640		56	1676	1	12
1569	1	11	1605	1	26	1641	1	42	1677	1	58
1570		56	1606	1	11	1642	1	27	1678	1	43
1571		41	1607		56	1643	1	12	1679	1	28
1572		26	1608		42	1644		58	1680	1	13
1573	1	12	1609	1	28	1645	1	44	1681	2	0
1574		57	1610	1	13	1646	1	29	1682	1	45
1575		42	1611		58	1647	1	14	1683	1	30
1576		28	1612		44	1648	1	30	1684	1	15
1577	1	14	1613	1	30	1649	1	46	1685	2	2
1578		59	1614	1	15	1650	1	31	1686	1	47
1579		44	1615	1	10	1651	1	16	1687	1	32
1580		29	1616		45	1652	1	2	1688	1	18

This Table of the Equation of the Sunne, serueth from the yeare of. 1545. where it hath his roote o; beginning, vntyl. 1680. And in the yeare of. 1681. it shall returne to the roote, adding therunto one degree more. As for example. In the yeare of. 1681. adde one degree vpon the other degree that the roote hath, and so shall the yeare of. 1681. haue two degrees of equation. And the yeare of. 1682. shall haue one degree and. 45. minutes: which is to adde one degree vpon. 45. minutes that had the yere of. 1546. &c. And hauyng passed other. 136. yeaeres, you shall returne to the roote, addyng two degrees.

The thyrde Chapter of the Declination of the Sunne.

What is the
Declination
of the Sunne



The declination of the Sunne, is the arcke of the greater circle, which passeth by the Poles of the world, included betwene the Equinoctiall and the Zodiac. And here is to be noted, that whatsoeuer foure poyntes o; pzyckes shall be equally distant fro the Equinoctials, haue equall declinations.

Wherof it foloweth, that the foure quarters of the Zodiacke haue equall declinations. And to auoyde ppolitic, I wyll adde hereunto a table of the declinations of onely one quarter of the Zodiac: so that all hauyng one self same maner of declinations, it may serue for al, and the order of it is this. The signes whose declination increaseth, are in the head o; fronte of the Table, and the degrees of these signes descende by the left syde therof. And the signes whose declination decreaseth, are in the foote of the Table, and the degrees of these signes, ryse by the ryght syde of the same. The disposition of the Table being vnderstode: then to knowe what declination the Sunne hath in euerye degree of the Zodiac, you ought to knowe the true place of the Sunne (as in the Chapter past is declared) for the day of the declination whiche you desyre to knowe. And the signe whiche

Sig: neg.	♊	♋	♌	♍	♎	♏	♐	Sig: neg.
	♋	♋	♌	♌	♍	♍	♎	
0	0		11	30	20	12	30	
1	0	24	11	51	20	25	29	
2	0	48	12	12	20	37	28	
3	1	12	12	33	20	49	27	
4	1	36	12	53	21	0	26	
5	2	0	13	13	21	11	25	
6	2	23	13	33	21	22	24	
7	2	47	13	53	21	32	23	
8	3	11	14	13	21	42	22	
9	3	35	14	32	21	51	21	
10	3	58	14	51	22	0	20	
11	4	22	15	10	22	9	19	
12	4	45	15	28	22	17	18	
13	5	9	15	47	22	25	17	
14	5	32	16	5	22	32	16	
15	5	55	16	23	22	39	15	
16	6	19	16	40	22	46	14	
17	6	42	16	57	22	52	13	
18	7	5	17	14	22	57	12	
19	7	28	17	31	23	3	11	
20	7	50	17	47	23	8	10	
21	8	13	18	3	23	12	9	
22	8	35	18	19	23	15	8	
23	8	58	18	34	23	19	7	
24	9	20	18	49	23	22	6	
25	9	42	19	4	23	24	5	
26	10	4	19	18	23	26	4	
27	10	26	19	32	23	28	3	
28	10	47	19	46	23	29	2	
29	11	9	19	59	23	30	1	
30	11	32	20	12	23	30	0	
Sig: neg.	♋	♋	♌	♌	♍	♍	♎	Sig: neg.

whiche the Sunne shall be founde in that day, shall you seke in the front or foote of the table. And yf it be in the front, you shal seke the number of the degrees on the left syde. And if it shal bee at the foote of the table, you shall seke it on the right syde. Then aboue or vnder the signe in the front of that degree of the sayde signe, you shal find two nũbers: wher of the fyrst is of degrees, and the seconde of minutes: and those degrees & minutes of declinatyon hathe the Sunne that daye. And this is vnder, stode without ha-uyng respect to the od minutes aboue the degree, whiche the true place of the Sunne hath.

And yf you desire to verifie this more p̄cyp̄selye, note the declinati-on of that degree, & of the degree fo-lowyng:

lowynge: and take the lesse from the moze. Then of the reste take suche parte as are the minutes that it hadde of. 60. And this parte of minutes muste be added to the fyrst equation of it, and be lesse then the seconde, or must be taken from it, if it shalbe greater: and that then ryseth therof, shalbe the pzeypse declination for that signe, degree and minute. As for example.

In the yere. 1546. the tenth daye of September, the Sunne shalbe in. 26. \odot . 38. P . of Virgo: and to the. 26. \odot . pzeypse, shalbe corresponde. 1. \odot . 36. P . of declination. And to verifyshe the declination that commeth to. 38. minutes, which is moze of the. 26. \odot . you muste marke the difference that is fro the declination of 26. \odot . (which is one \odot . 36. P .) to the declination of. 27. \odot . which is 1. \odot . 12. P . The difference is. 24. P . Of these you must take such part as is. 38. of. 60. which are almoste twoo terces. When two terces of. 24. are. 16. which muste be taken of one. \odot . 36. P . which corresponde to the. 26. \odot . of Virgo: because the declinations go decreasyng, and remayneth. 1. \odot . 20. P . And if the declinations increase, you must adde thereto, as you take away when they decrease.

¶ An other example for this yere of. 1561.

Example for the yere. 1561. the. xx. of Apryl
I find the true place of the Sunne at none in. 9. degrees 54. minutes of Taurus: When in the Table of signes present I seke for the ninth degree of Taurus, to which both aunswere for the declination. 14. degrees. 32. minutes: and to the next degree folowing, both aunswere. 14. degrees. 51. minutes. Then take the lesser out of the moze: so resteth. 19. minutes. Then frame a rule of. 3. & say: yf. 60. minutes geue. 54. minutes (which. 54. minutes both rest befoze of the. 9. degree of Taurus) howe many both. 19. minutes geue: which. 19. minutes are the diuersitie of the ninth and tenth degrees of Taurus. So I find that. 19. minutes, geueth. 17. minutes & 6. secundes which. 17. mi. & 6. secundes, I adde to the. 14. degrees. 32. minutes which answereth to the. 9. degrees of Taurus:
And

And that commeth to. 14. degrees. 49. minutes, and. 6. seconds, which is the true declination for the. 20. daye of Apryll. Anno. 1561.

It is also to be noted that I adde these. 17. minutes and 6. seconds, because the declination doth encrease: for if it decreased, it were to be taken out so much, and the rest is the declination. So is the declination for the. 20. of Apryll in the yeare. 1561. 14. degrees. 49. minutes, and. 6. seconds.

The. iiii. Chapter of the entraunce

of the Sunne into the. xii. signes. And of the

Equinoctials and Solstitials which

deuyde the foure tymes of

the yeare.



That is sayde in the Chapter before, it sheweth that the Sunne enterynge into the foure principall signes, causeth the foure tymes of the yeare. For entering into Aries, it chaungeth the tyme to be from wynter to the springe tyme. And entering

into Cancer, it chaungeth the time from spring to Sommer: And enterynge into Libra, from Sommer to Autumne. And lykewyse enterynge into Capricorne, it chaungeth from Autumne to Wynter. So that when to be that be on the part of the North is Sommer, then is it Wynter to them that are on the South part. And contrary wyse, being Sommer to them on the South, it is wynter to them on the North. The entraunce of the Sunne into these signes, and all other of the Zodiac, hath not ben ever at one selfe same tyme of the yeare. The cause of this is, that the Latine yeare is not equall with the movynge of the Sunne in the Zodiac: as shalbe sayde in the. v. Chapter, where we wyll entreate of the yeare. In the tyme that Christe our redeemer was borne, were the Equinoctialles. The one at the. viii. of the kalendes of Apryll, and the other at the. v. of the ka-

The entraunce
of the Sunne
into the foure
principall
signes.

The latine
yeare.

The Equi-
noctials in
the yeare of
Christes
birth.

The Solsti-
tials.

Four nota-
ble thynges

To knowe
more precise-
ly the enter-
counce of the
sunne into
the foure
principall
signes.

kalendes of October: So that they had the Equinoctial of the spryng, at the.rrv. of March: and the Equinoctiall of Autumne, at the.rrvii. of September, as wyrteth John Baptist Capuano vpon the seconde Chapter of the sphere of Iohan. de sacro bolco. They iudged then the Solsticials: as that of the Sommer, at the eyght day of the kalendes of July, whiche is the.rriii. of June.

The other of the wynter, they iudged at the eyght daye of the kalendes of January: whiche is the.rrv. of December. And here wyl I not omit to say howe in those tymes, at these foure dayes (that is to meane, in the two Solsticials and two Equinoctials) were celebrated o; dyd chaunce foure marueylous thynges in the world.

For in the spryng Equinoctiall, which was at the.rrv. of March, the Sonne of God was incarnate: and afterwarde bozne of the Virgin Marye in the Solsticiall of Wynter, which was at the.rrv. of December. In the Equinoctiall of Autumne, which was the.rrvii. of September, was conceaued blessed John Baptist, the cryer and p̄recursour of Christ: and was bozne in the Sommer Solsticiall, that was the.rriii. of June. And this is the first moneth whereof S. Luke speaketh in the Gospell. Which thyng also John Chrysostome doth verifie, saying that S. John was bozne when the days began to decrease: and our Lorde when they began to increase. And it may certaynly seme woo;thy to be had in memozye, that in the sayde Equinoctiall of the spryng, Christ suffered, Adam was created and losse the estate of innocencie, Abell was slayne, Melchisedech offred breade & wyne, Isaac by Abraham was brought to be sacryficed, John Baptist was beheaded at Macherunta, Peter deliuered out of pryson, Saint James beheaded by Herode, The good therse enioyed Paradyse, and the bodies of many saintes rose with Chyrste. And who so further desyret more precisely to knowe the entraunce of the Sunne into Aries, and into the other principall signes, shall in the thyzde parte of this woozke in the.viii. Chapter, fynde rules which shall byng hym to the know-
ledge

ledge therof. But to returne to our tyme, I saye that this present yeare of. 1545. the Sunne entred into the fyrste degree of Aries at the tenth of Marche, at foure of the clocke at after noone. And into the fyrst degree of Taurus the nyynth of Apryll. 20. houres, and seven minutes. And into Gemini the. 11. of Maye, two houres, and sixe minutes. Into Cancer, the. 11. of June. 14. houre. 44. minutes. Into Leo the. 13. of July. 3. houre 50. minutes. Into Virgo the. 13. of August. 9. houre. 56. minutes. Into Libra, the. 13. of September. 4. houre. 4. minutes. Into Scorpio, the. 13. of October. 7. houre 13. minutes. Into Sagittarie, the. 12. of Nouember, iuste at noone. Into Capricorne, the. 11. of December, 8. houre. 16. minutes. Into Aquarius, the. 9. of Ianuarie. 2. houre. 1. minute. Into Pisces, the. 8. of Februarie. 1. houre. 30. minutes after myddaye (that is to saye) from noone. 1. houre. 30. minutes. And that we maye in the yeares to come, knowe the daye, houre, and minute, in the which the sunne entereth into euery signe, we wll folowe this order. Uppon the dayes, houres, and minutes that the sunne entereth into euery signe this sayde yeare. 1545. we must adde for euery yere five houres and. 49. minutes, whiche with the. 365. dayes whiche euery yeare conteyneth, shalbe the tyme in the which the sunne accomplissheth his reuolution. And because that in the yeare of the Bisertile or leape yeare, is added to Februarie one day more to his. 28. whiche he hath ons in foure yere from. 6. to. 6. houres, yf we shall take from the computation that whiche we haue geuen hym, turnynge one daye backward (as shalbe in the yeare. 1548.) and vpon that that remayneth shall returne in the yere folowynge of. 1549. to adde fyue houres. 49. minutes, and as much more euery other yeare folowynge shalbe a certayne rule for euer.

To knowe
when the
sunne entereth
into euery
of the. xii
signes.

Leape yeare

And it is to note, that the degrees and minutes which we haue touched before, are properly for the cite of Cadiz. And yf we desyre to applye them for other Cities or places more Eastwarde: then for euery. 15.

Variation
of houres by
the rapt mo-
uyng of the
Sunne from
East to West

degrees that they are distant from Cadiz in longitude, we muste adde one houre. And yf so; Cities o; places moze Westwarde, in lyke maner so; every. xv. degrees we must take away one houre, by reason of the course of the Sunne by his rapt mouyng from the East to the West. For it is certayne, that when with vs in Cadiz it is. xii. houres of the clocke: To them that are. xv. degrees Eastwarde from vs, it is one of the clocke: and to them that are from vs. xv. degrees towarde the West, it is. xi. of the clocke.

The entree
of the Sunne
into the.iiii.
principall
signes, cau-
seth the
chaunge of
tyme.

Nowe that we haue rules to knowe the enteraunce of the Sunne into the. xii. signes, thereby may we also knowe his enteraunce into the foure Cardinall o; principall signes: whiche are they that determine and ende the Equinoctialles and Solstitialles, whereby are caused the foure tymes of the yere. And so;asmuch as the generall chaunge of tyme, is by reason of the Sunne, who by his comyng neare, warmeth: by his remaynyng, dyeth: with his departure, cooleth: and by his long taryng away, causeth moystnesse, we wyll shewe the qualities of the principall wyndes, elementes, regions, humours, and agies, in one brieft table. And then consequently in an other, wyll we describe the begynnyng, myddest, and ende of the foure tymes of the yere, aswell in the monethes as in the heauenly signes.

The Table of the qualities of the Elementes.

Qualities.	Hot & drye	Hot & moist	Cold & moist	Cold & drye
Partes of y yere	Sommer.	Spynge.	Wynter.	Autumne.
Principal winds	East.	South.	West.	North.
Elementes.	Fire.	Ayre.	Water.	Earth.
Regions.	East.	South.	West.	North.
4. Humours.	Choler.	Bloud.	Fleame.	Melancholy
4. Agies.	Youth.	Man's state.	Aged.	Age.

The

**The Table of the foure tymes of
the yere.**

Tymes.	Begynnyng.	Myddest.	Ende
Springe.	Marche. Aries	Apryll. Taurus	May. Gemini
Summer	June. Cancer	July. Leo	August. Virg.
Autumne	Septemb. Libra	Octob. Scorpio	Novemb. Sagit
Wynter.	Decembre. Capricor.	Januar. Aquar.	Febru. Pisces

The .v. Chapter of the Moone,

and of her motions and properties.

In the Chapters past of this seconde part, we haue entreated of the Sunne and of his motions and effectes, as the moſte noble and principall luminarie. In this present Chapter we wyll intreate of the Moone which is the seconde luminarie, although in the order of the heauens ſhe is the fyrſte, and neareſte vnto vs of all other planettes or ſtarres. The Moone therfoze is a rounde body, of heauenly ſubſtaunce, ſolide and darke in reſpecte of the Sunne, hauyng no proper lyght of her owne, but is apte to receaue lyght. She is moued from the Weſt into the Eaſt according to the order of the ſignes, euery daye. 13. degrees, lyttle moze or leſſe, and ſumwhat moze then. 10. minutes, by the proper motion of the heaue or ſphere vpon the Aris & poles of the Zodiac. I ſaid moze or leſſe, becauſe ſhe ouer and beſyde the mouyng of her deferent or circle which is moued euery day the afozeſaid. 13. degrees & 10. minutes, almoſt 11. ſhe hath an Epicycle where ſhe Moone is tyed. At the motion wherof, ſumtymes ſhe is moued moze ſwiftly, and ſumtymes moze ſlowely. Peruertheleſſe, according to her halfe motion, ſhe maketh her courſe in. 27. dayes and almoſt. 8. houres. And hauyng no light of her owne ſhe is lyghtened of the Sunne, as manifeſtly appeareth hereby, that beyng in coniuſtion with the Sunne, or neare vnto hym, we ſee her not lyghtened: becauſe the lyght whiche ſhe then receaueth, is onely by her vpper moſt or hygher part wherby ſhe directely beholdeth the Sunne

The ſunne
and moone
are the princi-
cipall lumina-
ries.

The Epicy-
cle of the
moone.

The coniu-
ſtion of the
moone with
the ſunne.

The moone
receiueth her
lyght of the
ſunne.

Sunne, forasmuch as he is in the fourth heauen and she in the fyrst. And departyng from the Sunne by her proper mouyng, the Sunne remaineth on the West part. Then towarde that part we begyn to see a lyttle of the part of the Moone lyghtened, and so more and more by little and little as she departeth further from the sunne. And at this tyme she hath her hoznes or corners toward the East, because the Sunne is in the West. Durynge this tyme also, she is sayde to increase, or that she goeth increasyng vnto the opposition which we see by the part of her, which the Sunne directly beholdeth. And so do we see her altogether lyghtened, and call it the full Moone. Then passing from the opposition, she commeth nearer the Sunne by lyttle and lyttle, beyng darkened and hyd from vs, and lyghtened onely by her byghesse part. And this tyme is called the decreasyng or wane of the Moone. Then also hath she her hoznes toward the West, because the Sunne is in the East: and this vntyll she turne agayne in coniunction with the Sunne, & that we see her not lyghtened at all.

The aspects
of the moon
to the sunne.

The increas-
yng and op-
position of
the moone.

The bygge-
ness of the
Moone.

The Moone
is nearest
vnto the
earth.

The Moone is lesse then the starres or other planets, except Mercury, and lesse then the earth. And yf anye shall affirme the contrary, saying that it is wyrtten in the fyrst of Genesis, that God made two great lyghtes: the greateste to geue lyght to the daye, and the lesse to lyghten the nyght (as Dauid also affirmeth:) To this I aunswere, that the Moone being nearest vnto the earth appeareth vnto vs greater then she shuld do, yf she were further distaunt from vs. And although she be great of lyght (receaued as we haue sayde) and bygge of bodye, yet is she not great in respecte of the other starres. And therfore the wordes of the Genesis aforesayde, maye be vnderstode to be spoken in such maner and phrase as holy scripture often useth to humble and applye it selfe to the weakenes of our vnderstandynge, and grossenes of our senses.

**The .vi. Chapter of the coniunctions
and oppositions of the Sunne & the Moone.**

The



The Sunne and the Moone are moued vnder the Zodiac with diuers motions. The Moone with a swifter motion then the Sunne foloweth hym, ouertaketh hym, and goeth befoze hym, vntill she place her selfe in Diameter with hym. And when she hath thus ouertaken hym, so that they are both in one selfe same degree of the Zodiac: then is the coniunction. When departynge from hym, and beyng in equall degrees of the signes opposite accordeynge to the Diameter, is the opposition. To knowe the tymes of these coniunctions and oppositions, is verye profitable & necessary for Marpners. These tymes may be knowen in two maners. One waye by the Ephemerides or Almanackes, or other tables, or Lunary instrumentes. And by these meanes is knowen precisely the day, houre and minute of the coniunction and opposition. It maye lykewyse be knowen by the rules of computaciō, which are the rules that are knowen by memozye, although not precisely as by the bookes aforesayde. And here is to be vnderstode, that from one coniunction to another, accordeynge to the halfe mouynges of the Sunne and the Moone, there passeth. 29. dayes. 12. houres, and. 44. minutes. And consequently from coniunction to opposition, and from opposition to coniunction, the halfe therof, which is. 14. dayes. 18. houres, and. 22. minutes. To knowe these coniunctions by rules of computation, is presupposed to knowe the golden number: and by it, the coꝛcurrent or Epacte.

The golden number, is the number of. 19. yeares. In which tyme, the coniunctions of the Sunne & the Moone make all theyr vareties in the tymes of euer y pere. So that if the coniunction were the. 12. day of Marche in this yeare of. 1545. from this yeare in. 19. yeares folowynge, which shalbe in the yere of. 1564. the coniunction shal retorne to be at the. 12. day of March. It was fyrst called the golden number by the Egyptians, who first found the vse therof & sent it to Rome writte in golde letters. To find this nūber, it is nedeful to know his rates, which is this

The motion
of the moone.

The coniun
ction.

The opposi
tion.

To knowe
the tymes
of oppositi
ons and con
iunctions

To knowe
the golden
number.

The rooten
of the golde
number.

In the yeaere that Chyist our Lorde and redeemer was bozne (wherby we make this accompt) the golden number was the number of one, which was the yeaere of the roote of begynnynge, and the fyrste yeaere of the byrth of Chyist, was two of the golde number. So that ioynynge to the yeaeres of our Lorde one of the roote of beginning and from all take away the.19. then the reste shalbe the golden number. And yf you desyre to make computacion by a nearer roote, take for the roote, the yeaere of. 1500. when. 19. was the golden number: and in the yeaere of 1501. byd begyn one of the golden number, and so consequently euer takynge away the.19.

This present yeaere of. 1545, we haue. 7. of the golden number. And in the yeaere of. 1546. we shal haue. 8. &c.

The concurrent.

The golden number beynge knowen, it is necessary for this computacion of the Moone to knowe the concurrent. The concurrent of euery yeaere, is the number of the dayes passed of the conjunction of the Moone at the begynnynge of Marche. And these grow of the difference of the Solar yeaere to the Lunar: as the Lunar yeaere hath. 354. dayes, and the Solar yeaere. 365: so hauynge euery yeaere. 11. dayes of difference, which are added euery yeaere vntyll they come to the number of. 30. and passynge. 30. those that do passe are of the concurrent.

The Solar
and Lunar
yeares.

To fynde
the number
of the concurrent.

The number of the concurrent of euery yeaere, is founde in this maner.

And the better to beare it in memory, you must imagin three places: and these commonlye are assigned on the thumbe. As the fyrste place at the roote of the thumbe, the seconde in the myddle ioynt therof, and the thyrde & last, in the toppe of the thumbe. When in the fyrst place put. 10. in the seconde. 20. and in the thyrde. 30. When by the order of these places shalbe coumpted the golden number: As one in the fyrst place, two in the seconde, and three in the thyrde: returnynge soure to the fyrste place. &c. vntyll the golden number of that yeaere for the which the concurrent is sought. And the number of that place where the golden number endeth, must be ioyned with the number of the golden number: and that both amount

amounte thereof, shall bee the concurrent, so that it passe not. 30. But if it passe. 30. then that that is moze then. 30. is the concurrent of that yeare.

And here is to be noted, that the yeares for this computation of the Moone, begyn at the first day of Marche, and laste vntill the last daye of February. So that this present yeare of. 1545. by computation of the golden number, we haue seuen: whiche accounted by the sayde places, endeth in the fyrst, whiche is. 10. whiche also ioyned with the golden number of seuen, make. 17. and so muche is the concurrent of this present yeare.

Epact.

Likewyse this number of Epact or concurrent is founde in multiplying the golden number by. 11. and taking out the. 30. then that resteth, is of the Epacte.

The concurrent being thus knowen, then to knowe the dayes of the Moone, it is necessary to knowe thre numbers. The fyrst is the concurrent. The seconde, the number of the moneth in whiche you are, beginnyng at Marche. The thyrde, the dayes past of the same moneth. And ioynyng these thre numbers, if they come not to. 30. so many dayes old is the Moone. And if they be. 30. it is the coniunction. And if they passe. 30. they also that passe are the age of the Moone.

To knowe
the dayes of
age of the
moone.

This is vnderstode in the monethes that haue. 31. dayes. For in them that haue only. 30. dayes, the coniunction is at the. 29. daye. And they that passe of. 29. are the age of the Moone. As for example: The fyrste dayes of August, of the concurrent. 17: Of monethes from March 6. and of dayes of the moneth. 1. make. 24. and so muche is the age of the Moone.

An other example. The tenth of September, of concurrent. 17. of monethes seuen, of dayes tenne, whiche are in all. 34. And because that September hath onely 30. dayes, we must take away. 29. of the. 34. and so resten fyue dayes whiche are the age of the Moone. And in like maner shall we geue to February nyne & twenty dayes of the Moone.

It foloweth, that the dayes of the Moone beyng known, then vntekenyng or disrekenyng backwarde,

To knowe
the dayes of
the coniunc-
tion.

we

We shall knowe the daye when the Coniunction was :
As for example. The. xx. of July, the Moone hath. xii.
dayes taken from the. xx. Remayneth. viii. Then the
eyght day was the coniunction.

The daye of the coniunction is lykewys knowne by
lopyng the monethes (begynnyng in Marche) with the
concurrent. And yf they come not to. 30. then at so ma-
ny dayes of that moneth as lacketh of. 30. shalbe the con-
iunction. Example.

In August. 6. of the monethes, and. 17. of the concu-
rent, are. 23. whiche of. 30. lacketh. 7. Then at the se-
uenth daye was the coniunction. And yf they passe. 30.
Then takyng them that passe, of the dayes which hadde
the moneth next before : in them that remayne was the
coniunction. Lyke as the Moone of September of the
yeare. 1546. we shall count the concurrent. 28. of mo-
nethes. 7. which are. 35. Then taking away the. 5. from
30. and one which August hath, remaineth. 26. and so the
26. of August, of the yeare to come of. 1546. the Moone
shall make coniunction.

The. vii. Chapter of the declaration

and vse of an Instrument, by the which
is founde the place and declination
of the Sunne, with the
dayes and place of
the Moone.



In the seconde and thyrd Chapter I haue
geuen rules to knowe the true place of the
Sunne and his declination. In this Cha-
piter I wyl describe an Instrument wher-
by may be knowne the declination & place
of the Sunne. And knowyng by the Cha-
piter past, the dayes of the Moone, shall also be knowne
her place in the Zodiac, and howe muche of her is lygh-
tened, and what aspect she hath with the Sunne. This
Instrument is in square forme, and hath by the sydes
23. degrees and a halfe : Of the whiche the. 23. & a halfe
that

To knowe
the place of
the Moone in
the zodiac,
and what as-
pecten she
hath with
the Sunne.

that descende from the myddest do wnewarde, is the declination of the South signes: and the other from the myddeste vpwarde, are the declinations of the North signes. Within this quadrature is described a circle, by the circumference wherof are the. xii. signes and they degrees, ioyned to the circumference. And further within is the number of them, and then they names. Yet further within this, is another circle, where are the. 12. monethes, with they numbers and dayes.

The description
of the
instrument

Then to the center of this circle are annexed twoo rundels: wherof the greateste and loweste is called the rundell of the Sunne. This hath an Index or Helver, in which is paynted the Sunne, & in the circumference of it are the dayes of the Moone. In the other circle, in the circumference thereof, is a rounde hole, representing the Moone: Directly from the which, is an other Index commyng forth of the circumference of this rundell, in which are all the lines of the aspectes which the Moone maketh with the Sunne.

Having described the Instrument, let vs declare the vse therof: which is this.

The vse of
the instrument
to find
the true
place of the
Sunne.

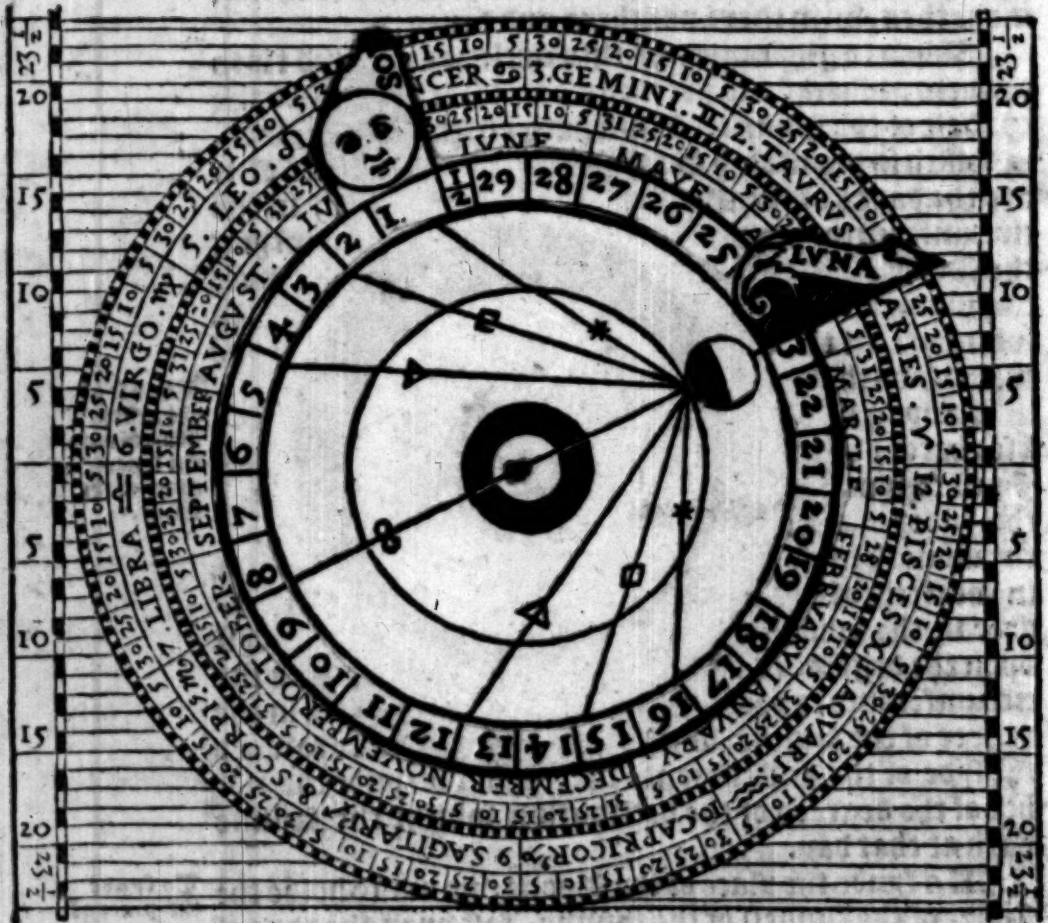
First to fynde the true place of the Sunne, we must put the Index of the rundell of the Sunne, vpon the daye of the moneth in which we are or desyre to knowe. Then in the circle of the signes, it shal shewe the signe and degree in the which it is. And in lyke maner, resting still vpon the degree, looking in the paralels that touch in the circumference, & proceeding by that that toucheth in the degree of the Sunne, which the Index doth note toward the syde of the Instrument: there shal we fynde the number of the degrees of the declination whiche the Sunne hath at that day.

To fynde the place of the Moone, we muste holde the Index of the rundell of the Sunne, fast vpon the daye of the moneth in the whiche we desyre to knowe the place of the Moone. And accountynge in the rundell of the Sunne, the dayes that haue passed from the daye of the coniunction (as I haue sayd in the Chapter before) and where endeth that number of the dayes, yf there we

To fynde
the place of
the moone.

The 2. part.

We apply the Index of the Moone, it shall shew in the circle of the signes, the place where she is. And so shall she appeare lyghtened or darkened more or lesse as in heauen. In lyke maner, consyderinge the place of the Sunne and the Moone, shalbe seene what aspecte they haue, by the lynes that trauesse the superficiall of the Lunar circle or circle of the Moone.



The

The aspectes which the planettes haue one to another, or whereby they beholde one another, are fyue.

fyue aspectes of the planettes.
Coniunctio.

Coniunction, is when two planettes be vnder one selfe same degree and minute in the Zodiac, whose characte is this. ♌

Opposition, is when betwene the place of the planettes is halfe a circle, which are. 180. degrees, and is thus figured. $\text{♌} \quad \text{♍}$

Opposition.

Trinall aspecte, is when betwene the planettes shal be foure signes, which are. 120. degrees, and is figured thus. Δ

Trinall.

Quadruple aspecte, is when one planette is distaunte from another by thre signes, whiche are. 90. degrees, whose caracte is this. \square

Quadruple.

Sextile aspecte, is when two signes are betwene the

Sextyle.

And yf by memozy you desyre to knowe the true place of the Sunne, without respecte of the minutes (whiche may sufficiently be done with the Astrolabie) beare in memozy these numbers. 10. 9. 10. 10. 11. 12. 13. 14. 13. 14. 13. 12.

To knowe the place of the moone by the rule of memozy.

Of the which, the fyrst serueth for January: the second for February with the 2 signes: and so of the rest.

Then to knowe in what degree the Sunne is, you shall take away the dayes that are applyed to euery moneth, accorpyng to the sayde numbers of the dayes for the which you desyre to knowe the true place of the Sunne. And in them that remayne, in so manye degrees is the Sunne of the signe into the whiche it entereth that moneth. And yf the dayes past of the moneth, shalbe lesse then the dayes applyed to the same moneth: you shall soyne. 30. with those dayes past of the moneth, and of the summe that amounteth, you shall take awaye the dayes applyed to the sayde moneth: and the rest shalbe the degrees in whiche the Sunne shalbe of the signe of the moneth past: as for example.

To knowe in what degree the Sunne is.

Ex

Gram

Example.

January.	10.	♊	The. 22. of October, ta-
February.	9.	♋	king awaye. 14. that were
Marche.	10.	♌	applied, remayne. 8. de-
Aprill.	10.	♍	grees of Scorpio, wher the
Maye.	11.	♎	Sunne is. The. 6. of Decē
June.	12.	♏	ber, that that is lesse then
July.	13.	♐	12. which are applied to it,
August.	14.	♑	if we ioyn the. 6. with. 30
September.	13.	♒	they make. 36. and from
October.	14.	♓	them we take awaye the. 12
November.	13.	♈	rest. 24. So in 24. degrees
December.	12.	♉	is the Sunne, of the signe

of the moneth before, which is Sagittary.

The. viii. Chapter of the Eclipses

of the Moone and the Sunne.

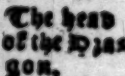
The Eclipses of the Sunne & of the Moone is a thing that causeth great feare and admiration amonge the common and ignorant people. And to them that understand the cause therof, nothyng at al. And therefore haue I thought good to declare the effectes therof.

The eclipse
of the moone

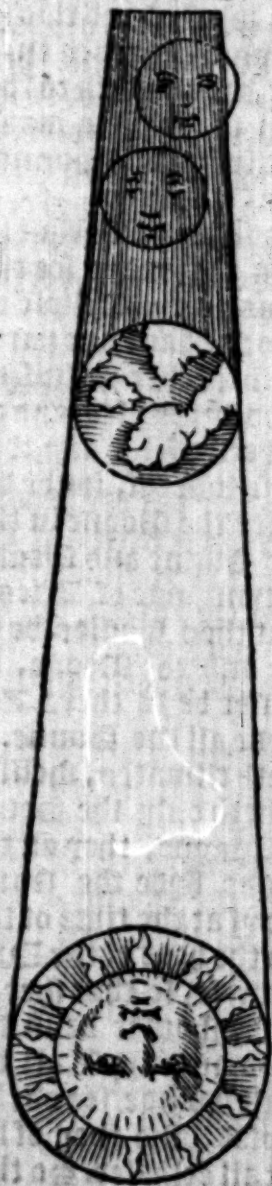
The Eclipse of the Moone, is the interposition of beyng of the earth betwene her and the Sunne. And whereas the Moone hath no proper lyght of her owne, and the earth beyng darke and not transparent, maketh his shadowe on the parte opposite to the Sunne. The Moone by her proper motion doth passe by this shadowe and is Eclipsed or darkened eyther in the whole or in part, accorpyng to the portyon of her that passeth by the shadowe. Moreover (as we haue sayde) that onely the Sunne is moued by the line Ecliptyke, & the earth being in the Center of the world, the point or pyncke of the shadowe shalbe vnder the Ecliptik. The Moone at somtymes declineth to one part of the Ecliptyke, & at other tymes to the other, because her Eccentricke so moueth.


The mo-
ving of the
Sunne in
the Ecliptik

The

The greatest declination or latitude of her Eccentricke is .5. degrees, and cutteth in two partes the Eccentricke of the Eclipticke. The one where it trauerfeth to the Eclipticke towarde the North part, which they call the head of the Dragon, and is marked thus. 

The head
of the Dragon.



The other whereby she passeth to the South part, which they call the tayle of the Dragon, & is marked thus.  And the Sunne mouyng by his proper motion, and commynge to the head, then shall the shadow of the earth be in the tayle, because it is the paynte opposite. And yf then the Moone come thither, of her proper motion she passeth by the shadow: and lackyng lyght of the Sunne, is in the Eclipse. And if the Sunne come to the tayle, the shadowe is in the head. And then lyke wyse shall the Moone be Eclipsed yf she passe by the head.

The tayl of
the Dragon.

It is to vnderstande that the Sunne is muche bygger then the earth. And by perspective, the shadow of the earth in how much the further it parteth fro it, becommeth sharper & sharper vntyll it come to a poynt: So that the shadowe of the whole earth, is pyramidallye sharpe. And as the Moone is lesse then the earth, yet (although his shadow goeth sharpenyng) it suffiseth to Eclipse the Moone yf she passe by the myddest therof.

The sunne
is bygger
then the
earth.

The shadow
of the earth.

The eclipse
of the sunne

The Eclipse of the Sunne, is the interposition of the Moone betwene vs and the Sunne. As yf the Sunne be in the fourth heauen, and the Moone in the fyrst, she being a darke bodye, and by her proper motion ouertake the Sunne: then puttynge her selfe betwene hym and vs, she couereth hym in part or in the whole: and this is the Eclipse of the Sunne. As the Sunne also goeth euer vnder the Ecliptike at the tyme that he cometh to the head or tayle of the Dragon, yf then the Moone make coniunction with hym, shalbe the Eclipse of the Sunne, soasmuch as they are both vnder the Ecliptike.

The eclipse
of the sunne
is not vni-
uersall.

The Eclipse of the Sunne can not be vniuersall in the whole earth. I saye vnto all them that maye see the Sunne at the tyme of the Eclipse, as is the Eclipse of the Moone vniuersall. For yf the Moone haue one parte Eclipsed, all that maye see her, shal see her Eclipsed: But the Sunne some may see all wholly eclipsed, and other in parte, or other also not at all eclipsed: and this all at one selfe same tyme. The cause wherof, is the diuersitie of the aspeete, whiche is to see the Moone in the Zodiac out of her place. As yf the Sunne and Moone shoulde make coniunction in the begynnynge of Aries & in the head of the Dragon: they that then shoulde be in the Equinoctiall vnder the Sunne and the Moone, or that the Sunne and the Moone shoulde be in theyr Zenith, they shoulde see the Moone hyde all the Sunne. And they that shoulde be in the North climates, shoulde see that the Moone hydeth or darkeneth only the South parte of the Sunne, and not all. Agayne, they on the South parte, shoulde see the Moone hyde the North part of the Sunne, and not all. And yf at the time of the coniunction, she haue a lyttle passed the head of the Dragon, or lacke a lyttle to come to the tayle, so that shee be in the North latitude: they that then shoulde be in the North Climates, shoulde see the Moone eclipse all the Sunne: and they of the Equinoctiall shoulde see onely the North parte of the Sunne eclipsed, and they of the South shoulde see hym nothyng at all eclipsed. So that
although

Howe the
sunne is e-
clipsed in
the whole
or in part.

although the Eclipse of the Sunne shalbe totall & particular, it can not be vniuersall in the whole earth.

And note, that for the quantitie of these Eclipses, the Astronomers deuide into, xii. equall partes, as well the Diameter of the Sunne as of the Moone. And these partes they call syngers, punctes or prickes. And according to the punctes of the Diameter of the Moone which couereth the shadowe of the earth, or the partes of the Diameter of the Sunne whiche couereth the Moone, so many fingers or punctes shalbe sayd to be Eclipsed. As yf. 6. the halfe, yf. 3. a quarter, yf. 4. a terce or thirde part, yf. 9. thzee quarters, yf. 8. two terces.

It is also to be noted, that although the Sunne be bygger then the Moone, yet at some tyme the Moone seemeth greater then the Sunne. And this shalbe when the Sunne is in the Auge of the Eccentricke, and the Moone in the opposite of the Auge of the Epicycle. And when it so appeareth, he may be all Eclipsed. Sometymes also the Moone seemeth lesse. This is whē the Sunne is in the opposite of the Auge of the Eccentricke. And the moone in the Auge of the Epicycle. Then although we should see the center of the Moone in the center of the Sunne, he can not hyde hym all wholly, because the Sunne shall appeare greater.

Of this that we haue sayde, it foloweth that all the Eclipses of the Sunne, muste of necessitie be in the coniunction. And the Eclipses of the Moone, in the opposition:



To knowe
the quantitie
of the Eclipses.

Why the
Moone seemeth
sometime bigger
& sometyne
lesse the the
Sunne.

The Sunne
is eclipsed
in conjunction,
and the
Moone in
opposition.

The eclipse
of the Sunne
in the death
of Christ.

Howe to see
the eclipses.

Eclipse of the Sunne in the death of Christe our redeemer, was not naturall, but miraculous: soasmuch as then was xv. dayes of the moone, at whiche tyme the moone is at the full, and farre distant from the Sunne, and coulde not Eclipse hym. In lyke maner is to be noted, that to see the Eclipses, they of the Sunne must be in the daye, and they of the Moone in the nyght. And whether the coniunction be in the nyght, or the opposition in the day, the Astronomers make none accompt.

The. ix. Chapter of Tyme, and of the definitions therof.

All mouyng
is in tyme.



Asasmurche as hytherto we haue entreated of the mouynges of the Sunne and of the Moone: and howe all mouyng is in tyme (so) that nothyng maye be moued in an instant or out of tyme) It shalbe conuenient nowre to declare what thyng Tyme is, and in to what partes it is deuiled.

What is
tyme.

Howe tyme
is cause of
generation
& corruptiō.

The begyn-
nyng & en-
dyng of
tyme.

The place
of tyme.

Tyme (as sayth the Philosopher) is a measure of mouyng accordyng to first and last, or befoze and after. Although by accident (as Armandus hath subtylly defined) Tyme may be a measure of reste or quietnesse: as measures of habites are measures of pziuations. Or Tyme may be a measure of the mouing of the first mouable called Primum mobile, and cause of generatiō thereby, and of corruption by accident. Tyme hath the lymittes that hath the worlde. And as the worlde, so is it caused of the mouyng of the heauens: and beganne whan GOD created the heauens, and shall ende when the worlde shall haue an ende, as the holye Schooles of the Diuines teache vs. It is assigned to be within the heauens: soasmuch as without them, is neyther time nor any naturall place. All the tyme sence God created the worlde, vntyll it shall haue an ende, is called Seculū (that is) a worlde, or an age of Tyme. Albest this word
Seculum.

Seculum in an other sence, may be extended further then the durabilitie or continuance of the worlde. And this in holpe Scripture is called Seculum seculi: that is, the worlde of the worlde: or secula seculorum, whiche is as much to meane, as the worlde & worlde to come: which signifieth eternitie, or everlastyng world without end. Lyke wyse also seculum is taken for the space of a hundredeth yeaeres: whereby in olde tyme certayne playes were called seculares, because they were celebrat from a hundredeth to a hundredeth yeaeres. The Pope Paule, the thyrde of that name, commaunded them to be celebrat in Rome, in the yeaere of. 1536. which was the yeaere in the whiche the seculum ended, and beganne a newe seculum.

And as in Tyme are dyuers mownges, so hath it dyuers measures: whereof some are greater and other lesse. The greatest measure of Tyme, is a revolution of the heauens which is slowly moued. And the principall or chiefe of these, is that that the Sunne maketh: which we call a yeaere. The lesse measure, is the mouing of the fyrste moueable, whiche moueth moste swyftely: and this measure we call a day. And soasmuch as there is variation in the greatest measures, we wyll in the Chapter folowynge entreate of the yeaere and of the diuersitie therof.

¶ The. x. Chapter, of the yeaere.

and of the dyuers begynnynge and
rechenynge, or computation
had therof in old tyme.



There are three differences of the yeaere: as the great yeaere (called Annus Magnus) the Solar yeaere, and the Lunar yeaere. The greate yeaere, is the space of tyme in the which all the planets retorne to the place where they had ben sometyme before. As yf they all had ben in the beginning of Aries, & had begunne thei course from thence, and shoulde agayne all retorne thither: then shoulde be the greate yeaere.

Three differences of yeaeres.

The great yeaere.

The. 2. part.

The revolu-
tion of the
eight sphere

The solar
yeare.

Howe the
Egyptians
painted the
yeare

The quan-
tity of the
yeare

The yeere of
the Hebrewes
The grekes

Julius Cæ-
sar

Leape yeere

Days of the
yeare.

By the description of other, the great yeare is when the egypt sphere ioyntly with all the Auges, make one perfecte revolution at the mouyng of the ninth sphere. And this shalbe in the space of. xlii. thousande yeares.

The Solar yeare, is a revolution of the Sunne, carped by the proper mouyng of his heauen vpon the Axis and Poles of the Zodiac, endyng where it began, and returning an other yeare by the selfe same course, as the Poet Virgill affirmeth, saying.

Atq; in se sua pervestigia voluitur annus.
That is to saye. The yeare turneth agayne to hym selfe by his owne steppes.

The Egyptians lackyng the vse of letters, & hauyng the same consideration, paynted the yeare lyke vnto an Adder, bytyng her owne tayle. And hereof was a ryng called Annulus, as it were Annus, (that is a yeare) because a ring turneth rounde in it selfe as doth the yeare.

Of the quantitie of this yeare, were dyuers opinions & computacions among them of auncient tyme. The Arabians and Persians accompted it regularly by. xii. moones which are. 354. dayes. Romulus gaue to his yeare. x. monethes, because that tyme suffised to a woman to bring forth her byrth: and also for that during so much time, it was not lawfull for a wydow to marry after the death of her husbände. Numa Pompilius added two monethes, to make it by twelue monethes in. 350. dayes, whiche was the most auncient yeare of the Hebrewes: according to the whiche they accompt at this day. The Grekes and Egyptians, consideryng the course of the Sunne, made the yeare of. 365. dayes. Then by the comaundement of Iulius Cæsar (whose order we nowe obserue) were added. 5. houres, to thende to make equall this number of dayes with the course of the Sunne. And hereof the bissextile or leape yeare had his begynnyng, from foure to foure yeares. But to say the truth, they erred: The one by somewhat to muche, and the other by somewhat to lytle.

The yeare conteyneth. 365. dayes. 5. houres, and 49. minutes.

Lyke.

Lyke wyse at the fyrste the yere had dyuers begynnynges. Numa Pompilius beganne it from the Wynter Solstitiall, because that then the Sunne beginneth to rise towarde vs, as Ouide affirmeth in these verses.

Beginning
of the yere.

Ouide.

Bruma noui prima est, veterisq; nouissima Solis:
Principium capiunt Phebus & annus idem.

Bruma, is
the staye of
the Sunne
in wynter,
the wynter
Solstitiall &
hottest daye
of the yere

Which may thus be Englyshed.

Brume is the fyrst of the newe yere,

And last day of the olde:

The Sunne and yere begynne at once,

As Ouide hath vs tolde.

Romulus began it in Marche, at the Equinoctiall of the sprynge: because that then all thynges reuiue and flourish. And by the opinion of the Diuines, it seemeth good reason to begyn the yere at Marche, because the worlde was created the. 25. of the kalendes of Apryll, whiche is the. 18. of the moneth aforesayde. Lyke wyse God speakynge of this moneth to the people of Israell, sayde vnto them: This shalbe the fyrst of the monethes of the yere. The Arabians begynne from the sommer Solstitiall: whose opinion is, that the Sunne was made in the signe of Leo. Other begynne the yere in September, about the Equinoctiall of Autumne, as do the Jewes, resting in the auctoritie of Genesis where is wyrtten thus: Lette the earth byng forth greene hearbes to haue fruite agreable to theyr kynde. &c. And because Autumne is a fruitfull tyme, they began from thence to accompt theyr yere. The Grekes, Persians, and Egyptians accompted it from October. The Christians, some from the Incarnation of Christ: other from his birth, and other from the fyrst day of January.

The creatio
of the worlde
Exod. xii.

where the
Christians
begynne the
yere.

In lyke maner is great diuersitie in begynnyng the number of yeres, which we call Era, (that is) the date. The Grekes beganne theyr date from the death of greate Alexander. The Egyptians from the death of

Diuersitie
in the num-
ber of yeres
of the date.

Nabu,

Nabuchodonosor. The Persians, from Geldargit. The
Machomet. Arabians of Moores, fro the preaching of Machomet,
 who was after the byrth of Chryst. 626. yeares. Other
The date of also from the Romane Emperours. The Christians be-
the Christi- gan the accompt of our Saviour Iesu Chryst. 500. yerer
ans. after his byrth, as writeth Cardinall Cusanus. And here
 it shall not be from my purpose to shewe holwe iustelye
 and ryghtfully was commaunded by Don John kyng of
 Spayne, the fyrste of that name, that in the courtes and
 Parliamentes which he held in segouia, in the yeare of
 1383. leauyng the dates that they had begonne from the
 Emperour Octauian, for tributes & other paymentes
 specified in wyptynges and priuileges: they shoulde no
 more put the date of the Emperour, forasmuche as the
 day in the which the Sunne of Godde became man, and
 was bozne of the blessed virgin, was so excellent a thing
 and mooste woorty to be hadde in memozy. So that in
 Spayne sence that tyme in all common wyptynges, the
 date is made from the Patiuitie of our Lorde, begyn-
 nyng there the fyrst day of the yeare: and commonly the
 fyrst day of January. Some Astronomers begynne it
 the fyrst of Marche.

We haue in this Chapiter entreated of the greate
 yeare, and of the Solar yeare, with his quantitie, be-
 gynnynge, and date. In the Chapiter folowynge we wyll
 entreate of the Lunar yeare, which we call a moneth.

The. xi. Chapiter of the Moneth, and of his differences.

The Lunar
 yeare of mo-
 neth.

Reuolution
 of the moneth.



Consideryng the Moneth absolutely with-
 out hauyng respecte to the Solar yeare, it
 may be called a yeare, accorbyng to the de-
 uision we haue made in the Chapiter of the
 yeare. For it is a reuolution of the hea-
 uen of the Moone, which moueth slowly
 in comparison to the fyrste heauen. And if
 we

We consider the moneth as part of the yeare, then is the name of a Moneth moze proper vnto it. For this worde Mens Mensis in Latin, is deriued of Mensura, which signifieth measure. And so, the moneth and yeare referred to tyme, all may be called moneth: Forasmuch as all is the measure of tyme, as we haue touched in the sayde Chapter of the yeare.

The moneth is to be considered in two maners: eyther as it is parte of the Solar yeare, or is caused by the course of the Moone. The moneth that is parte of the Solar yeare, is that which at this day we vse. And into xii. of these monethes is the yeare deuyded: As Ianuary, February, Marche, Apryll, May, June, July, August, September, October, Nouember, December. They are not all of equall dayes. Apryll, June, September, and Nouember, haue. 30. dayes: All the other haue. 31. except February, which hath. 28. and when the bisertile or leape is, it hath. 29. The names & numbers of these monethes were assigned at the wyll and pleasure of men: And the cause why they haue remayned so long tyme, is the auctoritie of the Emperours, that ordeyned them for the common people, who accepted them by the Roman Church which admitted the vse of them.

The Lunar moneth hath two considerations. The one is the tyme whiche the Moone tarpyeth from that she cometh forth from one puncte of the Zodiac, vntyll she returne thither by her proper mouyng. And this is called the moneth of peragracion: In which reuolution she spendeth. 27. dayes and almoste. 8. houres. The other consideration, is hauyng respecte to the tyme which the Moone tarpyeth from that she is in coniunction with the Sunne, vntyll an other coniunction. And this is called the moneth of consecution, and is moze then the moneth of peragracion by. 2. dayes. 4. houres. 44. minutes. For the Sunne and the Moone beyng in coniunction vnder one puncte of the Zodiac, and mouyng both by theyr proper mouynges towarde the East, as the mouyng of the Moone is swyfter then the mouyng of the Sunne: she leaueth hym behynde.

And

The deuision of the yeare into xii. monethes

The Lunar moneth.

The month of peragracion.

The month of consecution

The mouyng of the Sunne and Moone in coniunction.

The. 2. part.

And when she hath ended her moneth of peragratiō, she returneth to the poynte from whence she departed: And not finding the sunne there (because in the meane tyme the Sunne of his proper motion hath gone almost 27. degrees) the Moone passeth from this poynt: and in the sayde. 2. dayes. 4. houres. 44. minutes, ouertaketh the Sunne. And so commonly hath this moneth of consecution, 29. dayes. 12. houres and. 44. minutes. So that whatsoeuer is sayde of the Lunar moneth, is to be vnderstode of this moneth of consecution, whiche all they vse that accompt by moones: as do the Hebzeues, Arabians and Persians.

To knowe
the tides by
the aspectes
of the moone.

The illumi-
nation or
chaunge of
the moone.

Interlunium, is the
space of
tyme in the
which ney-
ther the
olde moone
nor the new
moone is
sene.

The Maryners ought not to neglecte this computacion because it is conuenient for them to knowe the tydes and other effectes caused by the aspectes of the Sunne and the Moone. For they aspectes do corresponde to the partes of this moneth, as the coniunction to the begynnyng, the opposition to the myddeste, and the quartyle aspect to the quarter, and so of the other. Likewise in this moneth, is considered the illumination of the moone and the dayes that the lyght sayleth her: so that neither by day nor by nyght we may see her for being burnt vnder the beames of the Sunne. The tyme that she is so, is called Interlunium, (that is) the chaunge or bydyng, which is sometyme more, and sometyme lesse. When the coniunction shalbe from the begynnyng of Capricorne vntyll the ende of Gemini, and the Moone hath North latitude, and her moyng swifte: then shall the newe Moone soone be sene, and so shall the Interlunium be but lyttle. And when the coniunction shalbe from the begynnyng of Cancer vntyll the ende of Sagittarius, and the Moone hath South latitude, and her moyng slowe: the longer wyll it be or the newe Moone shewe her selfe to vs. And certen of these causes concurringe and not all, so shall the Interlunium be in a meane betwene both.

C The

The. xii. Chapter, of the weeke.



The weeke is a time of seven dayes, the begynnyng wherof is Sundaye. And so dyd the Jewes count theyr fyrst day sayinge, Prima sabati, Secunda sabati, (that is) the fyrst of the Sabbath, the seconde of the Sabbath. &c. to the syxt of the Sabbath, and then the Sabbath. The Romans that called the planettes Gods, forasmuche as the Sunne was princypall among them, called theyr fyrst daye, the daye of the Sunne, the seconde of the Moone, the thyrde of Mars, the fourth of Mercury, the fyfth of Jupiter, the syrth of Venus, and the seventh of Saturne. The Chyrtians solemnysing the Sunday, began theyr accompt from it: As on such a day our Lorde was bozne, on such a day he rose, and on such a daye he sent the holy ghoſte vpon his Apostles. &c. They also accompt the dayes of the weeke so, Ferias.

The weeke
of the Jewes.

The Ro-
mans.

The Chy-
rtians.

Ferias, sig-
nific vacant
dayes, as
somtyme ha-
ly or festi-
uall dayes.

The. xiii. Chapter, of the day and of the nyght.



The day is of two sortes: As the naturall daye, and the artificiall daye. The naturall daye, is the tyme whiche the Sunne prolongeth or tarieth from the mouyng of the fyrste moueable from that he is in the South vntyll the West, & vnder the earth to the East, turnyng agayne to the South or Meridian. And in this tyme hath the Equinoctial geuen one whole turne: and moze such parte of it as correspondeth to the proper mouyng of the Sunne. Or other wyse, the naturall day is a circle described with the center of the Sunne at the mowing of the fyrst moueable. The Romanes began this naturall daye from mydnyght, and ended it in the mydnyght folowynge. And so do we accompte it so, sayyng

The natu-
rall day.

The begyn-
nyng of the
naturall day

The.2. part.

They are called temperall houres, because they vary in the tymes that the day varyeth. For in the time that the dayes shalbe greate, so shalbe the houres. And when the dayes shalbe shorte, so lyke wyse shall the houres be, and in lyke maner of the nyghtes. So that, as the artificial day great or lytle, is deuided into other. 12. houres, euen so the night great or lytle is deuided into other. 12. The auncientes deuided the day into foure partes, & the nyght into other foure: geuing vnto euery quarter part thre houres. At the rysing of the Sunne, whiche was the fyrst houre of the fyrst quarter, they called the fyrste houre: and thre houres passed, they called the thyrde houre: and syre houres passed of the day, they called the syrt houre, which was the mydday or noone tyde. Also the nyynth houre, they named at nyne houres past of the day. And the Sunne sette or going downe of the Sunne they called the Euenyng: as saith the Poet Virgill in this bearse,

The day &
nyght deu-
ded into
partes.

Interpreta-
tion of cer-
teyne places
of the Gol-
pell.

The nyght
deuyded in-
to foure
quarters.

Foure wat-
ches of the
nyght.

Ante diem clauso componet vespere Olimpo.
And accordyng to this computation, is to be vnderstode that writeth Saint Mathew: That the labourers came to the Vineyard at the eleuenth houre: wherby is ment the fift houre, one houre befoze the Sunne was set. And when we reade in saint Iohn: The ague lefte hym the seuenth houre, &c. By this accompt it was one houre after noone when Christe healed the sonne of the Kuler that was diseased in Capernaum. In lyke maner, by these houres the auncientes diuided the night into foure quarters, geuyng thre houres to euery quarter. And in these foure partes of the nyght were souldiers appoynted to watche. In the fyrst quarter (which they call *Canticinium* and we the fyrst sleape) they watched all. In the seconde whiche they called *Intempellum*, beyng the turne of midnyght, the yong men watched. In the thirde whiche they called *Gallicinium*, of the crowynge of the Cokes, watched the souldiers of myddle age. In the fourth and last quarter, called *Matutinium* or *Antilucanum* (that is the spryng of the day) the old souldiers watched. And thus is vnderstode the fyrst, the seconde, and thirde watche

watche of the nyght. In like maner ought the mariners to kepe watche and warde, to annoyde aswell the perpls of the Sea, as also the daungers of Rowers: and to de- Howe mar-
iners ought
to watche.
uide the nyght by quarters after the maner of the sol-
diours, as did also the mariners in olde tyme.

The. xv. Chapiter of the making and vse of a vniuersall Diall for the daye.



Here as in the Chapiter before, wee haue entreated of houres & their differ-
ences, we intend here to describe the
makynge of an instrument generall, to
knowe the houres of the daye by the
beames of the sunne: whiche is doone
in this maner. Take a rounde plate
of laton, and let it be called the Equi-
noctiall circle: The circumference wherof, you shall de-
uide into. 24. equall partes by both the sydes. And from
the center to euery of these partes, you shall drawe a
ryght lyne: one of the whiche, shalbe a meridian. And
in the one part of that, write. xii. which shalbe the houre
of the mydday or noone. And in the other parte, write
other. xii. whiche shalbe for mydnyght. In the hyghest
part turnyng vpon the center, towarde the ryght hand,
write one, two, thre, foure. &c. In the lower or nether
part, you shall counte towarde the left hande, turnynge
it vpon the centre: so that the one houre of the one part
come vpon the lyne of the one houre of the other part: In
lyke maner two vpon two, thre vpon thre, and so forth
of the other. And note that in the lyne of syre at after
noone, and at the lyne of syre in the morning, there re-
mayne certen rounde pieces, corners, or endes, after the
maner of axis, of the thickenesse of the selfe same plate.
Then make a halfe circle of the same metall, as bygge
as the halfe circumference of the plate: and of the thic-
kenesse of a piece of. iiii. rials of plate or sumwhat more,
such as the plate it selfe: and of the breadth of halfe a

To knowe the
houres of the
day by the
sunne.

The .2. part.

fynger if the instrument shalbe greate, or lesse if the instrument shalbe lesse. This halfe circle, shall you graduate or deuyde into. 180. degrees, begynnynge at the one ende, one, two, thye, and so forth vnto. 90. in the myddest. And the lyke shall you doe from the other ende vnto the same. 90. Also you must number them in the breadth of the same halfe cyrle. And this halfe circle, shall you make fast on the nether parte of the instrument, so that the endes therof may be fxyed in the endes of the Peridian line. Then thzough the center of the plate or Equinoctiall cyrle, shall passe a rounde stile or wyze of the same metall, made fast or sothered in it: so that it ryle or come forth equally fro euery syde of the plate the fourth parte of the Diameter of the same. And this shalbe called the Axis or axiltre of the woꝛlde. The instrument being thus made, you shall place it or set it in a frame hauyng two armes, standardes or arches, so that it hange betwene the sayde arches, bozne vp by the rounde pieces or endes of the plate leste therof at the endes of the lyne of the fyre houres alsoe sayde: In suche sorte that being thus stayed, it may be directly tourned. And in the myddest betwene these twoo armes, beneath in the foote of them, or where they are placed, you shall rayse a prycke or poynt: so that the plate which signifieth the Equinoctiall, being perpendicular, the byzmyne or edge thereof may fall vpon the poynte or prycke. And consequentlye the plate standyng playne or flat, the. 90. degrees of the halfe circle, must shewe or touche the sayd prycke: as shal also the ende or extremitie of the Axis of the woꝛlde: And the other ende shall shewe the Zenith or verticall poynt. This instrument must bee so placed that the Peridian lyne be North and South: whiche you shall fynde in this maner. In an open and playne place where the Sunne shyneth for the mooste parte of the daye, you shall make a circle with a payze of compasses. In the myddest wherof, you shall set a stile or wyze so byrght that it decayne not or bende not, cyther one waye or an other. And the same no longer then the fourth parte of the Diameter of the circle, Then in the moꝛnyng when the Sunne riseth, the shadowe

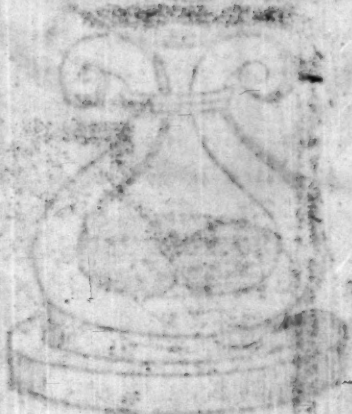
The placing
of the instru-
ment.

The finding
of the Peris-
dian lyne.

shadowe shalbe very longe. And as it ryseth hygher and hygher, so the shadow wareth shorter and shorter. When must you obserue the tyme when the extremitie or ende of the shadowe toucheth in the circumference of the circle. And where it toucheth, you shall make a pycke. Then goeth the shadowe shortening vnto the mydday or noone tyme. And as from thence the Sunne declineth, so doeth the shadowe increase. And when it shall come agayne to the circumference of the circle, you shall make an other pycke. When shal you part in the myddest, the arke that is betwene the one pycke and the other. And from the myddle pycke, drawe a ryght lyne to the center of the circle: And that shalbe the Meridian lyne, whereupon you shal set the instrument. Furthermoze in the foote of the frame of the instrument, you shal set a compasse or dyall which shal shew the Meridian lyne. This done, vpon the arches of the frame & corners of the syre houres, you shal turne the Equinoctiall so farre that it passe so muche of the halfe circle by the myddle pycke howe many degrees the pole is rayled aboue the Horizon of that region or place where you are.

And then the shadow of the wyze or style, shall iustly shewe in the plate, the houre, and what a clocke it is.

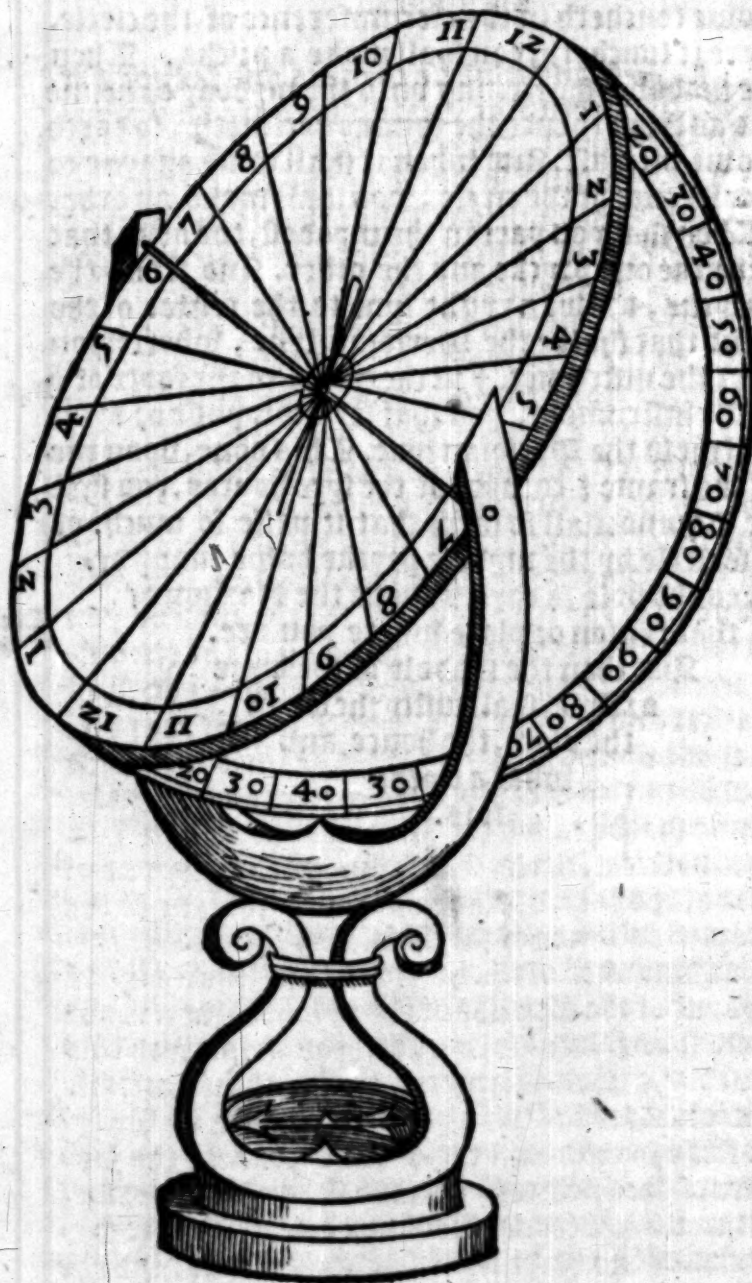
The elevation
of the pole.



384 *Cont's* s *Arte of Navigation*, translated by *Richard*

The 2. part.

Here followeth the Figure of the
Instrument.



The

The. xvi. Chapter of certayne particular dials spirall and Horizontall.



Among sundrie maners and fashions of
particular Dials, there are two princi-
cipall. Wherof the one is Orientall,
whiche is placed in the superficiesall of
the Horizon. The other is verticall, &
must be made or set on a wale perpen-
dicular, and directly against the south
or mydday, from the poynt of the true
levant or east, to the true ponent or west, the whiche the
Mariners call East and West. To make any of these
two dials, you must drawe a ryght lyne and call it the
Aris of the poles of the worlde, vpon the whiche, you
shall drawe an halfe circle and deuide it in. 90. equall
partes. And wher the halfe circle is cut with y^e lyne of the
Aris, must be accompted by the circumference, the alti-
tude of the pole for the cite or place for the whiche you
intende to make the dial. And in the poynt of the circum-
ference where endeth the altitude of the pole, you shall
make a marke: and wyte there, the altitude of the pole.
And from that poynt drawe a ryght lyne vnto the point
where you began to accompte the altitude of the pole.
Whiche lyne shalbe called the Semidiameter, or half Dia-
meter of the verticall circle. And from the same poynt of
the altitude of the pole, drawe an other ryght lyne to the
other extremitie or ende of the Aris. And this shalbe cal-
led the Semidiameter of the horizon. And likewise fro
the same poynt of the altitude of the pole, drawe a right
lyne perpendicular vntill it touche in the Aris. And this
shalbe called the Semidiameter of the Equinoctiall:
Whereby is considered a triangle whiche hath by the sy-
des thereof the Semidiameter of the verticall, the Se-
midiameter of the Horizon, and the Aris of the worlde,
whiche triangle shal serue afterwarde. These three Se-
midiameters, of the verticall, the Equinoctiall, and the
Horizon, being founde, you shall make the Diall in this
maner.

Dials hori-
zontall and
verticall.

East and West.

The trian-
gell.

The making
of the diall.

Draw a ryght line somewhat long and call it the line of contingence. This shall you cut with an other lyne in ryght angles after the maner of a T. whiche shall be the meridian lyne. Then with your compasse, take from the triangle the Semidiameter of the Equinoctiall. And of this bygnes, drawe a circle vpon the meridian lyne: so that the edge or bymme of the circle, touche in the lyne of contingence. Then with a compasse, take the Diameter of the verticall circle, if you wyl make a mural diall: Or the Semidiameter of the Horizon, if you wyl make a Horizontall diall on a playne or flat forme. Therfore with suche Semidiameter as you desyre, you shall drawe a circle vpon the other parte of the Meridian line, so that the circumference thereof touche in the lyne of contingence. Then shall you deuide the Equinoctiall circle into foure equall partes. And the quarter that is towarde the lyne of contingence, shall you deuide into syxe equall partes. And setting the ende of the ruler in the center of the Equinoctiall, and vpon every poynte of them that deuyde the syxe equall partes, from thence shall you drawe certayne ryght lynies, untill they touche in the lyne of contingence. And from these poyntes of the lyne of contingence, you shall drawe other ryght lynies to the center of the Horizontall circle: which lynies shall be the determiners of the houres. And neare vnto the Meridian lyne where it toucheth in the lyne of contingence, you shall wyte. 12. And consequente towarde the East, you shall wyte. 1. 2. 3. 4. 5. 6. And from this syxt houre, you shall drawe a ryght lyne whiche shall passe by the center of the Horizon, and be equally deuided from the lyne of contingence. The one quarter of the Horizon being drawn by the self same and of the same measure and bygnesse, shall you drawe the other, in such sorte, that the same bygnesse that is from. xii. to one, the selfe same shall you geue from the. xi. to the. x. And the same byggenesse and measure that is from one to two, shall you geue from. xi. to. x. and so forth of the other.

And note that the Horizontall dyall, after the syxt houre of the euening, shall haue the houres of. vii. and viii.

viii. And in climates farre North. (r. also, and moze p
 nide shal requyre. And consequently must haue the hou
 res of syue and foure of the moynng. And in climates
 farre North, thze also. And these must be so market that
 from syre to seuen, may be the same that is from syue to
 syre, and from seuen to eyght, the same that is from four
 to syue. Also foure and syue of the moynng, as seuen and
 eyght. The dyall beyng thus drawen in paper o: on a ta
 ble o: any other thng, must be paynted (on a table o: in
 stone, o: in whatsoeuer you desyre to make the dyall) a
 circle of the same bygnesse as is the circle Horizontall.
 And in that, must be translated the lynes and numbers
 of þ said circle Horizontall. Then must you make a trian
 gle of metall of the selfe same bygnesse and fourme that
 is made in the myddle circle. And the syde of this trian
 gle, (which is called the halfe Diameter of the Horizon)
 must be syred vpon the meridian lyne of the Horizontall
 dyall: So that the syde of the triangle (which is the axis
 of the worlde) and extremitie o: ende therof, may fall in
 the center of the Horizontall dyall, and must stande so
 perpendicular that it declyne neyther to the one part no:
 the other. The dyall beyng thus made, you shall sette it
 vpon a meridian lyne, so that the meridian lyne of the
 dyall may stande o: rest vpon it. And so shal the shadow
 of the triangle shewe the houre: And if so: this place we
 desyre to knowe it, we must syre it there. And if so: anye
 other place, so setting it we shall haue a certen houre.

So maye we in an instant remoue it to an
 other place, and lyke wyse set it there
 to make certen and true demon
 stration of the houre.

F. liii.

Here

Howes of
 the horizons
 call dyall.

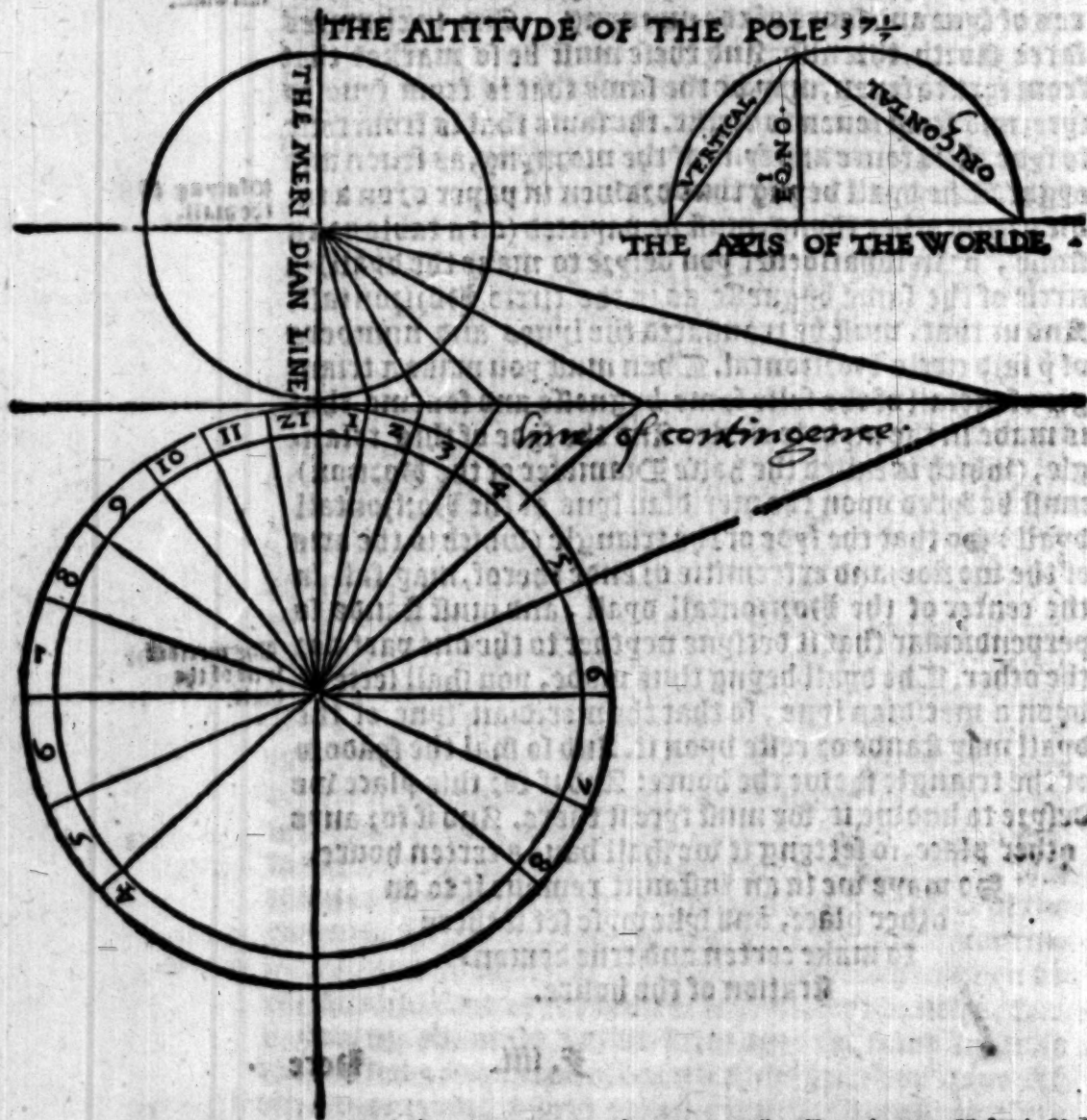
Placing of
 the dyall.

The meridian
 lyne of the
 dyall.

Diagram illustrating the construction and use of a portable sundial. The diagram shows a circular dial with a vertical axis (the meridian line) and a horizontal axis (the horizon line). The dial is divided into segments representing hours. The text describes how to place the dial on a surface and how to use it to tell time by the shadow of a triangle.

¶ Here followeth the figure of this demonstration.

THE ALTITUDE OF THE POLE $37\frac{1}{2}$



**The man
King of the
vertical dial**

In lyke maner as is made the Horizontall Wall,
must be made the verticall, takynge from the triangle
the Semidiameter of the circle verticall.

And note, that for the circle verticall, it shall not be needful of moze then six houres befoze noone, and other syre

syre after noone. And the triangle must be first in the meridiane lyne vpon the side that is called the Semidiameter of the circle verticall. And if you wyl not make a triangle of metall, but that a wyze of Iron may geue the shadowe, then must you make the sayde triangle of paste or paper. And according to the forme or paterne thereof, make the wyze of Iron, and cause the same to be set in all sortes of dyals as is beforesayde.

The. xlvii. Chapter of the composition and vse of an Instrument general for houres of the nyght.



Here as in the Chapters past, I haue described the maner and forme, to make twoo dyals for the houres of the daye, me semeth that for the more perfection of this wyke, it should be conuenient heare to teache the making of a diall, to knowe the houres of the nyght by the circle whiche the twoo starres called the Guardians or the mouth of the hoine, doe describe by the mouyng of the first moueable. But for as muche as it is a common opinion that in the myddest of Apryll, it is mydnyght when the Guardes be in y head, wherof they take the beginning of the yere: I wyl declare howe it ought to be vnderstode. Certaine it is, that to be mydnyght, is none other thyng, but the Sunne to be by the mouyng of the first mouable, to euery one in that parte of his meridian that is to hym vnder the earth: Euen as is to hym myddaye or noone, when to hym it is in that part of the Meridian that is aboue the earth. And in this present yere of. 1545. (to be out of doubt hereof) I made experience with a pcesse Astrolabie: so that the first or for moste Guard starre beyng perpendicularly ouer or aboue the North starre, I founde in the Meridia where the sunne maketh mydnyght, the nynt degree of Taurus. Wherby it foloweth, that the sunne beyng in this degre whiche is at the. xix. of Aprill, the same guard starre shalbe perpendicularly ouer the North starre,

The guard
starres.

what is mid
nyght.

Noone or
myddaye.

f. v.

whiche

whiche is the lyne of the head. And consequentye the Sunne beyng in the nynt degree of Scorpio, whiche is at the. xxi. of October, the guard starre shalbe in the line of the feete. And by this calculation maye be knowen when it shalbe in the ryght arme or the lefte, and in all the other lynes. So that they manifestly erre that accompte the mydnyght at the. xv. of Apryll, when the fyrst guard starre is in the line of the head: accompting a tence or thyrde parte of an houre soner and moze then they should doe.

An error.

The making
of the instru-
ment;

Having thus given principles for the instrument, you shall procede in the making thereof as foloweth. In paste, or on a plate of laton, make a circle of the quantitie of a spanne, or of the bignesse that you desyre the instrument or dyall to be. Then make an other circle somewhat lesse: so farre distaunt from the greater that betwene the one and the other may be a space in the which may be sygned or marked the dayes and monethes. Likewise shal you make an other lesse circle, leaving space to set the numbers of the dayes of euery moneth. And vnder this circle, shall you make an other, leaving space to wyte the names of the monethes. When shall you divide the fyrst and greatest circle, into eyghte equall partes. So that the. xix. of Apryll may bee in the hyghest or uppermostte parte of the instrument, whiche is where they say the lyne of the head to be. And the. xxi. of October must be in the nether part. Also the. xxi. of January, in the ryght arme. And in the left arme, the. xvii. of July. And so the other dayes that doe fall to the other lines according as they aunswere to the ryght ascension of the Sunne, as you may see in this figure.

This



ing thus deuise, you must also deuise the
are betwene the one lyne and the other, into
whiche be numbered in euery space: So that
the. xix. of Apryll and the thyrde of June, are
yes. And that space shall you deuise into. 45. par-
and where as the instrument beyng small, it can
not in so lyttle space receaue so many partes, you shall
deuide it from syue to syue partes. And so shall you deu-
de the other spaces by the numbers that are signed in
them. Then one daye more before the. r. towarde the
left hande, you shall make a stryke, and there shalbe the
xx. of Apryll. And syue dayes more before, make an other
stryke: & there shalbe the. xxv. And yet other syue dayes
more before, (whiche shalbe the. xxx. of Apryll) make an
other stryke ouerthwarte vnto the nethermoste circle, &
there shall May beginne. And from these dayes shal you
begynne to accompte the dayes of May from syue to
syue. And in the laste space, you shall put syre, whyche
shall make the one and thirte dayes that Maye hathe.

And

And there shall you make an other stycke whiche shall traaverse oꝛ ouerthwarte vnto the lesse circle. And in this maner shall you deuise the other monethes, geuyng to euery of them the number of his dayes.

This being done, vpon the outward part of the great circle, you shall cut rounde the paper, past, oꝛ plate of laton: leauyng of the same soꝛ a signe oꝛ marke, a floure deluce vpon the. xix. of April, soꝛ that it must be the head. And lyke wyse at the. xxi. of October, may be left a handel to holde it by. Then must you make a rundell of the same paste oꝛ laton of the bygnesse of the lesse circle, without the circumference wherof, shalbe left a tooth oꝛ inder, in the whiche you shall wyte: tyme. And from the one syde of this inder toward the left hande, you shal drawe a ryght lyne that may passe throughe the center to the circumference. And this shalbe the Meridian lyne. Also to this rundell shall you geue a circle, so muche lower from the circumference, that there may be left a space where the numbers of the dayes may be wyrtten. And this rundell you shall deuyde into. 24. equall partes: begynning at the meridian lyne of the inder at the twelfth houre of the nyght. Then in the next space toward the left hande, you shall make the number of one. Lyke wyse in the seconde space the number of. ii. In the thyrde the number of. iii. and so forth of the residue vnto the other. xxi. of the daye, in thopposite oꝛ contrary partes of the inder. So consequently proceeding. i. ii. iii. &c. vnto the. xxi. of the inder, whiche shalbe the. xxi. houres of the naturall day.

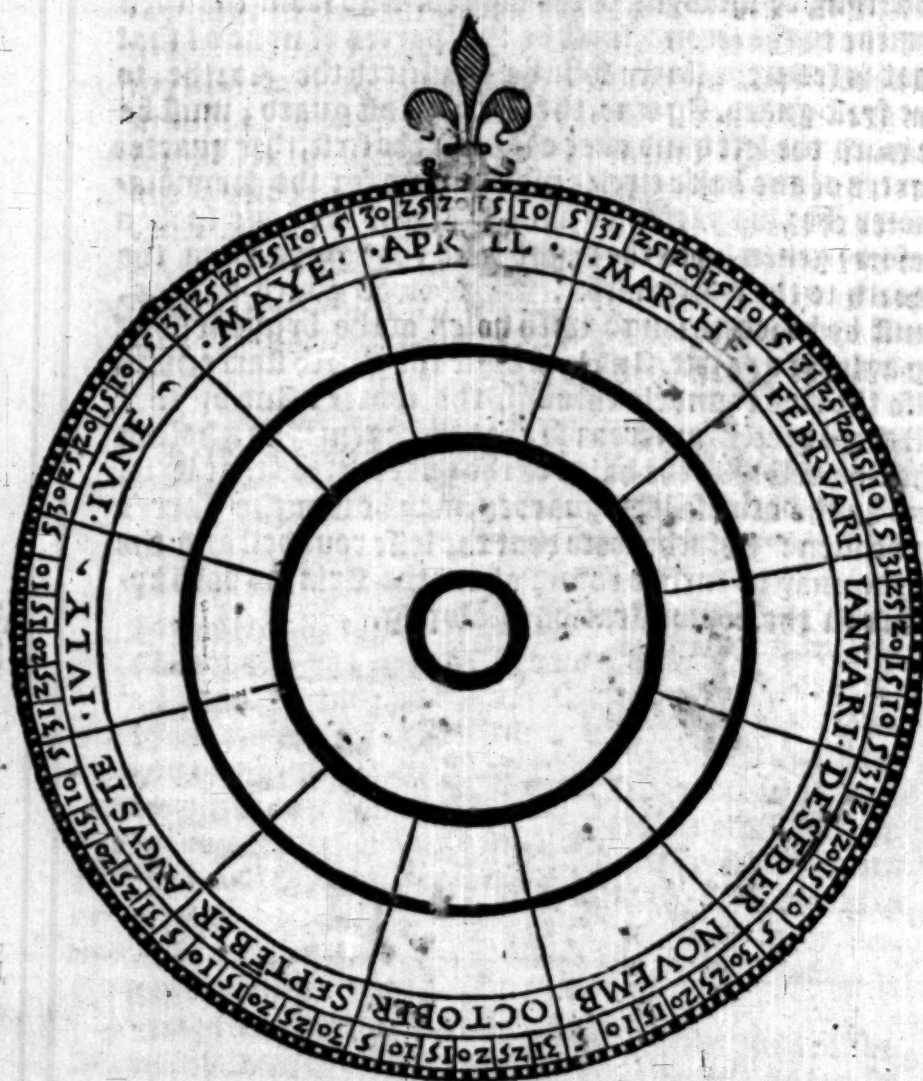
The boyn of
the. vii. star-
res whiche
make the left
beare.

Furthermoze also you must make an other piece of the same substance of past oꝛ metall, in maner of a bozne, in forme & order as are in heauen the seven starres whiche make the lesse beare. And this of such quantitie that the fyrst oꝛ formoste guard starre, may reache withoute the great rundell close to the circumference therof: hauyng the north starre his center with the center of the instrument. And from this starre oꝛ center vnto the fyrste and formoste guard starre, must be a right lyne by the which the bozne must be cut neare from the center vnto the dis-

couering

couerpyng o: shewyng of the houres. Also from the fyrst
 garde to the second, must be two partes of nyne of that
 that is from the starre whiche signifieth the North, to
 the fyrst garde. Againe, the second & last garde, must be
 toward the left hand ouer o: above the first, thre quarter
 partes of one halfe circle (whiche hath so: the Semidia-
 meter the two partes of nyne whereof we haue spoken
 befoze) geuen vpon the ryght lyne that goeth from the
 North to the fyrst garde. These twoo garde starres,
 must be bozed through with holes of the byggenesse of
 an aglet of a poynt. And lykewyse the North starre, with
 also the two roundels through the center: And by that
 all three pieces annered: so that there remaine a hole in
 the myddest lyke the holes of the guardes. So that by it,
 and by the other of the guardes, may be sene the starres
 in heauen: In suche sorte that the lesse roundell and the
 bozne, may be turned round about the Axis, as doth ap-
 peare in the demonstration folowynge.





To find the
houre with
the instru-
ment.

The instrument thus ended and brought to perfection,
when you desyre to knowe the houre, you shall turne
the inder of the lesse rundell (in the whiche is wrytten
tyme) to that part of the great rundell where is marked
the daye in the whiche you desyre to knowe the houre:
And directyng your face towarde the North, you shall
make the head towarde the heygth of heauen, at the.19.
of Apryll.

of Appyll. And seying in heauen by the hole in the myddest the starre of the North, holdynge the instrument in suche compasse of the face, that by the circumference of the greater rundell may be seene the Guard starres in heauen, you shall turne the horne rounde about, vntyll it fall vpon the Guardes: so that by the two holes of the mouth of the horne, the two Guard starres may be seene, and by the hole in the myddest the North starre, and all thre with one eye: Then the right line that goeth from the North to the fyrste Guard, shall shewe in the lesse rundell the houre that shalbe.

¶ The.xviii. Chapiter of the tyme of the Tydes, or rysyng and fallyng of the sea.



Grete accompte ought Pilottes and Maryners to haue of the Tydes, to take port, enter vpon barres, passe by flattes: and finallye for all maner of Nauigations. For being ignoraunt hereof, great hurt and inconuenience myght chaunce vnto them: as dyd of late to the valient Captayn Don Iohn Gusman Therle of Niebla, in the yeaere of. 1436: who was drowned befoze the Citie of Gibraltar, for that the Maryners kept none accompt neyther had consideration of the tydes. By reason wherof, not only he was drowned, but also with hym dyed many woorthye gentlemen and valient capitaynes of Spayne.

The Maryners holde for a certen rule, that the Moone being in the Northeast, or in the Southwest, is full sea: And beyng in the Southeast, or Southwest, to be lowe water. They affirme also, that at the fyrst day of the newe Moone, the Sunne beyng at Northeast and a quarter to the East (that is Northeast and by East) the Moone shalbe Northeast: And then shall be full sea, and thre houres, and thre quarters.

And

The Maryners opinion of ebbing & flowyng of the sea, or tydes.

Observaciō of the moone to knowe the tydes.

Eyght prin-
cipall wyndes

And at the seconde day of the Moone, when the Sunne shalbe at East North-east, the Moone shalbe at North-east, and then shalbe full sea, and foure houres and two quarters. &c. They accompt is, that the Sunne beyng in the North is mydnyght: and being in the North-east they accompt thre: and in the East, sixe. So that they accompt thre houres from wynd to wynde, by the. viii. principall wyndes, or lines which the Spanyardes call Rumbos. These wyndes muste be imagined vppon the North, placed in the angle vnder or beneath the earth: and the Sunne and the Moone at the mouing of the first mouable. And they ought not to be imagined in the Horizon, as the compasse sheweth. For speaking by the termes of Astronomie, you muste vnderstande that the Moone touchyng in the circle of houres, at the number of thre, is euer full sea. And touchyng in the same circle at the number of nine, is euer lowe water. No lesse ought they to obserue iust accompt of the houres by quarters of houres. For, to geue. 32. dayes to the Moone, it shalbe necessary to accompte by the systes of houres, as shalbe sayde hereafter.

Here is to be noted, that the Spanyardes thynke (be lyke) that a North-east and South-west Moone, maketh a full sea in al other places as it doth in Spayne. But in that they are greatly deceaued. And therefore the rule that they haue sette forth for the tydes, serueth onely for such places where it floweth North-east and South-west moone a full sea.

The moone
causeth the
the ebbing
& flowyng
of the Ocean
sea

And the better to vnderstande the increasynge and decreasing of the Ocean sea, it shalbe couenient to knowe the cause therof. Wherunto we saye, that the moone is the cause of ebbing and flowyng, or rysyng and falling, increase or decrease of the sea: not onely by her lyght, but also by her secrete or hyd propertie. The moone compasseth about the earth from the East into the Weste, vntyll she returne to the place or poynt from whence she departed. And in this course wasteth or spendeth so much more then one naturall daye, in howe muche her proper moonyng is more then the Sunne against the first mouable.

The mouing
of the moone

able. So that she maketh her tourne or course about the
four quarters of heauen in. xliiii. houres & foure fiftes
of one houre: whiche are the. xii. degrees that she goeth
more then the Sunne. And in this tyme the Ocean in-
creaseth and decreaseth twyse. So that this increasynge
and decreasynge, aunswereth directly to the course of the
Moone. Wher by it foloweth that the Sea increaseth six
houres & one fyfte parte, & decreaseth other syxe houres
and one fyfte. And if this daye at the. xii. houre was full
Sea, the lowe water shalbe at the syxe houre and one
fyfte parte. And at the. xii. houre and two fyfte partes,
it shal retourne to be full Sea. And at the syxe houre &
three fiftes, shalbe lowe water agayne. And at the. xii. &
four fyftes of the other daye, shalbe full Sea. So that
from one daye to an other, the tyde doeth shorten foure
fyftes of an houre, whiche is the tyme that the Moone
slacketh or tarieth more then one natural day, to retour-
ne to the pointe from whence she departed by the. xii. de-
grees wherof we haue spoken. Wherby it manifestlye
appeareth how they beguylde them selues that say that
the Sea increaseth syxe houres, and decreaseth other six.
For if it were so, the tydes shoulde euer bee at one selfe
same tyme and houre. But for as much as there is more
then. xliiii. houres by the sayde foure fyfte partes, there
by is caused the variation of the tydes: So that yf this
daye, the tyde be at one of the clocke, to morowe it shalbe
at one and foure fyfte partes. And the daye folowynge at
two of the clocke and thre fiftes. &c.

The shorten-
ing of the
tyde.

An error.

The varia-
tion of tides

For this accompt, I wyll describe a table in circular
figure: although not precise for the causes which we haue
touched before in the fift chapter speaking of the Moone:
who sumtymes in her mouing is swifte, and sumtymes
slacketh as much, bycause the coniunction is not euer in
one selfe same poynte of the Zodiack, as the mariners
presuppose for their rule. This figure shal haue two cir-
cles. In the lesse (whiche shalbe the fyrst and next vnto
the center) shalbe the dayes of the Moone from one to. 30
whiche we counte the coniunction. And in the seconde &
greatest circle, shalbe founde the houres of the tydes. So
that,

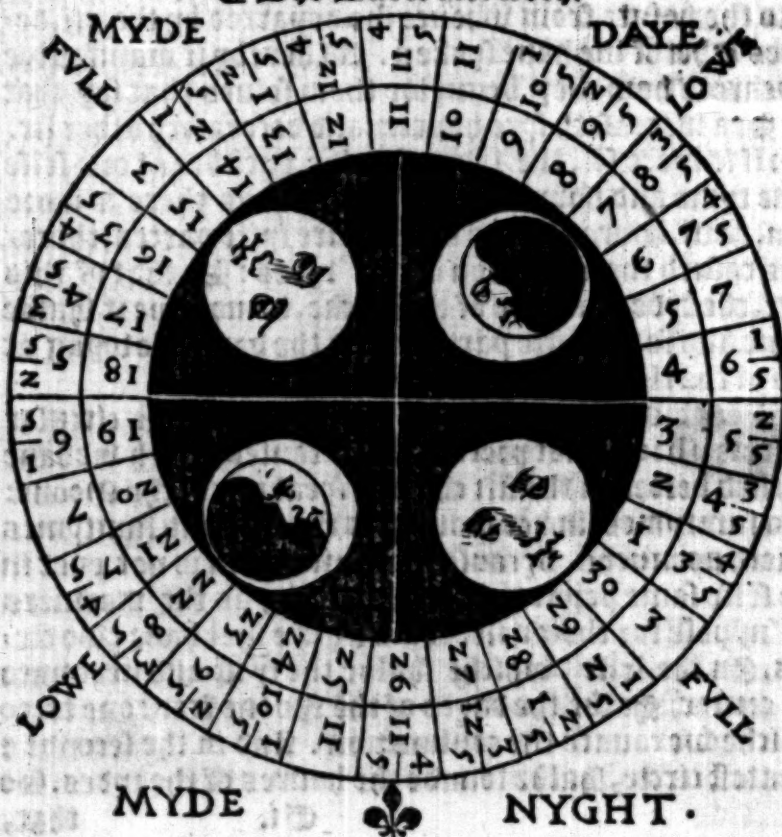
A table to
know the va-
riation of the
tydes.

Gi.

that,

that, who so desireth to knowe when the tyde shalbe, where it floweth Southwest and Northeast, let hym at that houre take heade to the dayes of the Moone howe many they are: as if she be in the coniunction, or if it be the fyrst or seconde of the Moone. &c. And the day beinge knowne, then in the seconde cyrcle whiche aunswereth directly to the daye, shal he fynde when shalbe hygh water or full Sea: and consequently the ebbe or lowe water, whiche shalbe fyre houres and one fyfte after the full Sea. And so like wyse may be iudge when shalbe the half tyde. And this aswell at the tyme when it increaseth, (whiche shalbe thre houres and halfe a fyfte parte of an houre before the full Sea) as also when it decreaseth: whiche shalbe the halfe ebbe, thre houres and half the fyfte of one houre after the full Sea.

The Table foloweth.



This increasing and decreasing of the tydes, is not ever in equall quantitie. In the coniunctions and oppositions, they increase and decrease muche: Whiche the Maryners call hyghe sprynge tydes. And the greatest increase of all, they call the hyghe sprynges. In the quarters of the Moone, (which are at the. 7. and the. 22. of the Moone or neare there about) they increase and decrease but litle: Whiche the Mariners call nepe tydes, lowe ebbes, lowe waters, dead waters, or lowe fluddes.

The. xix. Chapter of certen

signes whiche prognosticate Tempestes or fayre weather.



Good Wylote or Mariner ought not to be ignorant of certen signes or tokens whiche the naturall Wyllosophers describe of tempestes. For as they signifie vnto him, so shal he leaue his porte or enter into it. Whiche if he can not, then ought he with patience and hope to tary the time that God hath appoin

ted for hym, who moueth & troubleth the Seas when it pleaseh hym, & appeaseth them againe at his pleasure. Lette hurteth & damageth the Croke which we se coming or sofer, then that which hath strikē vs & taken vs carelesse. When the Sunne riseth faire & cleare, it signifieth a fayre daie. But if it shew yelow or deadly, tempest is like to folow. Again, if at the rising of the sunne, his beames shew them selues contracte or gathered together & short, you shal haue raine. If the mistes or cloudes make a circle about the Sunne or Moone, how much the greater that circle shalbe, so muche greater shalbe the tempest to come. And if there shalbe two circles, the tempest shal increase the more. And if it chaunce that at the rising of the sunne, the cloudes be turned red, it is a signe of no smal tempest. When the Sunne or the Moone shal haue a circle, loke toward the part where it breaketh, & from thence shal wynd come. If it depart or disperse equally, faire wether shal folow. Whē the Moone riseth bright & shining with pure colour, you may iudge it faire wether.

Signes of
fayre and
foule wea-
ther.

And if redde, wynde. If black, rayne. When in the new Moone, the hornes or cornes appeare grosse or great, it is a token of tempest. And if sharpe, it signifieth sayre weather.

The new Moone.

This that we haue sayde, is the auctoritie of Plinie & Aristotell, to whome the prudent Mariner shal credit vntill he haue founde other moze certayne, eyther by his owne experience, or by the experience of other wyse men woorthy to bee beleued. And euerye manne oughte to trauaile as muche as in hym is, for the knowledge of these thynges, accordyng as God hath gyuen him vnderstandyng and reason to obteyne the same. And this shal be wysdom, bearyng in memozie the experience of thyngs past, to gouerne presently, and to prouyde for thynges to come. The prouidence of God is so great, that depryving brute bestes of reason and vnderstanding, he hath geuen them sense and naturall instincte, whereby they may knowe that, that men do vnderstande by reason.

The sense of beastes in foreshewing tempestes.

Antes.

By this sense and secrete instincte of nature, the Antes or Distemares, with prouidence and diligence, laye by in store theyr prouision and egges, when before they fele the rayne to come.

Swalowes.

Fysshes.

The Swalowes also when they fele the wynter comyng, passe the Seas. Lyke wyse the Fysshes when they perceyue stormes to come, goe downe to the bottom of the water and hyde them in the mudde of the Sea. And although it may seme besyde my profession to meddle with matters perteynyng to Diuines, yet wyl I not omitte to speake that Christ our Lorde sayeth, as testifieth S. Mathewe. When the Phariseis with the Saduces (to tempte hym) willed hym to shewe them signes from heauen, he answered saying: when it is eueryng you saye it shalbe sayre weather, because the heauen is redde. And in the moornyng, you say it shalbe tempest when you see that the heauen draweth towards redde. &c. They knewe by that they iudged of heauen, to determen thynges to come: As whether it were euell to take iourney, to enter the Sea, to reape Corne, to laye it abroad, or to gather it in. I saye that to vnderstand the reason that moued them to haue suche consyderation of tyme,

Matth. xiii

tyme, (whiche we nowe lyke wyse obserue,) it is necessary to knowe that the redde colour which appeareth in the euening, signifieth the drynesse of the ayre: wherby the matter of the grosse vapours which should be conuerted into water, is so muche dzyed, that it appeareth in maner inflamed, and is therfore redde. And so is it not aptely disposed to be conuerted into water: And is therfore the nearest sygne of sayre weather. The other sygne when the heauen in the moynyng draweth toward rednesse, (yet not redde) sheweth manifestly that rayne shall folowe. Wherof the cause is, that this matter is ingroced: because this colour can not be but in grosse & thicke matter whiche is not dzyed, and therfore is not redde: as the cloude that appeare in the West in the tyme of sayre weather: But it is a matter somewhat troubled & partly redde. And is therfore a confounded matter: whiche touched with the heate of the Sunne, and therewith broken and disparsed, falleth downe and is conuerted into water. And further, as touchyng the sayd troubled or grosse matter, I say that the dzye and ruddy part therof, is eyther tourned into wynde by drynesse, or els beyng compassed about and inclosed with moist matter, is altogether conuerted into rayne, and so maketh tempest. For by tempest is ment, not onely rayne, but also tempestuous wyndes with water.

The redde
nesse of the
euening.

Ruddy colour.

What is tempest.

Luke. xii

The generation of rayne or cloude.

The qualities of wyndes.

Lyke wyse it is wytten by S. Luke: When you see a cloude ryse in the West, you say rayne shall folowe. And when the wynde bloweth South, you say it wyl be hotte. &c. To vnderstande this, I saye the cause of this is, that rayne is made or engendred of moyste vapours whiche both may be and are ingroced. Or other wyse, a cloude is a grosse body of moyste vapours so ingroced. And when the cloude doth so ryse, it shall be a signe that rayne shall shortly folowe. For that that was ingroced in the cloude, shall sene be resolued into water. To the other reason why they say that when the wynd bloweth South, it wyl be hotte, I saye that that wynde is hotte and dzye. Furthermore is to be considered that the wyndes are sometimes dzye, and sometymes moist. Yet not by their own

propertie: but accordynge to the regions by the whiche they passe. We see that in some one Region it rayneth with one wynde: and the selfe same wynde in other places disparseth the cloudes. The Northwest wynde is drye in Spayne. Yet in Libia is it very moyst and rayny. The South wynde in Europe, causeth rayne in mooste places. And therfoze the Poetes named it the wynde of waters. And this wynde in Palestina oꝝ Jure, is drye. The cause of this diuersitie, is, that when that wynde bloweth in Palestina, it passeth by hoate and drye Regions, as by the desertes of Aphrike, and passeth not by any Sea at all. But when it bloweth in these partes of Europe, it must of necessitie passe by and ouer the waters of the Sea Mediteraneum oꝝ the Leuant Sea, where it gathereth moisture & causeth rayne. The Leuante oꝝ East wynde, in Malaga and Gibraltar, is moyst: And in sheres, De la Frontera, is hoate as hell.

**The.xx.Chapiter of the bryght and
shining exhaltations that appeare in tempestes: whiche
the Mariners call santelmo
oꝝ Corpus sancti.**



Ignorance is the mother of errors. And therfoze wyl I not omit to shew the naturall cause hereof, although among certayne symple and ignoraunt people it is accounted for a myracle, that in certayne tempestes on the sea, the Mariners see certayne shynynge & bryght fyres which with great super-

stition they knele downe vnto and praye vnto, affirming that it is santelmo that appeareth vnto them. And not contented herewith, some sweare that they haue seene droppes of grene ware fall downe. Other affirme that this ware is of suche heate, that if it fall from the top of the shyppe, it doth melte the rosen and pitche of the hatches of the shyp, with suche other folyshe imaginations. And therfoze it shalbe good bryefly to speake hereof to
stopps

Some call
these fyres
seyes of S. Nicholas.
Ellen and
S. Nicolas.

stoppe the mouthes of suche sonde & ignorant persones. The exhalations or vapours of the grosse fumes or smokes that ryse from the earth, are constrained or gathered together by the coldnesse of the nyght and the ayre: & are thickened in the first region of the ayre next vnto the earth. This may and is wont to be inflamed or kyndled. And if it fynde a body whereunto it may cleaue, it abydeth in that vntill it be consumed. This fyre is cleare & shyning, and yet burneth not. The Grekes call it Polydeuces: and the Latines call it Castor & Pollux. It is accustomed to appeare vpon the shrowdes, and oftentimes is sene vpon the pykes of Soldiours in the armie of me of warre, as Plinie wyrteth. And this aswell by reason of continuall smoke, as also by the heate of muche people. Certayne it is, that smoke is none other thyng then fyre disperfed: as flame is an exhalation or enapozation that ryseth in maner of a smoke from a grosse or fat body: and at the tyme that it ryseth, being gathered together, is constrained into flame inuestured with fyre. This resplendence or shyning, is also often tymes seene not only in iourneying by lande, but also in sayling by ryuers. And when it appeareth on þe lande, it riseth of the smoke that is gathered together with the colde ayre of þe nyght: and on the bankes of ryuers, this smoke is gathered of the exhalations of the water. And consequently being kyndled, appeareth bryght and shyning. But now let vs come to the shippes that sayle by the sea, and to the Mariners that are accustomed to tempestes. To them therfore I saye, that that lyght or suche other lightes as they see, is engendred of the fumes and smokes of theyr shyppe with the heate of men couched close and neare together in a narowe place. And when a tempest ryseth, þe sayd smoke is thickened, prest together, and beate down by the wyndes, in suche sorte that being tossed from one syde to an other, it is sette on fyre by mouyng: and taketh holde sometyme on the shrowdes, and sometyme in the top, and somtyme also in the poupe or in the foreship: So that to see this lyght, or the same to appeare, is a naturall thyng, and not supernaturall.

C. liii.

When

wanderyng
fiere engens
wynd of exha-
lations and
vapours.

Castor and
Pollux.

what is smoke
or flame.

Exhalations
of the lande
and water.

Exhalations
or vapours
engendred in
shippes.

A thynnyng
flye.

A superstitious
opinion
of the Mary-
ners.

A lyf of the
fryer preachers.

psalm. lxxvii

Testimonie
of auncient
authors.

When capitaine Bezerra was at Corron in the Emperours Paue with his companie of Soldiours, he chaunced to be in a tempest and saue the sayd fyre of santelmo, whiche shortly after descended so lowe that the Capitayne myght easely come to it. And taking it in his cloke he founde it to be a lyttle droppe of water. Some haue thought it to be a certayne thynninge flye called Taros, which the Sea men sometyme see in a calme in the sommer season. And thus Santelmo appeared no more. The Capitaine remayned astonysht at the mockerie: and the other perceiued it to be no miracle. The opinion of the Mariners that affirmed it to be Santelmo, may ryse of saynt Erasmo Byshop of Naples: who (as they saye) not only in his lyfe tyme but also after his death, was a patron and helper of Mariners that called vpon hym in tempestes. This name of Erasmo, they of Naples call Cremo. And processe of tyme takyng a waye one. e. by the figure of sincope, remayned the name of Santermo. And y Spaniardes who neuer can long kepe any straunge vocable, cal it Santelmo, turnyng. e. into. l. Yet of this Santelmo wherof the Mariners speake, ther is neither scripture that maketh mention, nor authoritie that confirmeth it. I heare saye that the Fryers preachers had a religious man of commendable lyfe and good conuersation, named Fryer pero Gonzales, bozne in Calizia. And that in his lyfe tyme our Lorde dyd certayne myzacles by hym. And that this is he that thyneth & gyueth light in tempestes. No doubte but God worketh myzacles in his sayntes and by his Sayntes as sayeth Dauid. But yf this seruaunt of God was Pero Gonzales: howe then shal he be Santelmo? An other difficultie there is as touching this lyght. For there are wyrtynnes of more antiquitie then the lawe of grace and commynge of Chryste in fleshe, whiche geue testimonie hereof. For the Poet Virgyll in the seconde of his Aeneidos, wyrteth that this fyre appeared vppon the head of Iulius Ascanus. And Titus Liuius in his fyrste booke, affyrmeth that it appeared vpon the headde of seruius Tullius, the fyrte kynge of the Romaines.

pomponius Atticus saith, that Rome begunne to be builded in the thyrde yere of the thyrde Olimpiades. That is in the tenth yere of Ioathan kynge of the Iewes. And from the creation of the worlde. 3201. yeres: and. 729. yeres before Christ our sauour was borne. The kinges of Rome were seuen, and raigned. 244. yeres. Eusebius saith they raigned. 246. Seruius Tullius raigned. 44. yeres. Tarquinus superbus. 25. yeres after hym. So that discountyng these yeres, it shall appeare clearly as I say. And although the yeres were not discounted let them reade Diodorus siculus an auncient wypter, let them reade plutarchus, Aristotle, and other old auctours that haue wypten hereof. And they shall fynde that yf tempestes be neare vnto the sea, these fyres and lightes appeare in them. And appeared not onely to the Gentyles, but at this daye also appeare to the Turkes and Moores in tempestes. When only one lyght appeareth it is taken for an euyl signe. And hereof saide proprius thus.

The buyldyng of Rome.

The Roman kinges

Candida foelici soluit vela toro.

And why it is an euyl signe, this is the cause. That yf the tempest that ryseth be great, it choketh the exhala- tion: although yet by the parte leaste troubled it appeareth. When there are two lyghtes, is signifieth that in the ayre is great abundaunce of grosse humours. And is a token that it is sufficient to consume the matter of the tempest: so that the tempest begynneth to cease, & the grosse humour hath the masterye. But sometyme it chaunceth that two lyghtes appearyng, there maye be tempest: and one appearyng shall not be so greete. And oftentyme there is tempest without any light at al sene. The blynde Gentyllitie called these Castor and pollux, and placed them in heauen in the signe of Gemini.

One lyght or fyre is an euyl signe.

Two lyghtes:

Castor and pollux.

Nowe remayneth to aunswere to one obiection of the Mariners, who say, that neuer man that hath sene these fyres hath perished. To this I saye, that manye may se and haue sene these lightes: of whom some haue ben in peryll and some drowned. Notwithstanding, no man can affirme, that yf the drowned myght speake, they

An error of the Mar-ners.

The .2. part.

they would saye that they had seene them. Therfoze the
wyle Christian Mariner ought to haue a clear conscien-
ce, and to call foꝛ the helpe of almyghtie God, lyftynge vp
his eyes and handes vnto heauen, and saye with the

10 Cal. 12. 11. 11.

Prophet, Saluum me fac Deus, quoniam in-
trauerunt aquæ vsque ad anumam meam.

Save me oh my God, foꝛ waters
haue entred euen vnto
my soule.

¶ Here endeth the seconde parte.

The thynde parte, entreateth of the composition and vse of Instrumentes: and Rules for the Arte of Nauigation.

The first Chapiter of the number, Order, and names of the wyndes.

SO greatly esteemed was Eolus, kyng of the Eolas Ilandes, or Ilandes of Vulcane, for hauing reason and knowledge of the wyndes, that they of auncient tyme called hym the God and Lord of them. With no lesse consyderation, the prudent Mariner sought not to be ignoraunt of them, for as muche as the vniuersall benefite and commoditie of Nauigation consisteth therein. And to haue the better knowledge therof, you shall vnderstande that wynde is frute of the ayre, & vapour of the earth. The whiche by reason of his subtiltie, perceth the Ayre, striketh it, and enforceth it. Other saye, that wynde, is Ayre moued or tossed by the vehement influence of vapours of contrary qualitie. It is in Latin called Ventus, because it is vehement and violent. Whose force is so great that it ouerthroweth not onely heapes of stones or rockes, and casteth downe trees: but also disturbeth the Ayre and the earth, and moueth the Seas. There are foure principall wyndes whiche come from the foure cardinall or principal poyntes of the Horizon. We haue sayd that the Meridian circle cutteth the Horizon in two pointes: (that is) in the North & in the South. And the Equinoctiall cutteth it in other two: that is, in the East and the West. And from these foure pointes come these foure wyndes, wherof also the holy scripture maketh mention. These foure wyndes, thei in aun-
why Eolus was sayned God of wyndes.
what is wynde.
The foure principal or Cardinall of wyndes.
Lat. xliij.
East.
South.
West.

That

North.

Collaterall
wyndes.

Twelve
wyndes.

viii. whole
wyndes.

Deuision of
the Horizon
by the foure
pryncypall
wyndes.

viii. halfe
wyndes.

That from the North they named septentrio, or Aquilo, or Boreas, which we call North. To euery of these foure wyndes, they adioyned two collaterall wyndes in manner as foloweth. That that is from the East towarde the parte of the North where the Tropyke of Cancer aryseth or cometh forth, they called Vulturius. And that is from thence towarde the part of the South where ryseth the Tropyke of Capricorne, they called Eurus. Also that is from the west towarde the parte of the South, where the Tropyke of Capricorne goeth downe, they call Africus. And that that declineth to the North where the Tropyke of Cancer goeth downe, they call Caurus. The collaterall of the North and of the South, answer to the circumferences of the Polar circles. That that is from the North toward the Levant or East, they call Aquilo. And that declineth toward the West part, they call Circius. That is from the South towarde the East, Euro Auster. And toward the West Euro Africus. Thus many hath Aristotle in his Metheora. With these xii. wyndes they sayled in olde tyme, and made theyr compasse by them.

The Hydrographers of late dayes, and suche as are trauayled and exercised in saylyng, agree with the ancientes in the foure principall wyndes: Although they haue chaunged the names, calling the Levant or Orient, East. The Ponent or Occident, West. The Septentrionall, North: and the Meridionall, South. Betwene these foure wyndes, they deuide euery quarter of the Horizon into two halfes, made of the two nearest in this manner. Betwene the North and the East, taking name of them both, they name the Northeast. Betwene the East and the South, they name the Southeast: And betwene the South and the West, Southwest: betwene West and North, Northwest. These eyght wyndes in Pausigation they call whole wyndes.

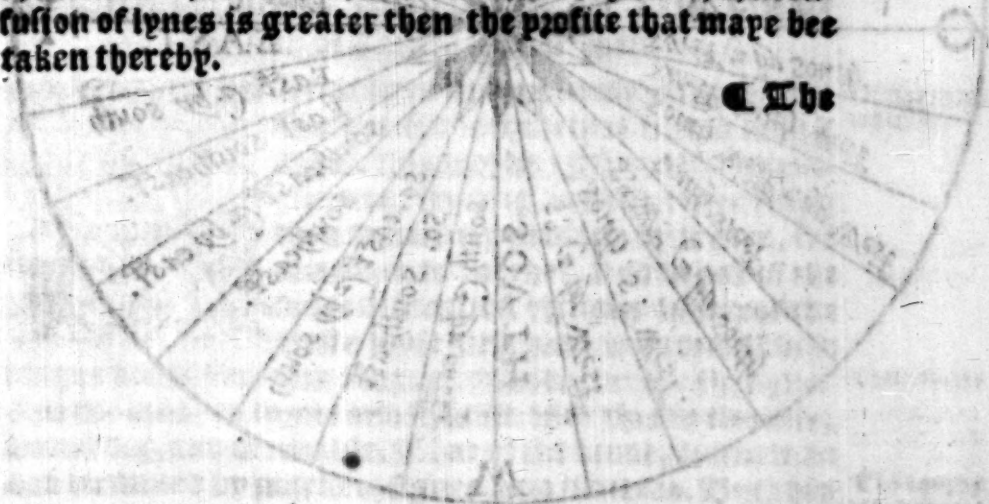
Betwene these eyght wyndes, they place other. viii. that are called halfe wyndes: whiche also are named of the two that are nearest vnto them. That that is betwene the North & Northeast, they call Northnortheast. Betwene

Between North-east and East, is North-east: & so south of the other. Besyde these halfe wyndes, they haue other whiche they call quarter wyndes. These take the name of the wyndes to the whiche they declyne: As if to the quarter from the North toward the North-east, they call it North and a quarter toward the North-east: that is North and by East. And that that is toward the North west, they call North and a quarter toward North-west. And so of the other as shalbe verified in the figure following. Whereof is gathered, that devidyng the eyghte principall wyndes into halfe wyndes, they are. 16. And every halfe wynde divided into two quarters, are in all 32. wyndes. Some haue bene so curious, or rather so baynely carefull and to precise, that they haue divided them into. 64. And in the cardes that they haue, the confusion of lynes is greater then the profite that maye bee taken thereby.

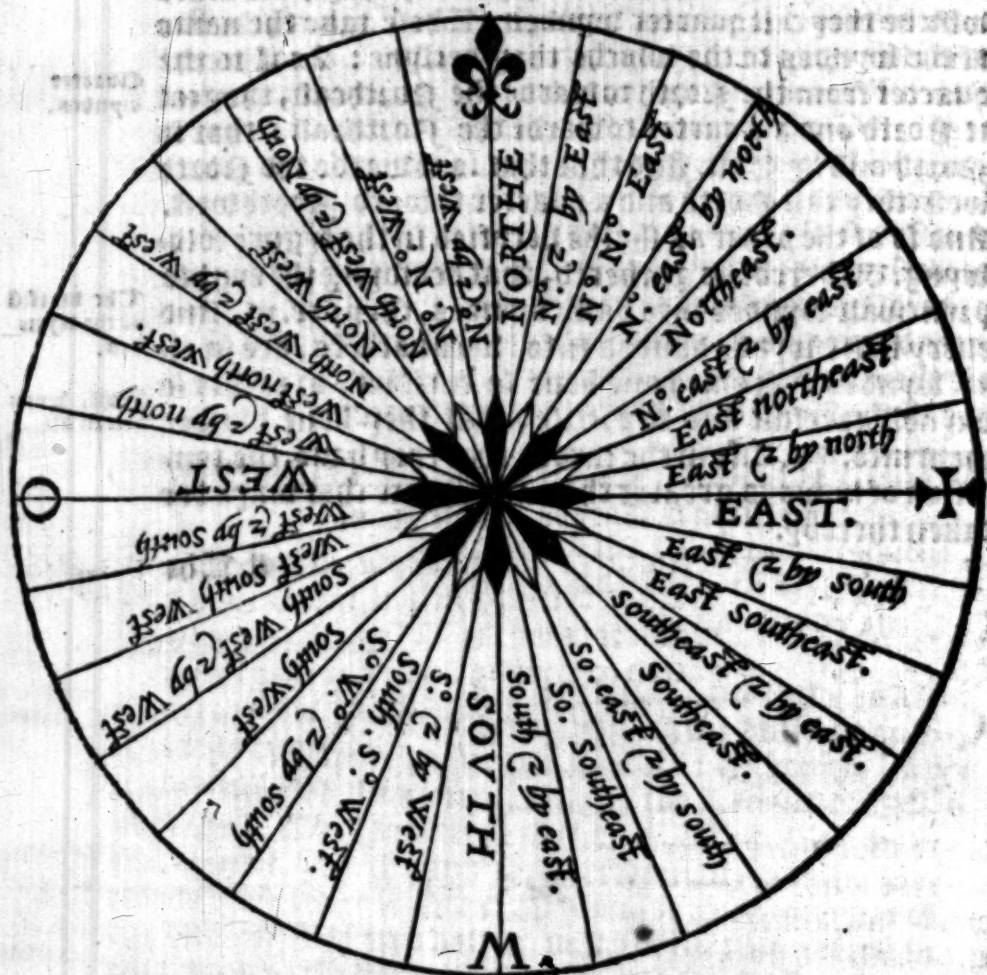
Quarter
wyndes.

The division
of the wyndes.

xxii. wyndes
in all.



The demonstration of the wyndes



These names do thei vse that saile by the Ocean sea. And it semeth that they had their beginning of the Almaine or Flemyshe tongue. For these nacions chieflie, saile in the Ocean. They that saile in the sea Mediterraneum, or Levant Sea, call them by other names, taking originall of the Tuscane or Italian tongue. Or els that they haue denomination of the partes from whence they come in respect of the Sea Mediterraneum. As the wynde called Græco, because it cometh from Grecia. And Libeico because

The names
of the wyndes
des in the Ita-
lian or Tus-
can tongue.

because it cometh from Libia: And Syroccho because it cometh from Syria. And beginning at the North, these are their names, Tramontana, Græco, Levante, Ponente, Maefiro. And that that is betwene Tramontana and Græco, they call Græco Tramontana. And that is betwene Græco & Levante they call Græco Levante. And that is betwene Levante & Syroccho, they call Levante Syroccho. And that is betwene Syroccho and Mezzo Iorno, they call Mezzo Iorno Syroccho. And so of the other: and the like of the quarters. And because they that sayle in the Ocean, are governed by altitudes, we will vse the names that they vse, where we intende to entreate of Altitudes. And euery man shall vse them as he lysteth, for as muche as the difference is not in the wyndes, but only in their names.

The seconde Chapiter of the composition of Cardes for the Sea.



Arriving to the ende desired (which is ^{What is navigation,} ~~navigation~~, the principal intent why I began this worke) I saye that Navigation or saylyng, is none other thing then to iourney or viage by water, fro one place to another. And is one of the foure difficultest thinges whereof the moste wyse king hath wytten. These viages doe differ from viages by lande, in thre thynges. For the lande is firme and stedfast. But this is fluxible, wauering, and moueable. That of the lande, is knowen and termined by markes, signes, and limittes. But this of the Sea, is vncerten and vnknowen. And if in viages by lande, there are hylls, mountaynes, rockes and craggye places, the Sea payeth the same seven fold with toymes and tempestes. Wherefore these viages beyng so difficulte, it shalbe hard to make the same be vnderstode by wordes or wytynge. The best explication or inuention that the wyttes of men haue founde for the manifestyng of this, is to geue the same paynted in a Carde. For the draughte or makynge whereof, it shall bee requisite to knowe twoo thynges. Wherof the one is, ^{Making of Cardes for the Sea,} ~~the~~ the

The wyndes
or lynes are
called thus:
both in the
Spanyshe
tongue.

the right position of places, or placing of countreys and coastes. The other is the distances that is from one place to an other. And so the Carde shal haue two descriptions. The one that aunswereth to the position, shalbe of the wyndes whiche the Mariners call lynes or poyntes of the compasse. And the other that aunswereth to the distances, shalbe the drawing and pointing of the coastes of the lande and of the Ilandes compassed with the sea. To paynte the wyndes or lynes, you must take skynnes of parchement or large paper, of such bignes as you will the carde to be. And in it drawe two ryght lynes with blacke inke, whiche in the myddest shal cut or deuide the selues in ryght angles: The one acrooyng to the length of the Carde, whiche shalbe East and West: And the other North and South. Upon the poynt where they cut, make a center: and vpon it, gyue a pziue or hydde circle whiche may occupie in maner the hole Carde. This circle, some make with leade that it may be easely put out. These two lynes, deuide the circle into four equal partes. And euery part of these, shal you deuide in the myddest with a picke or puncte. Then from one punct to an other, drawe a ryght Diametrall lyne with blacke inke: and so shal the circle remayne deuided with foure lines into eight equall partes whiche corresponde to the eight wyndes. In lyke maner shal you deuide euery of þ eight into two equall partes. And euery part of these is called a halfe wynde. Then drawe from euery punct to his opposite diametrally a ryght lyne of greene or azure. Like wyse shal you deuide euery halfe wynde in the circle, into two equal partes. And from these punctes whiche deuide the quarters, you shal drawe certayne ryght lynes with reed inke, whiche also shal passe by the center, whiche they call the mother compasse or chiefe compasse of the Carde, being in the myddest thereof. And so shal come furth from the center to the circumference. 32. lines whiche signifie the. 32. wyndes. Besyde these sayd lines, you shal make other equal distant to the, & of the self same colours, in this maner. Fro þ pointes of þ wyndes & half wyndes þ passe by þ center, drawe certē right lines þ passe

The mother
compasse of
the Carde.

These lynes
whiche sig-
nifie the 32.
wyndes.

not

not by the center, but be equally divided to those that passe by the center, and of the same colours and equidistance as are they that passe by the center. And as these lines concur together as well in the center as in the poyntes of the windes and halfe windes that are in the circumference of the circle, they shall leane or make there other. 16. compasses, every one with his. 32. wyndes. And yf h carde be very great, because the lynes may not go farre in sunder, yf you wyl make there other. 16. compasses, you muste make them betwene the one and the other of the sycke. 16. poyntes, where the quarters are made with they wyndes as we haue sayde. It is the custome for the most parte, to paynt vpon the center of these compasses a floure or a rose, with dyuers colours and golde, differencing the lines, and marking them with letters and other markes: especiallly signyng the North with a floure de luce, and the East with a crosse. This, besyde the distinction of the wyndes, serueth also for the garnysshing of the carde. And this for the moste parte is done after that the coaste is drawen. And thus much suffiseth for the draught of the wyndes.

The places
yng of many
compasses
in the
carde.

The floure
or rose of
the center.

The North

The situation of the places, portes and Ilandes in the Carde, accordyng to they proper differences, consisteth in the particuler and true relation of such as haue trauelyed them. And therfore for this purpose it shalbe nedefull to haue paterne of coastes, portes, & Ilandes, whiche muste be paynted in the Carde: And these of the best and most approued to be true. And not only to haue paterne well paynted, but also it shalbe necessarye to knowe the true altitudes of the Pole, of certen principall capes, portes, and famous Cities. This done, they must be translated into certen thynne papers and transparent, that may be seene through: and those of the best and finest that may be had, annoynting them with oyle of Line seede, & then drying them at the Sunne. Then take the paterne of Carde that is to be translated: And reach or stretch it forth vpon a table. Then put the transparent paper vpon the one side of the paterne where you wyl begyn. And the paper being made fast vpon the

The situati-
on of the
places. &c.

Translati-
on of the Carde
from one to
another.

paterne with plomettes of leade, or a litle towre that may easely be taken of, you shall in the transparent paper marke with a fine penne one East and West, and one North and South, or two, vpon those that are scene by the selfe same paper in the Waterne. And this is called tracynge or translatyng. In lyke maner shall you trace all the coastes, Hauens, Portes, Ilandes, Cities, Capes, and Ryuers, as appeareth in the Waterne, vnto the Rockes that come forth of the water, and the knownen bankes. And because this paper doth not suffice, you shall put thereto another, and moze as neede shall requyre. And begyn the translatiō in one where the other endeth, vntyll you haue translated all that you desyre: Not forgetting to make in euery one, lines of North & South, East and West, to serue for markes afterward. So that the line of North and South of the one paper may ioyne close and euen with the line of the North and South of the other paper that is ioyned to it by longitude.

And the paterne thus translated into these papers, you muste putte the ruled or lyned paper or papers vpon a playne, smooth, and stedfast table, where you shall stretche them forth, and make them fast with plomets or waightes, or naye them to the table by the sydes and coznerns with small nayles. Then vpon the sayde ruled paper, you shall put the paper that is translated from the paterne, in that syde or parte that is correspondent from the paterne to the ruled Carde, so that the lines of East and West, North and South of the translation, may be vpon the lines that aunswere to them in the ruled carde.

This paper thus made faste by the one syde or parte, you shall by the other syde (that it maye remayne in his place) put vnder it another fine paper, smoked or smyred on the nethermost parte (whiche is that that falleth vpon the ruled Carde) eyther with a lynke or with matches of pitche. These thus ordered and made faste one vpon another, you shall take a stiele bodkyn, or wyre

Some do
this only
with oyle.

with

with a smoothe and blunt poynt. that it rase not o2 boze not the paper: and with it shall you drawe, pressing vp, pon all the translation, and traceyng it with diligence and discretion, marking euer how much in it is translated from the paterne: sauing the wyndes o2 lines which the Maryners call Rumbos, and so shall remayne all the impression of the smoke in the ruled Carde. Upon the which with a fine penne you shal trace with ynke: which beyng drye, you shall with crumbes of breade make it cleane from all the smoke, and so shall the coast appeare in the Carde drawen with ynke.

The tracing
of the Carde

This done, then with a small penne shall you describe in the Carde all the places and names of the coast in that part where they are, and as they are seene in the paterne. And fyrst you must describe in red, the portes, principall capes, famous Cities, with other notable thynges: and all the residue in blacke. Then shall you drawe o2 paynt Cities, shippes, banners, and beastes, and also marke the regions and other notable thynges. Then with colours and golde shall you garnyshe and beautifie the Cities, Compasses, Shippes, and other partes of the Carde. Then shall you set forth the coastes with greene, by the shore o2 bankes of the landes, and make them sayre to syght with a lyttle saffron, o2 other wyse as shall seme beste. Lyke wyse shall you describe certen letters with theyr significacions in this maner.

The paynting
of the Carde.

B. for a Bay. C. for a Cape. A. for an Angle. I. o2 P. for an Ilande. M. for a Mountayne. P. for a Port. R. for a River.

Then in place where is more roome, o2 that is least occupied, you shall drawe two ryght lynes equallye distant: and the one no further from the other then halfe a synger o2 lyttle more, and so longe, that betwene them maye bee marked at the leaste three hundred leagues. And this the Maryners call the truncke o2 scale of leagues, & place it o2 vse it in this maner. They take with the compasse a hundred leagues of the truncke


The making
of the
truncke or
scale of the
leagues.

of the Carde or paterne that is translated. And they set them iustke betwene the two lines, and this space they part by the halfe, and reſte in. 50. And theſe deuided by the halfe, they reſte in. 25. And the. 25. beyng deuided, they reſte in. 12. leaques and a halfe. And marke them as appeareth in the demonſtration ſolowng.



The gradu-
ation of the
Carde.

The Carde beyng thus made, then to graduate it or de-
uide it into degrees, you muſt drawe three lines, which
make ryght angles with the line of Eaſt & Weſt, equi-
diſtaunte to the line of North and South: and they alſo
ſhalbe North and South. Theſe ſhalbe drawn by the
Ilandes of Aſores or Soria, or nearer to Spaine, or wher
the Carde ſhalbe leſſe occupied. And for this purpoſe,
the one line muſt be ſo farre diſtant from the other, that
in the two ſpaces which they make, may be marked, in
the one the degrees, and in the other the number of the,
conſoꝝmable to the graduation of the paterne: as the
numbers of degrees ſheue Eaſte and Weſte, with the
poꝝtes, capes, and coaſtes in theyꝝ proper altitudes.

And yf the carde haue no graduation, you ſhall take
in the compaſſe of the trunke of the leaques, ſeuē ſpa-
ces of. 12. leaques and a halfe, whiche are. 87. leaques &
a halfe. And theſe muſte be deuided into ſiue partes,
which come ſooꝝth at. 17. leaques and a halfe for a part.
And the ſoure partes taken in the compaſſe, make ſoure
degrees: and deuided into ſoure partes, euery part is a
degree, and is marked thus. 

The marke
of a degree.

And yf you wyll make the degrees at. 16. leaques & two
terces or moꝝe: you ſhall geue to euery degree ſo muche
ſpace as the leaques compꝛehende. This graduation
muſt be begun from ſome one cape, whoſe altitude of the
Pole is wel knowen. And the whole Carde beyng thus
graduate, you muſt begynne the number of the degrees
from the Equinoctiall line, one, two, three. &c. toward
the one Pole, and the lyke toward the other: ſo that

to

to the known Cape maye aunswere the number of his altitude. And so shall you do to the whole Carde. Also the Equinoctiall line shalbe marked in his proper place. And in lyke maner shal you marke the Tropicke accordyng as they are in the Sphere. But forasmuche as in Spayne, Cape Saint Vincent is the pyncepal: they begynne there to make graduation, and number it in. 37. degrees. And from thence towarde the Pole Arctike, the degrees do increase. And from thence towarde the Equinoctiall line they demynyshe: and from that line to the pole Antartike they increase agayne (as we haue sayde) as is conteyned in the Carde, and as appeareth in this demonstration folowynge.

Cape Saint
Vincent.

Increasing
and dimi-
nyshing of
the linea.



And if the paterne haue neyther leagues nor degrees, you must take or knowe the altitudes of two capes that are North and South, and the difference of the degrees

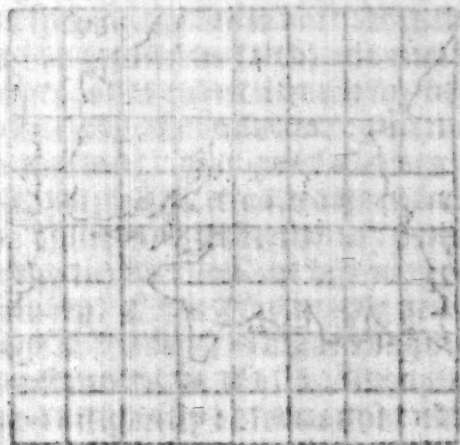
If the paterne haue
neither
leagues nor
degrees.

that is from the one cape to the other, by the whiche degrees they diuide the space of syttene leagues and a halfe for a degree. And accordyng to the opinion of the leagues of the roundnesse of the earth, as we haue sayde as touchyng this in the eightenth Chapter of the fyrst parte. In Spayne they vse with the compasse to take the space that is from Cape saynt Vincent, to the myddest of the greatest Ilande of Berlinga, which they accounte thre degrees: So that after syttene leagues and a halfe for a degree, they are. 52. leagues and a halfe. And so muche do they put in this space. Other put, 50. leagues accountyng after syttene leagues and two terces for a degree. And in this maner they make of leagues degrees, and of degrees leagues. The saylyng Cardes, haue no certain bygnesse limited them: because they onely represent the discription of the water and earth, and not the quantitie. And for this cause, some are paynted in great space, and other in lyttle. They that are in greate space, are moze manifest and moze pzeise. And these the Mariners call Cardes of the largest pzeise or draught. Some desyre rather to haue them in lesse space, because they are byleser and conteyne muche in lytle rounge. And these they call Cardes of the lesse pzeise. And if for any consideration aforesayde, you desyre to reduce any Carde from the greatest pzeise to the lesse, or contrarywise: you must paynt onely the coaste and Ilandes on a paper in maner as you dyd in the ruled Carde of the lynes or wyndes. I saye let it be drawen vpon paper for destroyng or raising the paterne. And when it is traced onely with inke, then vpon that draught shall you drawe certayne ryght lynes equidistaunt, made all by one compasse accordyng to the length of the Carde. And other lynes that may cut them in ryght angles and lykewise equidistaunt, and of the same compasse that the fyrst are. These two orders of lynes, shall deuide all the superficiall parte of the Carde into perfect squares or quadzatures. And it is to be noted that the nearer the lynes are ioyned together, and the squares the lesse, so muche the moze perfectly may it be reduced, and moze easely. When shall you take an other paper

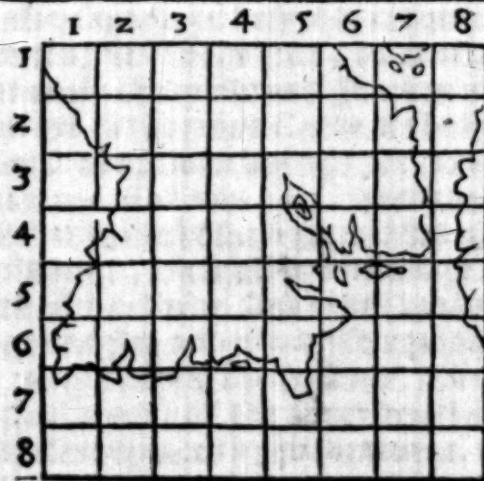
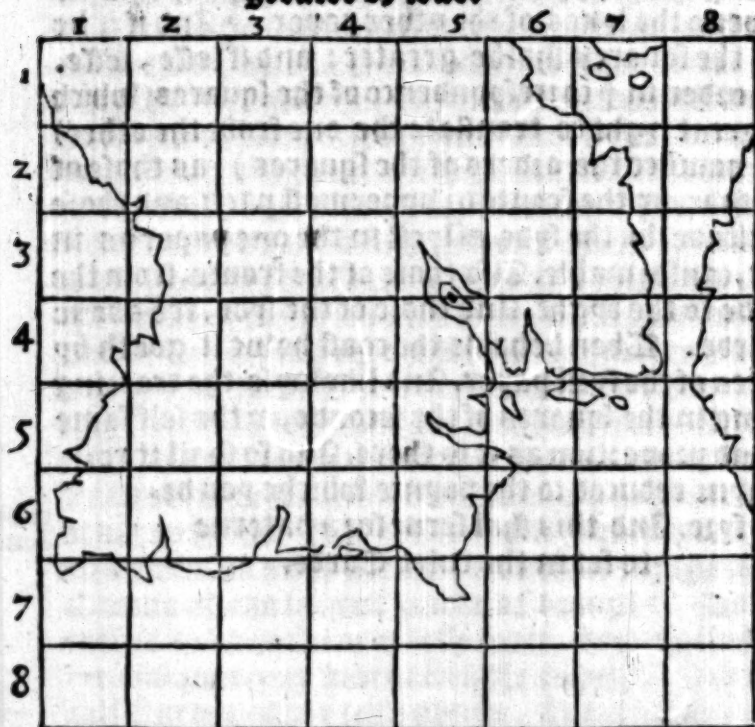
The quantitie
of cardes

The reducing of Car
des from a
bigger forme
to a lesse, or
the contrary

paper greater or lesse then the Carde, according to the
 poynt that you desyre to reduce it vnto. And in the length
 and breadth thereof, you shall deuyde so many spaces as
 are betwene the lynnes of the other paper. And if it be
 greater, the squares shalbe greater: and if lesse, lesse.
 To kepe order in the correspondencie of the squares (which
 shalbe a great lyght to translate the one from the other)
 you shall number the orders of the squares) as those of
 the longitude, by the fronte or vppermost part: and those
 of the latitude, by the syde, as well in the one paper as in
 the other, confor[m]able. Also those of the fronte, from the
 lefte hande to the ryght. And those of the syde, frō aboue
 downwarde. Then beholde the coast howe it goeth by
 the squares of the fyrst paper. And likewise the tracing
 or drawing in the squares of the seconde, in the self same
 order and propoztion as it is there. And so shall it re-
 mayne reduced to the poynte whiche you de-
 syre. And this shal serue for a paterne
 to set in the ruled Carde.



¶ Here foloweth the maner of translating the
Carde from one forme into another
greater or lesse.



¶ Here foloweth a similitude of the Spany-
ners Carde.

The Pilottes and Maryners neyther vse nor haue the knowledge to vse other Cardes then only these that are playne, as I haue sayde. The which, because they are not globous, sphericall, or rounde, are imperfecte, and sayle to shewe the true distaunces. For in howe muche they depart from the Equinoctiall toward which scener of the Poles, the Meridian lines are contrainte narrower and narrower: In suche maner, that yf two Cities or poyntes in the Equinoctiall, shoulde be distaunt of longitude. 60. leagues, and in the selfe same Meridians at 60. degrees from the Equinoctiall toward epyther of the Poles, shoulde be other two Cities or poyntes, they shoulde be distaunt in longitude but onely. 30. leagues. And for the better declaration and vnderstandpng hereof, I say that yf two shippes shoulde depart from the Equinoctiall, the one distaunt from the other a hundredth leagues by East and Weste, and that epyther of them shoulde sayle directly by his Meridian toward the North: then when epyther of them hath the Pole ouer his Horizon. 60. degrees, the one shalbe distaunt from the other only. 50. leagues by the paralelle of East and West: as appeareth by the plaine Cardes, that they haue the selfe same hundredth leagues. And beside these considerations, one errour byyngeth in an other: and so an other another. Wherof to speake any moze here, it shalbe to cer- ten Pilottes (as the Proverbe saith) not onely to geue musicke to the deafe, or to paynt a house for bynd men, but shal also be an endlesse confusion. Furthermoze it is necessarye to consider, that good Cardes ought to haue the Coastes, Portes, Cities, & other places, situate accordyng to the wyndes or lines therof, proportional- ly as they are in the world: and not by the wyndes that the compasse sheweth. This I say for the North-easting or North-westynge of the compasse (called the variation) as hereafter I wyll touche in the. v. Chapter. And lyke wyse shall you diligently obserue that the gradua- tion of the Carde shewe the same in theyr proper alti- tudes. The Cardes that lacke this, ought to be corre- ted

The playne
cardes are
imperfecte:

Example of
errour in the
plaine Cars
des.

The igno-
rance of
certaine Pys-
lots.

Good Car-
des.

The varia-
tion of the
compassse.

Altitudes.

In the nar-
row seas
they sayle
not by the
elevation of
the pole.

Corrected of
the sea card.

The West
Indies.

Charles the
first.

ted and amended by wyse and experie men: Sauynge
that in the Leuant sea (called Maré Mediterraneum) and
in the Chanell of Flaunders (called the narrow seas) it
is not inconuenient for the nauigation, that the portes
be marked in the Cardes by the wyndes, whiche the
compasse sheweth: soasmuche as they sayle not by the
altitudes of the Pole: Lyke wyse it shall not be incon-
uenient, but rather very necessary (to auoyde so manye
errours, of the whiche do flowe great daungions and
such a confusion) that your Maestie shoulde commaunde
certain learned Cosmographers, and experie in the arte
of saylyng, to verifie the altitudes of the Pole, that are
of Portes, Capes, Ilandes, and people by the coastes
of the Sea. And in lyke maner truely to descrybe the
coastes of the lande: Especiallve of the nauigation of
the West Indies or Mundo Nuevo, where it hath pleas-
ed God that so many nations and people haue receaued
the water of holy baptism, comming to the knowledge
of the true God: whereby the Chrysryan Emppre is
greatly amplified, besyde the greate ryches had by the
sayd Indies. And this hath God miraculously wrought
by the conquestes of your Maestie, in subduyng Infy-
dels and Gentyles to the obedience of the true Catho-
lyke sayth. Whereby not only God hath bene well pleas-
ed, but also your Maestie hath receaued perpetuall
same, with eternall renoume and immortall glorie to
your posteritie in worlde to come.

The. iiii. Chapter, of the vertue and propertie of the Lode stone, called in Latin Magnes, and in Spanyshe Pi- edrayman.

The



The Lode stone (as wyrteth Cardinal Cusanus) hath substance, vertue, and operation. His vertue is engendred of his substance, essence, or being. And of his essence and vertue proceedeth his operation and effecte: In such sorte, that this stone communicatynge his vertue to iron, by reason thereof, causeth the iron to moue, although betwene the one and the other be a cuppe or plate of syluer, or a table, or any other lyke thyng.

The attractyue or drawyng force of the Lode stone, causeth the nature of Iron to be and reste in it: And that so firmly and quietly, that beinge naturallie heauye and ponderous, it descendeth not, because his nature resteth not in hym selfe, but is vnite with the nature of the stone, which seemeth to extende it selfe, and as it were to caste forth a liuely spirite of enchauntege vertue. Insuche that (as we see by experience) by the sayde vnion, it not onely distributeth his vertue to one Iron, but that Iron likewise to another, and that other agayne to another: and so forth, vntyll of many rynges or lynkes of Iron be made a chayne.

Saint Augustine (as he wyrteth in his booke De Ciuitate Dei) dyd maruaile that he sawe an Iron moue it selfe vppon a vessell, by mouynge the Lode stone vnder the vessell.

It is called Magnes, because the inuentour or fynder therof was so named: Whose (as Plinie wyrteth) keepynge cattapill in Casse India, had his shoes soled with plates of Iron, and Iron nayles, such as they vse in Gasconis, and had in his hand a staffe with a pyke or hooke of Iron. And restyng hym selfe vppon a quantitie of this stone, coulde not remoue his feete, neither lyfte by his staffe. When stayng a while astonyshe, as ignoraunte of the cause, at the length began to perceaue the proper tie of the stone, & to vnderstande the attractyue vertue thereof. The colour of it differeth not from Iron.

And

The vertue, substance, & operation of the Lode stone.

Vertue attractyue.

Cusan applyeth this to the glasyfyng bodye of Christ, accordyng to these wordes. *I shall be exalted, I will drawe all vnto me.*

Why the Lode stone was called Magnes, & the fyndynge thereof.

Sundrye
kynnes of
the lodestone

The lode stone
of Spain

The lode stone
of Elua.

The lode stone
of Denmarke.

The lode stone
of Ethiopia.

Diuers opinions
of the lode stone.

The qualities
and properties
of the lode stone.

The partes
of the lode
stone.

What part of
the stone answereth
to the North &
South.

And was therefore called quicke Iron or luyng Iron. The beste kynne of these stones, is of Azurine or blew colour, as the Sea sometymes appeareth.

Of these are founde fyue kynnes or differences. The first is of Ethiopie. The seconde of Macedonie. The thyrde of Lechio in Boecia. The fourth of Troade neare to Alexandria: And the fift of Asia. But at this day, it is found in diuers other places. It is founde also in many places in Spayne: As in the hyll Morena neare vnto the village of Calera, beyng of the order of saint James in the prouince of Leon. Lyke wyse in a hyll of Moron in the territozie of the Cyle of Vrenia is great quantitie therof, & in diuers other places. The stone that we moste commonly vse, is of the Island of Elua of the Loyde of Pomblin: whiche I iudge to be better then that of Denmarke. This and the other, haue vertue to drawe iron vnto them. And trewe it is that Teanxedes wyrteth: That in Ethiopie is founde an other kynne of this stone, that putteth iron from it. Aueroes the commentator of Aristotle, denieth that Magnes draweth iron vnto it. But sayth that iron by his naturall inclination, both moue to the stone as to his naturall place, by a certayne qualitie which the stone impresseth in iron. And besyde this vertue and propertie that it hath to drawe iron vnto it, it hath also an other. And that is, that it geueth vnto iron vertue and powre to shewe the two pointes of the Horizon where it cutteth the Meridian, that is in the two wyndes of North and Southe. These vertues are found more intent in only two partes of the stone. And these are ener opposite or contrarie the one to the other. And so are they contrarie in operation. For iron touched with the one parte, and placed where it maye moue frely, wyl shewe the North. And an other iron touched with the other parte, wil shewe the South. Fyndyng this experience, may be knowen what part of the stone answereth to the North: which the Spaniers call the face of the stone: And lyke wyse of the Southe. This stone is so necessarye, that without it, Navigation shoulde bee imperfecte and vncertayne.

Because

because it geueth lyfe to the needle and compasse which leadeth and gupdeth the Pilotte that he may go certenly in the day, and not erre or wander in the nyght. Also it sheweth and directeth to compasse the worlde, and to know the wyndes. And therefore, forasmuch as the compasse is so necessary, we entende to shewe the order and maner howe it ought to be made. For it may chaunce to fayle or be lost in the vbiage.

The bles
making of
the Mary-
ners com-
passe.

The .iiii. Chapter, of the ma-

king of the Maryners compasse:

for Nauigation.



Make such past of paper wherof Cardes are made. And make in it a circle, of the quantitie of a spanne, or lytle more or lesse. In the which you shall paynt the .32. wyndes with theyr coloures, in suche order as we gaue in the fyrst and seconde Chapitule of the wyndes, and of the Cardes: Not forgetting to mark the North with a floure deluce, and the East with a crosse. And more then this may euery man garnyshe and beautifie the same as seemeth best to his phantasie. Vpon the lower or nether part of this paste, you must draw a line which shalbe directly vnder that of the North and South: whiche shalbe the marke for the settinge of the Irens and Stieles. Then shall you take wyre of iren or stiele of the byggenesse of a great pinne, or accordyng to the byggenesse of the roundenes of the paste, floure, rose or flye, as it may be called. This wyre muste be boorde double, so that euery of the partes maye be equalle as longe as the Diameter of the flye, and a quarter parte more. The endes or poyntes of these irens or stieles, muste be pinched together & made close, and open in the myddest the one from the other, vntyll the endes come to be equall with the extremities of the Diameter of the flye. And so shal the stieles remayne in maner in fourme of an egge. These wyres or irens must be made fast in the

The floure
deluce and
the crosse.

The flye,
floure or
rose of the
compasse.

The line of
North and
South.

The touch-
ing of the
needle with
the lode stone

The beas-
tyng of the
stone to
drawe out
his vertue.

the nether parte of the flye, so that their extremities,
endes, or poyntes, come precisely by the line of North
and South. And to fixe or fasten them so, they muste
be covered with a thynne paper glued, leauynge the
poyntes and endes vncouered. And these endes muste
be touched with the lode stone in this maner. The parte
that is vnder the floure deluce, muste be rubbed on that
parte of the stone that aunswereth to the North, as is
sayde in the Chapter before. And this shall suffice for
the perfection of the compasse. Yet some there be that
for superabundance do touche the other part of the iron
with that part of the stone that aunswereth to the south,
although it maye suffice to touche it onelye with the o-
ther parte. This touchyng of the iron with the stone,
that the demonstratiue or woorkyng vertue maye shewe
it selfe forth, must be done with geuyng certain strokes
with a hammer on that part of the stone wherewith the
iron muste be touched: That is to saye, in the North
parte or the South. And from these wyll come forth of
the stone certen beardes lyke small yscles, wheron you
shall rubbe the poynte of the iron as you wolde whette a
knyfe: And so shall certen of those beardes of the stone
cleane and sticke faste to the iron. And the irons thus
touched with the beardes cleauyng to them, you must
take a pycke or poynt of laton, of pyramidall sharpe, or
sceptle fourme, whiche is brode belowe and sharpe a-
boue towarde the poynt. This is made rounde or eight
square, as seemeth beste. And in the nether parte or
breadth, it must be boyled (but not thorough) with a bo-
rer which must also be of pyramidall fourme, and enter into
the myddeste of the sayde pyramidall pycke or poynte of
laton, vnto the myddest, or somewhat more. This Pi-
ramidall poynt (which the Maryners call the Capytell)
must be of heyght halfe a finger breadth, or accordyng
as the compasse shalbe, and muste be put through the
center of the flye, so that the poynte come forth on the
hygher parte thereof, and muste there be made faste and

well

well firste: When shall you take a rounde bore of wood, within the whiche the needle maye be, not touchynge the sydes of the same: And this must be of the heyght of the halfe Diameter of the compasse. And the grounde or bottom of therof muste be sette to it, as the couerynge of a bore, that it maye be easely taken of and put on, to haue often recourse to touche the Irons with the stone (whiche they call feedyng) when neede shalbe, that the vertue of the compasse fayle not. Also in the myddest of the grounde or floore of the bore, you must set a sharpe poynt or pricke made of a wyze of laton: This muste stande ryght vp. And vpon the pricke or poynte thereof, you shall sette the bozed hole of the Capitell. And that the wynd enter not aboue, you shall couer the bore with a glasse. And thus beyng touched with the stone and set vpon the poynte, it shall shewe the true parte of the North, and consequentye all the other wyndes.

The bore of
the compasse

Featyrng the
needle with
the stone.

And here is to be noted, that after the Irons or needle of the compasse hath ben touched in anye of these maners, yf you bryng the North parte of the stone to the North of the needle or compasse: then wyl the North of the needle come to it. And yf you bryng the North parte of the stone to the South parte of the needle, it wyl flee from it.

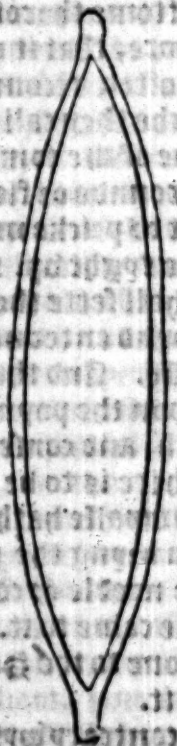
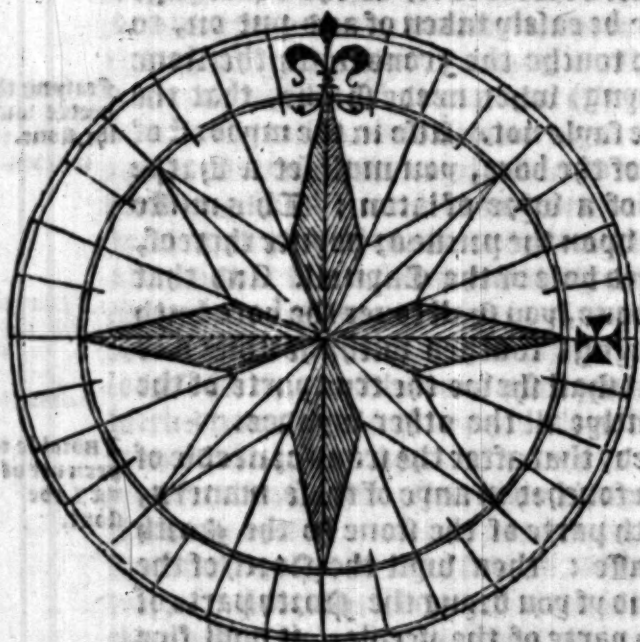
A notable ex-
periment of
the Lode
Stone.

And contrarywyse, yf you bryng the South parte of the stone to the South of the needle, it wyl come to it: and yf to the North, it wyl flee from it. This is vnderstande, the needle or compasse standynge as it shoulde be. And this also is a good signe to knowe whiche is the North parte and South parte of the stone.

Moreover, this bore muste be putte within another bore, in the whiche it muste hange vpon two circles of laton, annexed the one within the other: whiche serue that the compasse wape not or hange not towarde the one syde or the other, althoughe the shyppe swaye. And this bore also muste haue his couer of woodde, to kepe the other. You shall lykewyse obserue that the poynte of the Capitell and the hole thereof, and also the point or pricke vpon the which it resteth, be vpryght,

and

and lyke wyse the Rose, that it decline not to one parte
or other. And yf it be quicker then it ought to be, then
make the point that it goeth vpon some what blunter.



The. v. Chapter, of the effecte

or propertie that the compasse hath to

Northeastynge, or Northwestynge

wherby is knowen the

variation of the

compass.

The variati
on of the
compasse



Any and diuers are the opinions that
I haue harde, and also read in certein
wyters of later dayes, as touchynge
the Northeastynge, and Northwestynge
of the compasse. And yet mee see-
meth that none doeth touche the
pricke, and fewe the whyte. Wher
call it Northeastynge, when the
needle

needle sheweth oꝛ poynteth from the North (whiche is his true marke) toward the Northeast. And Northwesterlyng, when from the North it declineth toward North-west. For the better vnderstandyng of these differences whereby the needles differ oꝛ varie from the Pole, you must (being in the Meridian where the compasses shew the pole) imagen a poynt vnder the pole of the worlde.

And this poynt to be without all the heauens conteyned vnder the fyrst mouable. The whiche poynt oꝛ parte of heauen, hath a vertue attractiue that draweth vnto it iren touched with the parte of the lode stone correspondent to that, certayne parte of heauen imagined without oꝛ vnder all the heauens moued by the fyrst mouable. For if it were imagined to be moued within any of the moued heauens, then the attractiue poynte by the mouyng of the fyrst mouable, and consequently the compass, should make the selfe same mouing in. 24. houres, whiche is neuer scene. And therfore, this poynt is not in the moueable heauens, neyther in the pole. For if it were in it, the compass should not varie Northeasting oꝛ Northwestyng. Therfore the cause of Northeasting and Northwestyng, oꝛ departing from the pole of the worlde, is, that being in the sayde Meridian, the attractiue poynt & the pole, are in the selfe same oꝛ in one Meridian: And the compass shewyng the attractiue poynt, sheweth directly the pole. And departing from the same Meridian toward the East (the worlde being rounde) the pole of the worlde remayneth to vs on the left hande: And the point of the attractiue vertue, shalbe on the ryght hand, which is toward the Northeast wynde. And in howe muche more we shall sayle toward the East, the distaunce shall appeare greater vnto vs vntill we come vnto the. 90. degrees: And there shalbe the most and greatest Northeasting. And passing from thence further soꝛwarde, it shall appeare vnto vs that the attractiue poynt commeth nearer and nearer vnto the Meridian lyne: And so muche shal the compass go betteryng oꝛ amendyng the Northeasting, vntyll it returne to the selfe same Meridian in the opposite oꝛ contrarie parte from whence they came

The poynt attractiue is imagined vnder the pole of the worlde

The cause of the variatyn of the compass

Departinge of the pole fro the point attractiue.

The greatest northeasting

or where they began. And then shall the attractive point be to them directly vpon or against the pole of the world: And the compasse shall shewe or poynthe directly toward it. And agayne passynge further southwarde, the pole of the world shall remayne to the ryght hande: and the poynthe attractive to the lefte hande. And so shall the compasse begynne Northwestyng, increasynge it vntyll it come from thence to the. 90. degrees: and there shall be the moste of his Northwestyng. For tournyng towarde the Meridian from the attractive poynthe, it shall go amēdyng or betteryng vntyll it retourne to the selfe same Meridian from whence it departed. And there shall the compasse shewe the pole of the world directly by or ouer against the attractive poynthe, whiche is perpendicularly vnder the pole. And if from thence they should tourne to passe towarde the West, the pole should rest to the right hande, and the attractive poynthe to the lefte: And so shall the variatio be to the Northeast. And this is the cause of the Northeastyng and Northwestyng, or variatio of the compasse. Also it is not to be vnderstode that this north-eastyng and Northwestyng is vniforme as is the departing (or according to the departure) from the Meridian where the compasse sheweth perfectly: but rather before at the begynnyng of the departing from the sayde Meridian, it maketh difference or variation in a certayn quantitie. And the increase that is afterwarde, is little: And so muche the lesse, in howe muche the moze the departing is from the sayd Meridian. For it is a passion of circles deuidyng or cutting them selues in the sphere. So that these differences are, as are they of the declinations of the Sunne: Whiche neare vnto the Equinoctials, are great, & neare to the Solstitials, are little. All the which shall evidently appeare in the figure folowynge: whiche is a circle deuided by two Diameters into foure equal partes, cutting them selues in the center in ryght angles. And from the center poynthe (called the pole) cometh south a moueable Meridian. And in it goeth a compasse lyke wyse moueable about the circle. The attractive poynthe is somewhat distaunt from the pole of the world. And fro it, cometh

The greatest
Northwestyng.

The attractive
poynthe is
vnder the
pole.

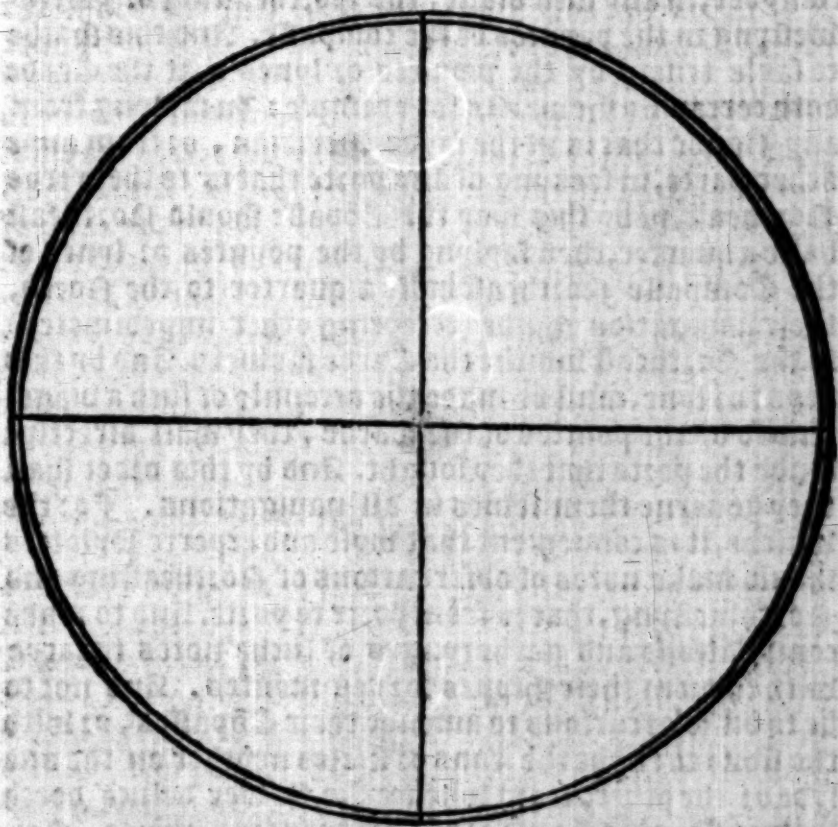
The North-
eastyng and
Northwest-
yng is not
vniforme.

The declina-
tion of the
Sunne.

it, cometh forth a threde whiche must ever passe by the North and South of the compasse. And the compasse being in the Meridian of the point attractive that passeth by the pole, shall shewe the pole. And without that, shall go Northeastynge or Northwestynge, so varying and departing from the true Meridian that cometh forth of the pole of the worlde. It is the opinion of some mariners, that the Meridian where the compasse sheweth directly the pole, passeth by the Ilande of Sancta Maria. And other saye, by the Ilande of Cuervo in the Afores.

The meridian that sheweth the pole.

Demonstration of Northeastynge.



And where as the inconuenience is manifest & notorious, the same must be remedied with prudence & tyme: And not to be neglygent in the blage. But ever to vse and obserue experience, moze profitable then the subtilie

Experience the grounds of reason.

Aduertise-
ments to
Pilottes.

Exemple of
saylyng.

The varia-
tion of the
compasse.

and curious questions of the secrete searchers of natural
thynges without experience, whereof reason taketh his
p[ri]ncipall ground. And therfore the wyse Pilotte ought
to knowe by experience (as many of them doe not) howe
much a good cōpasse doth varie Northeasting o[er] North-
westing from one port to an other. So that to knowe
howe much the compasse doth varie, Northeasting o[er]
Northwesting from one place to an other (as to saye,
halfe a quarter o[er] moze o[er] lesse in quantitie as they are
distaunt from the sayde Meridian where the compasses
shewe the pole) shall in the nauigatio[n] take heed and wel
consyder, in any such viage, the Northeasting o[er] North-
westing in the poyntes of the compasse. And this shalbe
to saye truly by the poyntes o[er] lynes that the Carde
doth certaynly shewe. As fo[r] example: In saylyng from
any Ilande that is in the sayde Meridian, o[er] from any
other parte, in seeking of any porte that is to them true
Northeast, yf by this way the Cōpasse should Northeast
halfe a quarter, then saylyng by the poyntes o[er] lynes of
the Compasse Northeast halfe a quarter to the North,
their nauigation shalbe (excepting other impedimētes)
to the Northeast whiche the Carde sheweth. And by this
poynt o[er] lyne, must be made the accounte of such a viage.
And so by the pointes of the Carde, they shall directl[y]
fynde the porte that they sought. And by this order shall
they gouerne them selues in all nauigations. Fo[r] the
whiche, it is conuenient that wyse and experte Pylottes
should make notes of obseruations of Northeasting and
Northwesting, that is from porte to porte. And to make
comptilations and gatherynge of suche notes to carpe
with them in their shippes fo[r] regimētes. And not to
be to busie o[er] curious to amende their Cōpasses, o[er] with
the stone to rubbe the irons o[er] stieles neyther on the one
syde o[er] the other, from whence the flower deluce doeth
shewe: Fo[r] this should cause many inconueniēces. Nei-
ther ought they to admitte in their Cardes two gradua-
tions: Especially fo[r] that to knowe howe much in euery
place the Compasse doth go asyde o[er] varie from the true
Meridian, may easely be made an instrument to shewe
the same

the same by the Sunne in the daye, and by the starres in the nyght.

The. vi. Chapiter of the introduction and principles of the Arte of Nauigation.



As as muche as nowe we haue the guide, whiche is the compasse, it is conuenient to enter into the waye: which is Nauigation. The which (as we haue sayde) is to go or passe by water from one place to an other. And this presupposed, I saye that he that desyeth to attempte Nauigations, muste knowe

two thynges whiche the Carde shal shew hym. The one is, by what point or lyne he ought to sayle. And this, shal the lynnes of the saylyng Carde shewe him. The other is, the leagues of the distaunce: And this shal the scale or trunk of the leagues shewe. Takyng with a compasse the distaunce of two places, and applying it to the scale. The knowledge of these two thynges, ought the Pylote to beare in memory. And to put them in effecte, ought to directe his foreshypppe to the selfe same wynde which the compasse doeth shewe. For the distaunce, he ought to knowe howe muche the shyppe goeth dayly: well considering and obseruing the wynde, tydes, currentes, and all suche thynges as may be with hym or against hym. And accordyng hereunto, he shal knowe howe muche he hath gone, and what remayneth for hym to go: and whether he be farre of or neare vnto the place whither he intende to sayle: The whiche in nauigation, is the ende desyed. And because this estimation or computation can not be iust and exacte, especially in a long blage or in lōg tyme, it shalbe conuenient that we rectifie or amende it, knowyng the place where the shyp is on the superficiall parte of the water, by the place that answereth to it in heauen. This place of beauen, is known by the altitude of the pole. And by the altitude of the pole, is known

In nauigation what is chiefly to be considered.

The distace

The altitude of the pole and Equinoctiall.

The method:
an altitude.

To knowe
the place of
heauen.

To knowe the
waye of the
biage.

Rules to
knowe the al-
titudes.

Longitude &
latitude.

Variation of
degrees.

altitude of the Equinoctiall. And by the altitude of the Equinoctiall and declination of the Sunne, is knowen the Meridian altitude. And contrarpe wyse, knowynge the Meridian altitude and declination of the Sunne, is knowen the altitude of the Equinoctiall: and by the Equinoctial the pole: and by the altitude of the pole, is knowen the latitude. And this is the place that is desyred to be knowen. But so; as muche as the heauen is moueable from the East to the West, this place is not knowen as a certen poynte. But is knowen as a lyne o; paralele at a certen distance from the Equinoctiall. And it is not knowen in what poynt of this paralele the shyppe is, by the altitudes that are taken from heauen: But it is knowen by the line that the shyp hath gone, as we wyll further declare in the. xlii. Chapter of making a poynte o; pycke in the Carde. And in this maner you shall haue rectified the waye that the shyppe hath gone: and consequently the waye that it hath yet to goe.

And so; as much as these altitudes are so profitable and necessary, it shalbe nedefull to gyue rules howe we may vse them to our mooste commoditie. And so; this, is presupposed to know, that all places situate on the superficiall parte of the earth and water, either they are vnder one Meridian, so that they haue, o; where they haue one selfe same longitude, and differ in latitude, o; are in one paralele where they haue one self same latitude, and differ in longitude: o; are in diuers Meridians and paraleles where they differ in longitude and latitude. And I saye, that if they haue one self same longitude, they sayle from the one to the other by the lyne of North & South. And howe many degrees doth varye the altitude of the pole, and of the Equinoctial in heauen, so many degrees haue they gonne by Sea o; by lande. If two places haue one selfe same latitude, they passe from the one to the other by the lyne of East and West. And in suche maner of biage, the altitudes do not profite vs, because there is no variation. If they differ o; varie in longitude and latitude, they sayle from the one to the other by some of the other lynes. But there are moze degrees that co; responde

responde to the waye that the hypppe maketh, then the degrees that varie the altitudes of the Equinoctiall & the pole. And this difference shalbe greater, in howe muche the lyne shall be neare to East and West. And howe muche it shall be neare to North and South, it shall be lesse. Of the degrees, or leagues that aunswere to euery degree of the variation of the altitude, we wyl en-
treate hereafter in the. xii. Chapter.

These altitudes are knowne many wayes: but especially by two: As, by the Meridian altitude and declination of the Sunne (as we haue sayde) is knowne the altitude of the Equinoctiall: and by it, the altitude of the pole. The seconde waye, they are knowne by the altitude of some fyfte starre of those that are not hydde. And among many other, the North Starre is taken because it is nearest to the pole. To knowe the altitudes by the Sunne, thre thynges are necessary. That is to saye, an instrument, the declination of the Sunne, and rules.

The instrument to knowe the Meridian altitude, shalbe the Astrolabe because it is moste commodious for this purpose: whereof we wyl intreate in the Chapter following. The declination of the Sunne, (whiche is to take it away, or to ioine it with the Meridian altitude,) we haue already described in the thyrde Chapter of the seconde parte. The rules to knowe when the declinations must be ioined with the Meridian altitude, or taken from it, we wyl geue in the. viii. Chapter. To knowe the altitudes of the pole by the altitudes of the North starre two thynges are necessary. That is: an instrument and rules. The instrument wherewith the Mariners are accustomed to take the altitudes of the North, they call Bolestilia: whiche is a crosse staffe, wherof we wyl wyte
hereafter in the nynth Chapter. And the rules

of the tourne or compasse whiche the North starre maketh about the pole, we
wyl declare in the tenth
Chapter.

3. ill.

The

How the altitudes are knowne.

The fyfte starre.

The North starre.
To knowe the altitudes by the sunne

The meridian an altitude.

The declination of the sunne.
The altitudes of the pole.

Jacobus Barth.

The .vii. Chapiter of the makynge and vse of the Astrolabe, with the whiche the Mariners take the altitudes of the Sunne.



The rectify-
ing of the
Astrolabe.

The threde
of plomet.

The lynen
vertical and
horizontall.

Take a plate of copper or laton (whiche
for this purpose is better then any o-
ther metall) of the bygnesse that you
desyre to make the Astrolabe. And is
commonly of the bygnesse of a spanne
the Diameter. And let it be of the thic-
nesse of half a finger at the least: For
the weightier that it shalbe, so muche
shall it be moze steddie to take the altitude. This plate
must be made rounde by a cyrcle, leauing comyng forth
of the circle, a corner in the whiche you shall put a ryng
or handle with a hole wherby you may hange the Astro-
laby by a threed or lyne to take the altitude. After it is
thus made with the ryng or handle annered therto, make
it byght and smothe polished on both sydes, and all of
one equall thychkenesse that one syde be not heuier then
an other: whiche you shall trie in this maner. Hange the
plate by the ryng or hole that you haue made: And from
the same hole, hange a plomet of leade fastened to a beare
or lyne threed of sylke. The Astrolabe thus hangynge
free and at libertie with the plomet, if then the threed
fall vpon the center of the Astrolabe, it is well. But yf
the threed do leane or swarue to the one syde or the o-
ther from the center, then is that syde thicker and heuier
then the other: and must therfoze be made thynner untill
the threed fall iustly vpon the center. This done, make
a circle vpon the sayde center, a little within the circum-
ference of the Astrolabe. Then drawe a Diameter fro
the center of the hole in the which the ryng or handle is,
vnto the center of the Astrolabe, trauerling or ouerth-
warting the hole circle. And this shalbe called the lyne
of the Zenith or verticall poynt: whiche also shalbe cutte
with an other Diameter vpon the center, makynge right
lynys with it. And this Diameter shalbe called the Ho-
rizon.

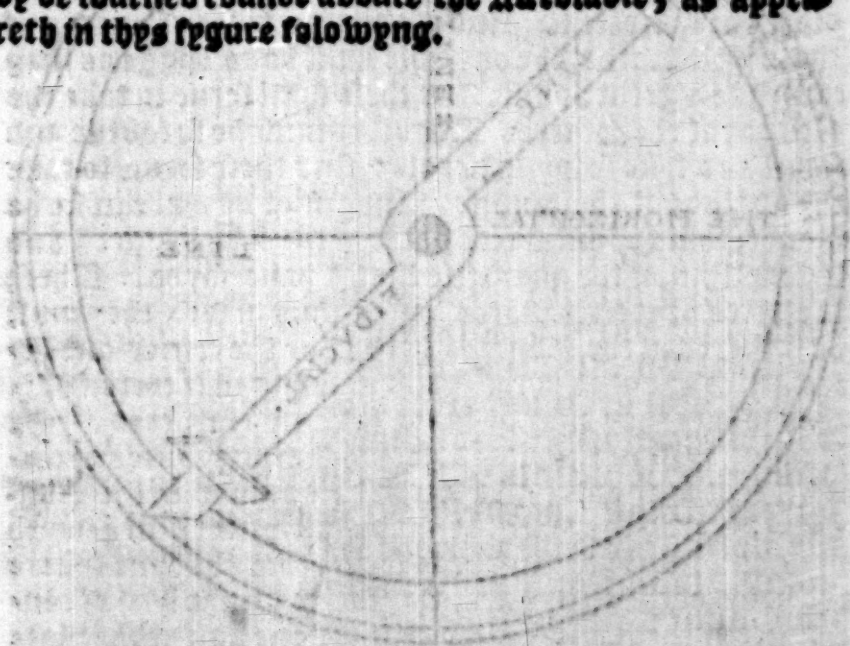
horizontall lyne. These two Diameters shall deuise the
 cycele into foure equall partes. After this, you shall make
 an other circle so muche moze within the second, that be-
 twene the circumferences of both the circles, may be co-
 teyned the numbers of the degrees. Then (the Astrola-
 bie hangyng befoze you) you shall deuise the one parte
 (being the superioz and left parte) fyrst into thre equall
 partes. And euery part shall conteyne. 30. degrees. Then
 shall you deuyde euery parte of these into other thre e-
 quall partes. And they shall conteyne ten degree. s. And
 euery of these deuyde into two partes, and they shall con-
 teyne fyue degrees. This done, put a ruler vpon the cen-
 ter of the Astrolabie, applyng it to euery of the poyntes
 that deuyde the sayde partes, And drawe certayne lynes
 that passe from the circumference of the first circle vnto
 the lesse circumference. And in the spaces of the lesse
 cycele, wypte the numbers of the degrees: Begynnyng
 in the Horizontall lyne. And in that space put fyue, and
 in the seconde tenne, and so forth of the other, vntyll
 the. 90. degrees ende in the lyne of the Zenith. Then
 shall you deuise the spaces that are betwene the fyrste
 Circle and the seconde, euery space into fyue, whiche
 shall make the. 90. degrees. The Astrolabie thus made,
 you shall make the Alhidada or Labell. For the whiche,
 you shall take a plate of laton of the breadth of scarcelye
 two fyngers, and as thicke as the Astrolabie: also as
 long as the Diameter of the Astrolabie. And make a line
 in the myddest therof by the longitude. In the myddest
 of this lyne, make a circle so great, that it may touche in
 the sydes of the plate. Then cut of this plate on the one
 syde, that that it hath from the lyne to the ryght hande:
 And on the other syde, that that it hath from the lyne to
 the left hande, leauyng the cycele whole. This line that
 shall passe by the center of the cycele, is called Linea fidu-
 cia (that is) the lyne of confidence: whiche is that that
 sheweth in the degrees, the altitude that is taken. Then
 shall you take away the endes or corners of the Alhidada
 that are without the line, so that you touche not the line.
 This done, you shall make two lyttle cyllyng or rayseb
 tablettes

The Alhidada
 or Labell of the
 Astrolabie.

The holes of
the Alhidada

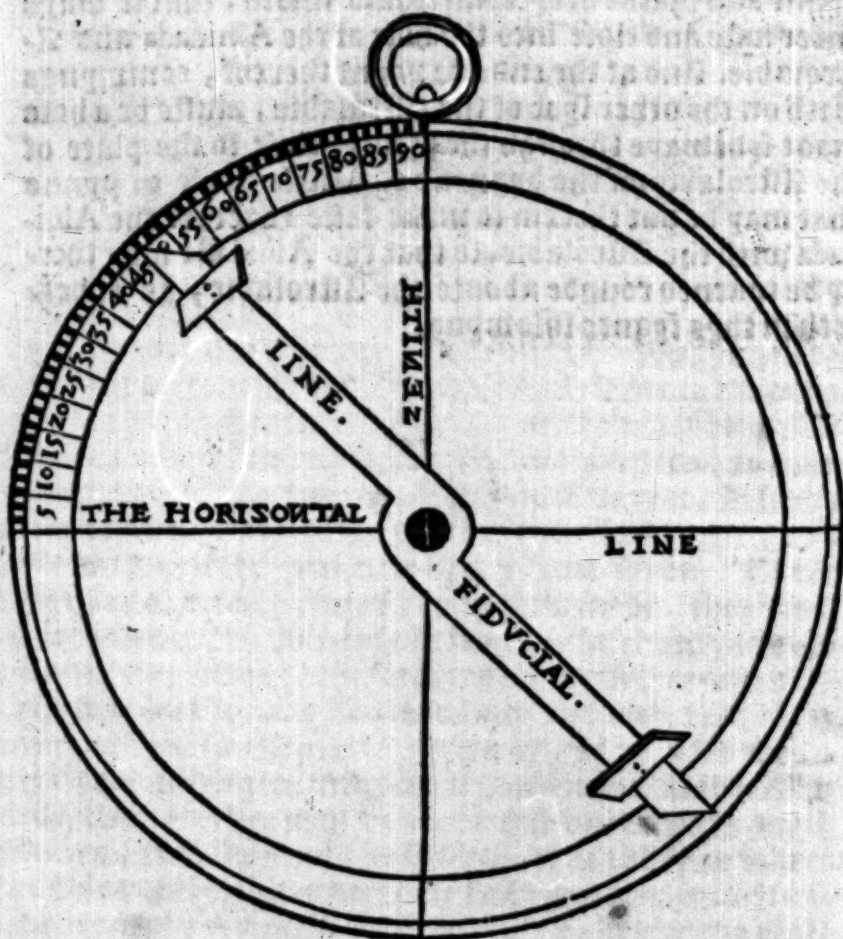
tablettes or plates of the same metall wherof the Astrolabie is made, & of the selfe same thynknesse that is the Alhidada, or little lesse: and of the breadth of the Diameter of the circle of the Alhidada. And let the be a thumbe in heyght or breadth. In the myddest of these two plates by the height, you shall make a lyne. When these are made equall and al theyr angles ryght, in euery line of these that you haue made, you shall also make two holes equally distant from the sydes or edges of the sayde plates or tablettes. And of the two holes of euery of the se lytle plates, the one hole must be as bygge as may conteyne a great pynne. And these shall serue to take the altitude of the Starres. The other must be so subtile and small as a fyne solwynge neede: And these serue to take the altitude of the Sunne. They must be made in suche maner, that the outwarde parte of them be bygger, and lesse within, of the quantitie that I haue sayde. These tablettes or erected plates beyng thus made, they must be sothered in the Alhidada betweene the center and extremities or endes of the same: makynge in it certen notches where they may be made faste and sothered. And leauynge fyrst in the plates, certen sharpe poyntes or corners that may enter into certen holes made in the Alhidada, wherby they may be made fast vnderneath wyth pynnes. And they must be so sette, that the lyne where the holes of the plates are, may fall vpon the lyne of confidence of the Alhidada. So that the one half of the plate be set vpon the Alhidada, and the other halfe without it or at large. In lyke maner shall you take good aduertisment that the great hole of the one plate, stand directly agaynst the great hole of the other plate, and be nothing at all awrye. This done, you shall boze the Astrolabie through by the center: makynge a very rounde hole that may haue in the myddest of it the center of the Astrolabie. This hole shall be of the bygnesse of a goose quylle. And the lyke shall you make in the center of the cyrcle of the Alhidada. When shall you make a pynne or nayle of the same lator: The whiche on the vpper parte of the Alhidada maye haue a playne and rounde head. This pynne

pyne also shalbe very rounde and smoth, that it maye enter inke and close into the hole of the Alhidada and Astrolabie. And at the ende of poynt thereof, commynge forth on the other syde of the Astrolabie, muste be a hole made syde wyse thzough the pyne, close to the plate of the Astrolabie, of the bygnesse of a little nayle or pyne that may be put therein to make faste together the Alhidada with the Astrolabie, so that the Alhidada may thereby be tourned rounde aboute the Astrolabie, as appeareth in thys fygure folowynge.



The laste specification of the alhidada, is that it be made of a rounde plate of wood or metal, and that it be of the same diameter as the astrolabe. The alhidada is to be attached to the center of the astrolabe by a small pin or nail, which passes through the alhidada and the astrolabe. The alhidada is to be made of a rounde plate of wood or metal, and that it be of the same diameter as the astrolabe. The alhidada is to be attached to the center of the astrolabe by a small pin or nail, which passes through the alhidada and the astrolabe.

To see the
alhidada
the alhidada



To take the
altitude of
the Sunne.

To take the altitude of the Sunne, hange by the Astrolabe by the ryng: and set the Alhidada against the Sunne. And rayse it or put it downe in the quarter that is graduate, vntyll the beames of the Sunne enter in by the lyttle hole of the tablet or raysted plate, and pzeypely by the other lyttle hole of the other tablet. Then looke vppon the lyne of confydence. And howe manye degrees it sheweth in the quarter that is graduate (begynnynge frō the Horizontall lyne) so many degrees of height hath the Sunne. In lyke maner shall you doe to take the altitude of any other Starre lookynge thozough the greate holes,

holes, because this may hardely be scene by the lyttle holes.

The. viii. Chapter of the Definition

of the Altitudes. And howe the Altitudes of the pole may well be knowne by the Peridian altitude and declination of the Sunne.

It is conuenient to define the Altitude before we geue rules of the vse thereof. The Altitude of the Sunne or the Moone, or of any other Starre, is the distaunce that is betwene it & the Horizon. And this ought to be accompted by the degrees of the greater cyrcle whiche passeth by the Zenith and by the center of the Sunne or of the Moone, or of the Starre vnto the Horizon. And the degrees that are from the Horizon to the Starre or to the Sunne, that is the Altitude: And the degrees that are from the center of the Starre or of the Sunne vnto the Zenith, is called the complement or supplement of the Altitude. The altitude of the equinoctiall, is euer counted by the Peridian. And the degrees of the Peridian that are betwene the Equinoctiall and the Horizon, is the altitude of the Equinoctiall. And other so many, are they that are from the Zenith to the pole. For the Altitude of the Equinoctiall, is equall to the complement of the Altitude of the pole. The degrees of the Peridian that are betwene the Equinoctiall and the Zenith, is called the complement of the Altitude of the Equinoctiall: and is equal to the altitude of the pole. And although we haue defined the altitude in generall, yet shall we only profite our selues by the Peridionall altitude of the Sunne. The Peridian altitude, is the greatest altitude that the Sunne hath euery daye. And this shalbe when the center of the Sunne is in the Peridian. And the arke of the Peridian that is betwene the Horizon and the Sunne, is the Peridian altitude. So that when we saye the altitude of the Sunne is taken, it is vnder

what is the altitude of planetes or starres.

The complement of altitude.

from the zenith to the pole.

The Peridian altitude of the sunne.

The shadowes that the Sunne maketh at myddaye.

Rules for all variations.

The perpendicular shadowe.

The declining shadowe.

is understood at midday. The shadowes that the Sunne the maketh, are in three sortes. For either to us it casteth the shadowe toward the North part, or toward the South, or perpendicular by a right by lyne, so that at myddaye or noone, nothing that standeth vpryghte, geueth any shadowe at all. But for as much as there is suche variation in declinations, altitudes, shadowes, and paraleles, it shalbe necessary to geue rules for all variations. And these shalbe reduced into foure bylese and compendious rules: the whiche I haue here described that the wyttie may take profite by them, and the rude learne the: For carrying for the rules of the Mariners, because they are so long and tedious. For (as the Phylosopher sayeth) it is baynely done by many, that may well be done by fewe.

When the shadowe shalbe perpendicular, it is because the Sunne is in the Zenith, and 90. degrees above the Horizon. And then how many degrees of declination the Sunne hath, so much shall we be distant from the Equinoctiall toward the parte where the Sunne declineth. And if it haue no declination, it and we shalbe vnder the Equinoctiall.

When the Sunne and the shadowes shalbe to us from the Equinoctiall toward one of the poles, we shal take away the declination from the Meridian altitude. And the complement for 90. shall we be distant from the Equinoctiall toward the same pole.

When the Sunne declyneth from the Equinoctiall toward the one pole, and the shadowes shalbe toward the other, we shall soyne the declynation with the Meridian altitude. And if all come not to 90. then the complement for the 90. shall we be distant from the Equinoctiall toward that pole to the whiche the shadowe falleth. And if thei be mo in number then 90. then the ouerplus of 90. shall we bee distant from the Equinoctiall toward the pole where the Sunne declyneth. And yf they be inst. 90. we shalbe vnder the Equinoctiall.

When the Sunne hath no declynation, we shalbe distant from the Equinoctiall the complement of the Meridian

bian altitude toward the pole where the shadows are.

that the sun
hath no decli-
nation.

By these rules, besyde the vse whereof we haue spoken maye be knowne howe muche is the greatest declination of the Sunne, the altitude of the Equinoctiall, the daye, houre, & minute, when the Equinoctiall was: the whiche is knowne as foloweth.

Having taken the greater Meridian altitude of the spring (whiche is in the beginning of Cancer) & the lesse of wynter (whiche is in the beginning of Capricorne) taking awaye the lesse from the moze, the rest is that that is from Tropike to Tropike. And consequently parted by the myddest, is the greatest declination. As for example: Take the greater Meridian altitude from the beginning of Cancer in, 77. degrees: And the lesse from the beginning of Capricorne in, 30. degrees, taking them out of the 77. remayne. 47. degrees: and so muche is from Tropike to Tropike. And the halfe (whiche is, 23. and a halfe, is the greatest declination. —

To knowe
the greatest
declination
of the sunne

Example.

Consequentlye the greater declination added to the lesse Meridian altitude, or taking it away from the greater Meridian altitude: that yseth therof is the altitude of the Equinoctiall. Example. 23. and a halfe of the greatest declination, ioyned with, 30. of the least Meridian altitude, or taken away from the, 77. of the greatest Meridian altitude: remayne. 53. degrees and a halfe, whiche is the altitude of the Equinoctiall in the cytie of Cadiz. Hereof it foloweth, that when we shall take the Meridian altitude in, 53. degrees and a halfe, that daye is the true Equinoctiall. But if one daye it had lesse, and the other daye folowynge it had moze, we must take the lesse from the moze, and fourme the rule of thre vpon the rest: saying. If the rest come to me of foure and twenty houres, then of those houres that shall come to me, that that lacketh of thye and fyftie and a halfe: that is the altitude of the Equinoctiall: And that that cometh therof, shall bee the houres of the Equinoctiall after mydday.

Example.

The true or
equinoctiall

Example.

Example.

Example of the experience that I made in the cite of Cadiz the tenth day of Marche at mydday o2 hygh noone. I toke the altitude of the Sunne. in 53. degrees 7. 26. minutes: They lack to be the Equinoctiall. 4. minutes. An other day the. xi. of Marche, at noone, I toke the Sunne in. 53. degrees and. 50. minutes: whiche are moze then the Equinoctiall by. 20. minutes. Then to knowe at what houre the Sunne was in the. 53. degrees and. 30. minutes of the Equinoctiall, I toke away the Meridian altitude that I tooke at the tenth of Marche, from that that I toke at the. xi. whiche is the difference. 24. minutes. And I formed the rule, saying: If. 24. minutes the Sunne byd ryle to me in. 24. houres, then in howe muche tyme shall ryle vnto me the. 4. minutes that sayled me at the tenth of Marche? I multiplid, deuided, and founde that in foure houres: And so shal you say that the Equinoctiall was in the cite of Cadiz the tenth daye of Marche at foure of the clocke at after noone. Whiche is vnderstode (acco2dyng to the Astronomers) at foure houres runne at the. xi. daye of Marche of this p2esent yeare 1545.

The. ix. Chapter of the making of the Crosse stasse wherewith the Mariners take the Altitude of the North Starre.

MAke a square stasse o2 yarde of the thynnesse of a fynger, moze o2 lesse acco2dyng to the goodnesse of the wood: And of length fyre spannes o2 moze. For the longer that it is, the moze p2ecise shal it be, and the degrees shal be 2 greater, whereby foloweth the certayntie of the altitude. Then take a very playne table of the lengthe of the stasse, and twoo spannes of breath, o2 at the least a spanne and a halfe: And in the myddest of this table, make a ryght lyne by longitude, and in the one ende of this lyne, make an other line that may cut it in ryght angles. And vpon the cutting of these two

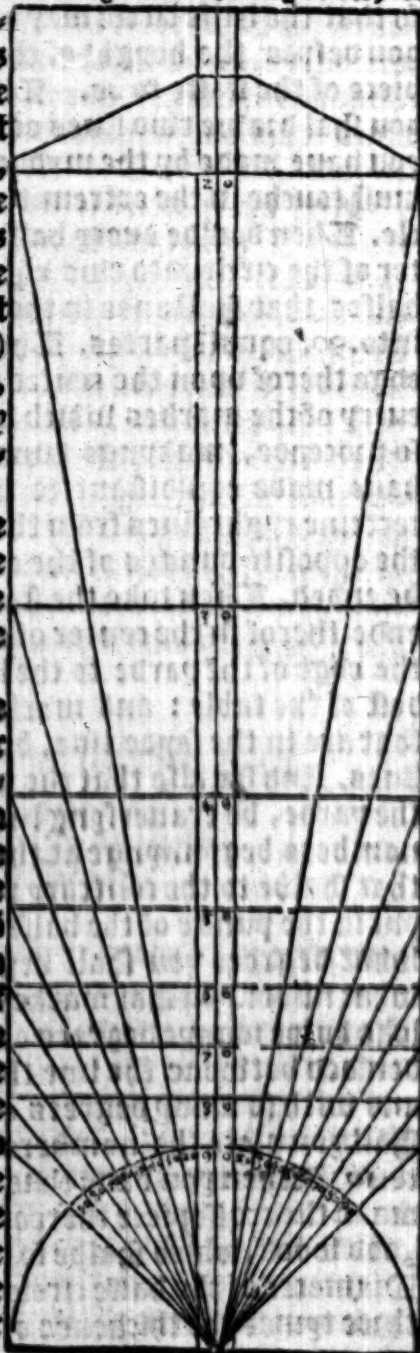
two lines, put the foote of the compasse, and make halfe a circle which may remayne on the part of the long line, so that the halfe circle may haue so muche Diameter as you desyre the heyght of the Hammer, head, or crossepiece of the staffe to be. This halfe circle beyng made, you shal drawe two lines equidistaunt to the line which you haue made by the myddest of the table. These lines must touche in the extremities or endes of the halfe circle. Then deuide euery halfe of the halfe circle or quarter of the circle into two equall partes: and the twoo halfes that shall ende in the fyrst line, deuide eche of the into. 90. equall partes. Then take a ruler, and put the edge therof vpon the center of the halfe circle, and vpon euery of the markes which deuide the. 90. partes: And so pproceade, makynge punctes in the lines whiche you haue made equidistant to the fyrst line. Then drawe certeine ryght lines from the punctes of the one line, to the opposite punctes of the other: & so shall the draught be ended. Then take the staffe or yarde, and put the one ende therof in the center of the halfe circle, and applye the edge of the yarde to the line that goeth by the myddest of the table: and marke in the yarde the markes that are in the sayde line, by meanes of the trauersyng lines. And see also that the markes whiche you make in the yarde, be trauersyng lines. And make them theyr numbers begynnynge at the ende or poynte of the yarde that shall be to the contrary part from that which you did put in the puncte of the halfe circle. And to knowe with what degrees you shall begyn the yarde or staffe, and what nuber you shall marke in the fyrst line of the pund: loke howe manye degrees are from the circle which you deuided betwene the line that goeth to the laste market: and with so many degrees enter. And so consequentye shall you place the numbers from. 5. to. 5. or from. 10. to. 10. When you haue thus numbered the yarde, then to make the crossepiece thereof, take a table or planke of good wood, which shall be so much in length as shall be the Diameter of the halfe circle, and so much in breadth as thre tymes the thickenes of the yarde, and of thickenes

two syngers or lyttle lesse. On the one syde also it must be very playne, and on the other syde in the myddest, it must haue a square or square nature of all the thickenes of the planke. And from the square to the endes, it must be made thinner & thinner, so that it haue in maner the forme of suche pickeares wherewith myll stones are picked. And in the myddest (by longitude and latitude) it muste haue a square hole, by the which the yarde may enter iust, & make ryght angles with the crossepiece.

And the poynte of the yarde must enter by the plain side of the crossepiece, and come forth the of the square syde therof.

To take the
altitude of
the Sunne.

To take the altitude of the North Starre, or anye other Starre on the Sea (for it serueth not on the land nor for the Sunne, excepte yf the Sunne shalbe vnder anye thynne cloude, & the Horizon cleare) you shal put the head of the staffe to the corner of your eye, rayssing it vp, or putting it downe vntyl the nether part of the crossepiece come with the Horizon. And being so, if the higher parte of the crossepiece shal come with the starre, you muste looke the playne syde of the crossepiece in what number



of degrees of the staffe it falleth : and those degrees shal be the altitude of the starre. As yf the crossepiece reache not to the starre, you must byng the crossepiece nearer to your eye, vntyl the one part therof come with the Horizon, and the other with the starre : and the degrees whiche it sheweth shalbe the altitude.

The. i. Chapter, of the Altitude of the Pole, knowen by the Altitude of the North starre.

I know the paralel in the which the hypp is, ouer and besyde the rules beare befoze of the altitudes of the Sunne : it is lyke wise knowe by the altitudes of the North starre. These two maners are vsed, for that more credit is geue to two witnesses then to one. So that yf by one aryse any doubt, the same may be certified by the other. And also because time may sometyne serue for the one and not for the other : As to haue a cloudy mydday or noone, and a cleare nyght.

The altitude is taken of the North starre : which is a starre in the extremitie or ende of the tayle of the lesse Beare, being a constellation commonly called the Bozne. For this North starre (of the most notable starres about the Pole) is nearest vnto it, and shall therefore shewe a lesse circle then any of the other : and so shal his altitude differ lytle from the altitude of the Pole. This starre hath declination. 85. degrees, and. 51. minutes. And the complement to. 90. (whiche are. 4. degrees and. 9. minutes) is his distannce from the Pole. And although the Maryners holde opinion that it is not distaunt more then three degrees & a halfe: yet to my iudgement, more credit ought to be geuen to the Astronomers then to the Maryners : Forasmuch as the Astronomers do knowe the places of the starres, with their longitudes, latitudes, declinations and ryght ascensions, more perfectly & precisely then do the Maryners. For they account not onely by degrees, but also by minutes and secundes. But let none deceaue them selues thzough my opinion.

The North
starre.
The lesse
beare.
The bozne.

The distace
of the
North starre
from the
Pole.

Therefore, whosoever will precisely knowe it, let hym take the hyghest altitude of the North Starre, whiche is his beyng ouer the Pole: and the lesse altitude, whiche is his beyng vnder it. Then take awaye the lesse from the moze: and the halfe of that that remayneth, shal be the distaunce of that starre from the Pole of the worlde. And lyke wise by this experience may be knowen the altitude of the Pole, and what all the other starres that go not downe vnder the Horizon, be distaunt from it, ioyninge the greater altitude with the lesse: And that shal amount therof, deuided by the halfe, shalbe the altitude of the Pole. And takynge awaye this altitude of the Pole, from the greater altitude of the starre, or the lesse from the altitude of the Pole: the rest that remayneth, shalbe the distaunce of the starre from the Pole.

The Pole
is inuisible

The two
starres cal-
led the guar-
des of the
North starre

Common
rules of the
Mariners.

And as the Pole is inuisible, it can not be sene or knowen when the North starre is hygher or lower, excepte it be by the meane of some other marke. And for this is considered the position of the former Guarde or watch, beyng one of the two starres called the Guardes, which are in the mouth of the Horne. The Maryners haue noted eyght positions from the former Guarde starre to the North starre, whiche aunswere to the eyght princypall wyndes. And as the Guarde is to the North accordynge to the placeynge of these positions, so shal it be hygher or lower from the Pole. Lette vs here put the common rules which the Maryners vse, to comply with those that are of opinion of the thye degrees and a halfe. And for the opinion of the Astronomers (whiche is the distaunce of. 4. degrees and. 9. minutes) I will hereafter giue a circular figure with a moueable horne. Then the eyght wyndes of the eyght positions being marked, and puttynge the Guarde and the North in euerye of the wyndes: it shalbe the distaunce that the North starre is hygher or lower from the Pole.

Common Rules.

The former Guard beyng in the East, the North starre is in one degree and a halfe vnder the Pole.

The

The Guard beyng in the North, the Starre is three degrees vnder the Pole.

The Guard in the North west, the Starre is half a degree vnder the Pole.

The Guard in the West, the Starre is one degree & a halfe aboue the Pole.

The Guard in the South west, the Starre is three degrees and a halfe aboue the pole.

The Guard in the South, the Starre is three degrees aboue the pole.

The Guard in the Southeast, the said North starre is halfe a degree aboue the pole.

Note that these eyght wyndes are made accordynge to foure lynes. Wherof two are ryght: which are North and South, and East and West. And the other two are crooked: whiche are Northeast Southwest, and South east Northwest. When the garde and the North shalbe in the ryght lyne, it shal appeare cleare how they are. And when they shalbe in the crooked lynes, it maye bee seene, because the guardes are the one by the other in a ryght lyne.

The eyght
principall
wyndes ac-
cording to
foure lynes.

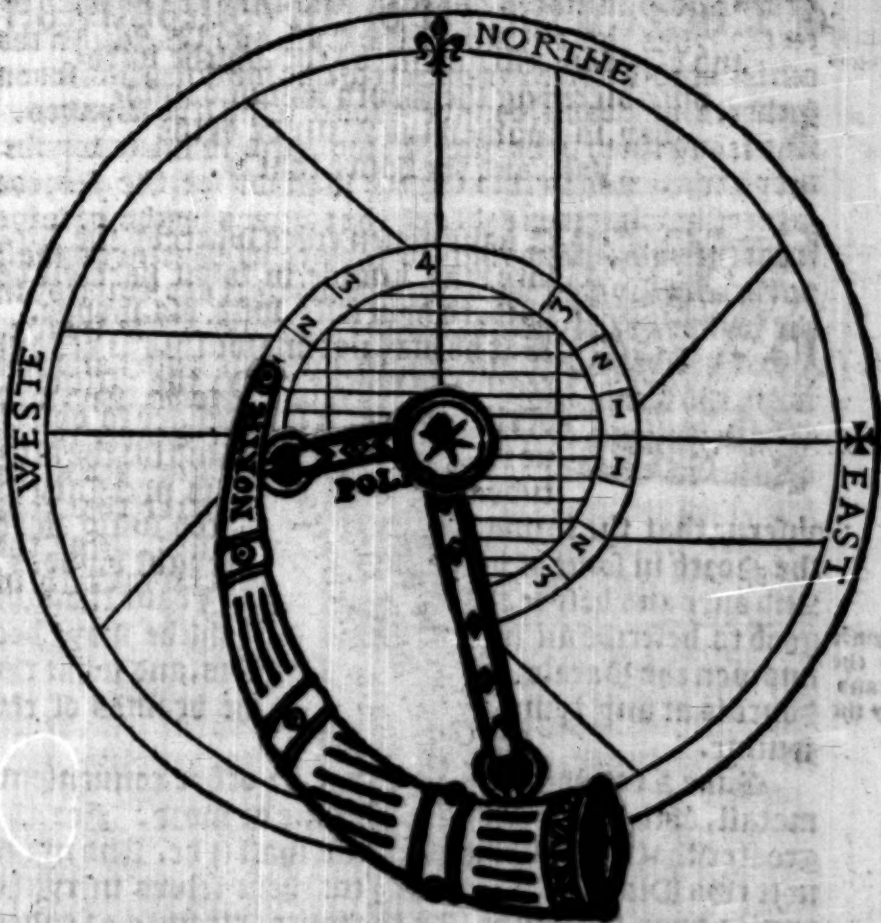
To see by theozike or speculation howe the North starre ryseth vp and goeth downe from the pole of the worlde, I wyl here descrybe the sayd circular figure or instrument: which is a circle in whose circumference are wytten the eyght wyndes. The North in the hyghest place of the instrument whiche they call the head: And the South in the nether parte therof, whiche they cal the foote. The East in the ryght arme: The West in the lefte arme. The foure rest, betwene these in their places. And here is to be noted that the lynes whiche passe not through the center, are of the wyndes of their equidistances that passe through the center. Within this circle, is an other little circle which describeth the starre of the North by the mouyng of the fyrst moueable: And hath for his center the pole of the worlde, as hath the first. This lyttle cyrcle hath for his Diameter eyght degrees and eyghtenne minutes: as foure degrees and nyne minutes aboue the pole, and the other foure de-

An instrumēt to knowe
the ryling of
falling of the
North starre
from the
pole of the
worlde.

The boyn of
the seven star
es.

Advertence
to Mariners

grees and .9. minutes vnder it. And they are deuised by
certain lynes equidistant to the East and West. In the
center of this circle, is annexed a bozne with his seven
Starres moueable rounde aboute by all the wyndes.
And seying them in heauen, holwe, and in what wynde
they are, even so in this fygure shall we see the North
Starre in what parte it is of the degrees hyghe or lowe
from the pole. And that the Pylote or Mariners shall
not erre, I say that he ought not to put the foreguarde in
the wyndes that passe through the center of the fygure.
For it shalbe North and South with the pole, and not
with the starre of the North as it ought to be. And so of
the other wyndes. And in this maner the Starre of the
North, shall shewe in the lynes equidistant from the
lesse circle, the degrees and partes of degree that it is
hyghe or lower then the pole of the worlde. For the
same course, differences, and variations, it maketh in
heauen.



Thus being knowen howe muche the North starre
is vnder or above the pole, let vs take the altitude ther-
of. And that of it that is vnder the pole, let vs ioyn to
his heyght. And as muche of it as is above, let vs take
away: And that shall ryse thereof, shalbe the altitude of
the pole aboue our Horizon.

The altitude
of the pole
aboue the ho-
rizon.

B. lill.

The

C The.xi. Chapter of the composition

and vse of an instrument, by the whiche with-
out obseruyng the South Sunne or mid-
day, is knowen the Altitude of the
pole, and the houre that is.



We haue geuen rules whereby the Py-
lote may knowe in what paralele he
syndeth hym selfe with his shyppe.

But he may not knowe this at al hou-
res: for as muche as for the altitudes
of the Sunne, it is necessary to obser-
ue the mpydday iustly. And for the alti-
tudes of the North, it is necessary to

obserue that the forreste Guarde be placed iustly with
the North in some of 4 foure lynes of the eyght wyndes.
And ouer and besyde the rules aforesayd, I haue thought
good to describe an instrument by the whiche maye bee
knowne the Paralele where the shyppe is, and what the
houre is at any tyme of the daye by the beames of the
Sunne.

An instrument
to knowe the
paralele and
houre by the
Sunne.

Make a rounde plate of Laton or other conuenient
metall, of the Diameter of a spanne or more. For the
greater that it is, the more precise shall it be. And make
in it two Diameters that may cut them selues in ryght
angles vpon the center. In the foure extremes or endes
of these diameters, leaue foure round punctes or pointes
that may serue for Arcs. The one of these Diameters,
shalbe called the Aris of the worlde: and the other, the
lyne of East and West. This done, make of the same la-
ton a semicircular piece of the thickenesse of the plate or
little lesse: And of the breadth of halfe a synger. This
must stande vpon an edge, so that the conuere part maye
come iustly with the halfe of the circumference of the plate
to the whiche it must be nayled or sothered in the nether
part of the plate, the semicircle being rayfed, & that the
endes therof may come with the endes of the Aris of the
worlde. And this semicircle shall you deuide into two e-
qual partes, and euery half into, 90. degrees, beginning
from

from the halfe pointe towarde the endes of the Axis of the worlde, whiche are the Poles.

In like maner shall you make two circular pieces, of the byggenesse of a piece of foure ryals of plate, which they call rundels for the houres. These must be made faste in the plate by the Poles of the worlde, which maye holde or beare them by theyr centers. And euery of these rundels must be deuided into. 24. equal partes: & although not all, yet the vppermost part of the plate. And aboue in the byghest poynt of these deuisions, you must wypte. 12. because that there it shall shew the mydday or noone. And from thence, the afternoone houres must begynne their numbers towarde the West part: and shal end. 6. houres in the halfe or myddest of the ioynt of the circle with the plate. In the other ioynt of the other part, shal begyn. 6. of the houres befoze noone: and shal ende. 12. in the byghest poynt. You must also make an other Semicircular piece, of the breadth of a synger. This must be playne or flatte: and the concauitie or holdwnesse therof, equal to the Semicircle of the edge or syde of the plate, and in the endes muste haue two holes, wherein may iustly enter the poyntes that come forth of the circles for the houres, which are the Poles of the worlde. Also this Semicircle muste haue two lines: one on the vppermost part, and the other on the nethermost, which maye deuide the breadth into two equall partes. This halfe circle lykewyse muste be deuided into two equall partes by longitude, with a trauersed line which shalbe called the Equinoctiall. And fro this line to the inward part therof, must be counted. 23. degrees and a halfe towarde the one parte, and as much towarde the other part of the. 90. that euery halfe of the circle conteyneth. And at euery part where ende the. 23. degrees & a halfe, make a trauersed line, so that from the one to the other may be. 47. degrees. And in this space shall you drawe certeyne lines equidistaunt with them of the myddeste, that they and the myddle line, may deuide into. 4. equal partes the breadth of the halfe circle. When loke in the table of the declinations of the Sunne, what declinati-

The. 3. part.

The carac-
ters of the
xii. signes.

The hole
that repres-
senteth the
Sunne.

The place-
yng of the
yng of the
Instrument

on haue the. 5. degrees of Aries : and that shall you ac-
count from the Equinoctiall toward the one part, and
as muche moze toward the other, makynge a line that
may traaverse that of the myddest, where that declinati-
on both ende and touch in the other two lines. And the
same shall you do at .10. 15. 20. 25. and. 30. whiche is the
ende of Aries and begynnynge of Taurus : and then the
line shall traaverse all the breadth. The lyke also shall
you do to Taurus & Gemini. Then in the spaces, wyte
the caraces of the. xii. signes : begynnynge Aries from
the Equinoctiall toward the North Pole. And then do
Taurus and Gemini ende in the greatest declination,
begynnynge Cancer in the other parte of it. Then Leo
and Virgo do ende in the Equinoctiall where shall be-
gynne Libra, Scorpio, Sagittarius : And in the other
part, Capricornus, Aquarius, and Pisces, shall ende in
the Equinoctiall where Aries beganne. This halfe cir-
cle must haue an openyng or open place, even and iust in
the myddest from the Equinoctiall vnto somewhat moze
then the greatest declinations : and must be a little bro-
der on the inner parte then without, and not so brode as
may come to the two lines, because it woulde then take
awaye the graduation of the signes. And in this open
place must be put a square grapne or stubbe, whiche on
the inner part maye come playne with the halfe circle,
and on the vtter part may come forth a lyttle, where
shalbe nayled a square piece of laton of the breadth of
the halfe circle. This grapne or stubbe beyng so nayled
with the piece, must haue in the myddest a hole, so small
as may receaue a lyttle pyne : and by the center of this
hole, must passe a line which shall traaverse all the graire.
And this line shall serue to putte the Sunne (whiche the
hole representeth) in the degree of the signe where it
is. This halfe circle where it goeth in the circumferen-
ces of the rundelles for the houres, must be syled on the
one syde vnto the line that is in the myddeste, to marke
it and shewe the number of it. For the placeynge or
settyng of this Instrument, you must cutte a gyrdell or
rynge

rynge of laton, as thicke as the plate, and of the breadth of a synger, or lyttle lesse: and so large, that of it maye be made a circle somewhat bygger then the plate, so that the plate and the Meridian maye easely be conteyned within it. This circle shalbe called the Horizon, which must be deuyded into foure quarters.

In lyke maner muste be made two semicirculer pierces: and the endes of them muste be nayled or sothered in the poyntes that deuide the quarters of the circle: And deuyde the one fro the other in two equal partes, making ryght spherall angles. And in this ioynt of these two pierces, muste be nayled or sothered a mastell, the which at the one ende is deuyded into two bzaunches or forkes. When shall you make a base or soote for the same: whiche in the vppermoste parte thereof shall haue a concauitie or holownesse, where maye be sette a sayling compassse or a needle, touched with the Lode stone, and couered ouer with a glasse. And on the hygheste edges of this base, the twoo bzaunches of the Mastell shalbe made faste. And this Base with the Mastell, the halfe cyrle, and the cyrle, shall be all one piece, whiche shalbe called the seate or frame of the Instrument. The Horizontall circle in the endes of one halfe circle, muste haue twoo holes, in the whiche maye enter the Aris that are made in the endes of the lyne of East and Weste.

Also you must take good heede when you sother or make faste the Mastell in the Base, that the North and South of the plate or Horizon come with the North and South of the needle that is beneathe: Hauynge ever respecte howe muche the needle doeth varpe from the Meridian, by Northeastynge or Northwestynge. In the ioynte of the two halfe cyrcles vppon the Mastell, muste be a poynte (called the Index or shewer) whiche shall shewe in the halfe cyrle sothered in the plate on the neather parte, the degrees that the pole is rayed aboue the Horizon.

The Soote
or Base of
the Instru-
ment.

The Index
or shewer.

The places
yng of the
Horizon.

For the land

For the sea.

The vse of
the instru-
ment.

The altitude
of the
Pole.

For the perfection of this instrument, it shalbe convenient to sette the Horizon verpe playne and equall at the tyme of the operation or practysing with the instrument. And this may be done in two maners. Wherof the one is: hangyng by a fine threde at the center of the plate, a plomet made some what poynted at the nether ende: So that the Horizon standyng playne and leuell, the poynt of the plomet may fall vpon the poynt of the inder. And this maner is good for the lande. But for the Sea, you shall sother in the Horizon two Arres, lyttle stubbes, or endes commyng forth. These shalbe put in the two opposite holes of a circle of metal made some what stronge: and this circle muste haue other two stubbes lyke wyse commyng forth, and equally distant from the two holes. These muste be sothered or nayled in two holes of an other circle in lyke maner. And the other circle with other two stubbes, inclosed in a bore. If then the bore stande euen and leuell, the poyle or wayght shall cause the Horizon to stand leuell, although the shyppe sway or roule from syde to syde. The vse of this instrument is in this maner.

When you desyre to knowe the paralell in the which you are, and the houre that is: put the line that trauerseth the grayne, in the degree of the signe in the which the Sunne is (which you shall knowe by the table of the place of the Sunne, in the second Chapter of the second part) and set the North and South of the plate with the North and South of the needle. Then turne the moueable Meridian agaynst the Sunne, the foote of the instrument standyng faste: and rayse it or put it downe in the plate, vntyll the beame of the Sunne enter in at the hole of the grayne, and fall in the center of the plate.

And standyng so, beholde the inder, and how many degrees it sheweth from the Meridian: so muche is the altitude of the Pole. Then loke where the moueable Meridian sheweth in the rundell of the houres: and there shall you see the houre that is.

¶ Here

Here followeth the Demonstration.



The xii. Chapter, of the leagues
that are runne for a degree, according
vnto dyuers courses.

To knowe
the distance
from one pa-
rall to an
other.



The arke of
the greater
circle.

The alti-
tude of the
pole vary-
ing one de-
gree.

The quar-
ter seruing
for the xxii
wyndes of
the compasse

R the fyrte Chapter I promised to geue a rule to know the distance from one parallel to an other, saylynge by whatsoeuer line or wynde, except the East and West. For the which is to be vnderstode, that the Nauigation or course from one place to another (according to the Cosmographers) ought to be by the arke of the greater circle; for that by this maner shalbe the shorteste course. And this greater circle they deuide into .360. degrees. And al the distaunces that are fro one place to another, they accompt by the degrees and minutes of this circle: And so saylyng from North to South, to one degree of the variation of the height of the Pole, shall aunswere another degree of the greater circle in the superficial part of the water and land. And therefore saylyng by whatsoeuer other line, vntyll the Pole doth varie one degree of altitude, we shall haue gone more then one degree of the greater circle. And the degrees that aunswere to enery line or wynde, you shall see in the demonstration folowynge, which hath two parallel lines, which are East and West. And the line that cutteth them in ryght angles, which commeth forth of the center from the quarter of the circle that is made: is North and South. And then shall you see by his order, all the other wyndes, halfe wyndes, and quarters of wyndes, reduced to one quarter. For the selfe same accompt serueth for North-east and South-west, & North-west and South-east: and so of the halfe wyndes & quarters of wyndes that are equally distaunt from the line of North and South. And so this quarter shall serue for all the .32. wyndes of the compasse. Without this quarter, harde by the line, you shall fynde two numbers: wherof the fyrst shalbe of the degrees, & minutes of degrees of the greater circle, which is from one parallel to another. The other number, shalbe the leagues and partes of leagues that suche degrees and minutes do amount vnto,

Degrees of
the greater
circle.

By the fourth line, is runne one degree, minutes. 25. leagues. 24. & three quarters. And depart from the Meridian, one degree iustly, leagues. 17. and a halfe. By the fyfte line, is run one degree, minutes. 48. leagues 31. and a halfe. And departe from the line one degree. 30. minutes, leagues. 26. & one quarter. By the sixte line, is runne. 2. degrees, minutes. 37. leagues. 45. and of the 15. partes of one league, the eleventh part. And depart from the line. 2. degrees, minutes. 25. leagues. 42. and a quarter. By the seventh line, is runne. 5. degrees, minutes. 8. leagues. 89. and two terces. And depart from the line. 5. degrees, minutes. 2. whiche are leagues. 88. accountynge. 17. leagues and a halfe for a degree of the greater circle. And yf for every line, you desyre to know this computacion of leagues, after, 16. leagues and two terces for a degree, or for more or lesse leagues or myles: multiplye those such degrees by the number of the leagues or myles which enter into every degree. And lyke wyse shall you number the minutes that are more then the degrees, by the same number of the leagues that enter in euery degree, deuydunge them by. 60. And that that shall come of the deuision, you shall ioyne with the multiplication of the degrees: and that shall amounte therof, shalbe the leagues & partes of leagues that was in those such degrees.

The. xiii. Chapter: Howe to sette or make a pꝛicke in the Carde of Nauigation.

To knowe in
what part
or poynt the
shype is.

The Altitude of the
Pole.



Howe Paryners call the pꝛickynge of a point in the Carde, to see and appoynt in it, in what point or part of the sea the shype is in Nauigation. For the persourynge wherof, it shalbe requisite that the Pilot knowe from what degree or howe manye degrees of the altitude of the Pole he departed, & with what wynde he sayleth. And when he desireth to know where

where he is, let hym knowe the altitude of the Pole by some of the aforesayde rules. And if taking the altitude, he fynde hym selfe in the same degrees where he was when he departed, his nauigation hath bene from the East to the West. And what he hath gonne can not be knownen but by the iudgement of a wyse and expert mā, according to the swiftnesse or goodnesse of his shippe, with consideration of the more or lesse tyme he hath had, as we haue sayde befoze in the syrt Chapter. But if he fynde hym selfe in more or lesse degrees, let hym take two payre of compasses, and put the foote of one in the poynt or place where his shippe was when he departed: And the other in the lyne or wynde, by the whiche he sayleth. And lykelysse let hym set the one poynt of the other compasse in the graduation of the Carde in that number of degrees y he fyndeth the altitude of y pole. And the other poynt of the same compasse in the next lyne of East and West. And so with both the compasses, one in the one hande, and the other in the other hande, lette hym go ioyning them together, takyng good heade that the poynt of the compasse do not swarue from the wynd, wherby he hath sayled: Neyther the poynt of the other compasse fro the line of East and West where he set it. And folowynge these two compasses by these two lynes, vntyll the poyntes of the two compasses ioyne (that is to meane, the point that was set in the place fro whence he departed, and the other that was set in the degrees that were founde) then wher these two pointes do ioyne, is the point where the ship is. But (as we haue sayde in the syrt Chapter) they muste haue great respecte to the wyndes and Seas, and other thynges which experience sheweth them, to knowe if they haue gone directlye by that lyne, or if they haue fallen fro it, and to what parte. The whiche I remitte to the iudgement of men of good experience. From thence forwarde, they shall returne to kepe the same accounte as when they departed from the hauens: especially when they chaunge theyr course.

To fynde
the distance
by the card.

Directiōes
mentes to
the Pilot.

A. i.

The

The. xiiii. Chapiter of the making

and vse of an Instrument generall to knowe the
houres and quantities of the daye: And
at what wynde the Sunne ryseth
and falleth.



Take a rounde plate with a ryng or a handle aboue as in the Astrolabe: draw-
ing a lyne from the ryng downe-
ward passing throught the center, and
an other line that may cut it in righte
angles throught the center: And this
last line shalbe called the Horizon.
Then shall you geue a circle vpon the
center: leauing so muche space betwene it and the edge
of the plate, that therein may be written the numbers of
the degrees: Then also make an other circle somewhat
more within: Leauing likewise a space where the gra-
duations may be deuided. This done, deuide one of the
highest quadrates toward the left hand, into. 90. partes
whiche shalbe called the degrees of Altitude: beginning
the number of them from the ryng, and ending the same
in the Horizon. Then make an other rundell somewhat
lesse then this, in suche manner that the degrees and nu-
bers of the greater, remaine vncouered. And deuide this
lesse, by two Diameters into foure equal partes. And at
the one ende of the one Diameter, leaue a point comyng
forth of the lesse rundell, cut directly with the same Dia-
meter by the one parte. And this shalbe called the index
or shewer. In this rundell you shall make a circle, halfe a
fynger lesse then the rundell. Then with a compasse take
23. degrees and a halfe from the Diameter whiche signi-
fieth the Equinoctial. And where as end the. 23. degrees
and a halfe for every parte, make a ryght line from one
poynt to an other: so that this be a line of. 47. degrees:
and as muche more at the other ende of the sayde Equi-
noctiall. Upon every one of these ryght lynes, you shall
make a halfe cpycle: And deuide every of them into fyre
squall partes whiche may aunswere to fyre signes. And
euery

every signe into thre partes whiche may aunswer to the tenthes or tenth partes of degrees. And if the Instrumēt be great, you shall deuide every signe into fyve or moze partes, so that you may make it perfecte & precise. This done, from the pointes or prickes of the one halfe circle, to the poyntes of the other, drawe certen lines whiche shall be equidistant to the Equinoctiall. In the endes of these lines, betwene the lesse circle and the edge of the runble, drawe also certen lines whiche may reache unto the beginninges & endes of the signes. And in the top of the endes or over the endes of these lynes, make an arch so farre distant from the lesse circle, as is the thynknesse of the edge of a piece of foure rials of plate. And in the space that is lefte, graduate the sygnes from tenne to tenne, or as the diuision shall be. The space that remaineth from thence to the edge of the runble, you shall deuide by the halfe, and in it shall be made twelue spaces where you shall set the sygnes with theyr names or characters orderly: So that Aries be nexte to the Equinoctiall. Then Taurus towarde the parte of the Index. Then Gemini. And turning towarde the Equinoctiall, Cancer, Leo, Virgo. Likewise on the other parte of the Equinoctiall, Libra, Scorpio, Sagittarius. And turning to the Equinoctiall, Capricornus, Aquarius, Pisces. And thus hauing signed the Zodiac, you shall also sygne or marke the houres in maner as foloweth. Deuide the lesse circle of this rundle into foure equal partes, so that every quarter may haue fyve partes. Reduce this deuision to the Diameter, puttyng the ruler vppon the poyntes equally distant from the Horizon. And where it toucheth the Equinoctiall, make pryckes or poyntes: So that the Equinoctiall remayne deuided into twelue partes. Then vpon one of the Tropikes, geue a circle whiche maye haue the same Tropike for his Diameter. Deuide this cyrcle into foure and twenty equall partes: And reduce these diuisions to the Tropike as is done in the Equinoctiall, & fro one Tropike to an other. Then the Equinoctiall and the Tropikes beynge thus deuyled with these pryckes or poyntes, you shall passe

The placing
of the sun,
signes in
the instru-
ment.

The zodiac.

Deuision of
the Equino-
ctiall & Tro-
pikes.

The houres
with their
numbers.

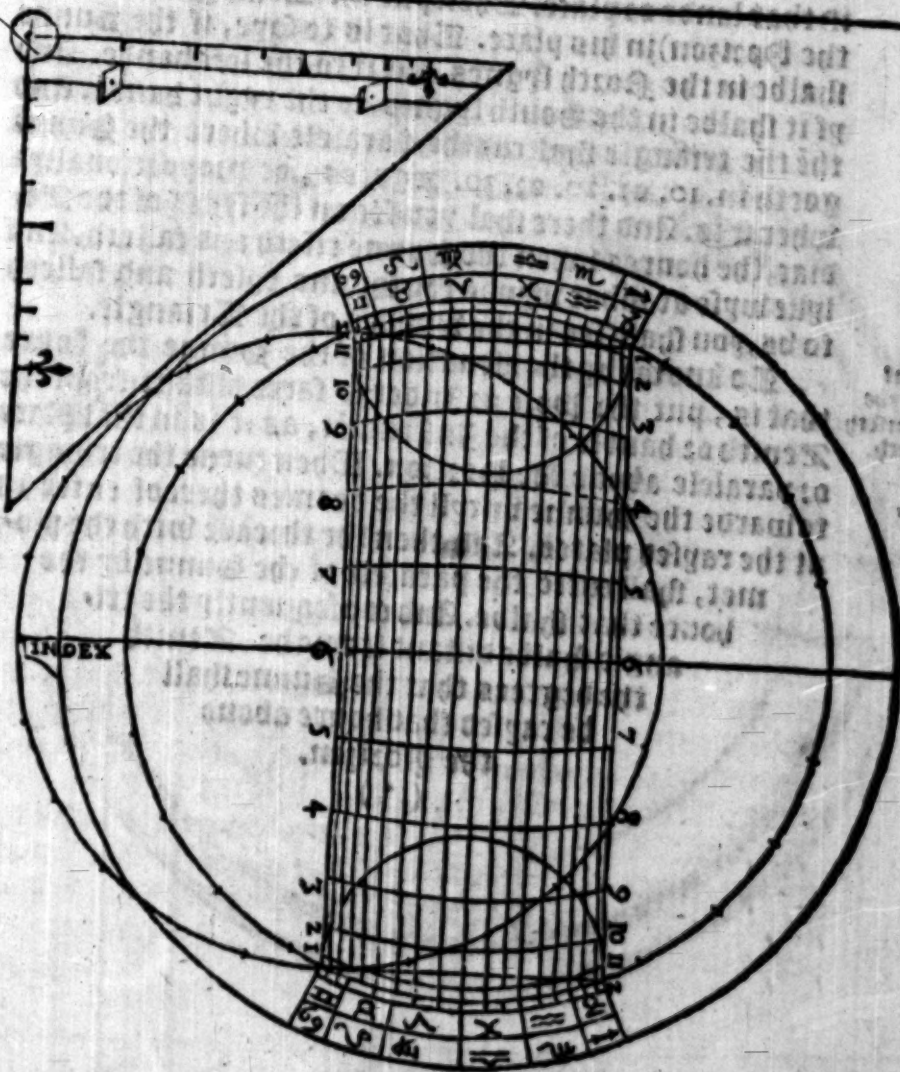
The triagle

Division of
the wyndes

with a payze of compasses by euery poynt equally orde-
red, from the Horizon, to the one and the other parte.
And these shalbe called houres, wytyng in the endes of
them, their numbers: beginning the one parte in one,
and endyng it in twelue. On the other parte, begynne
one in thopposite part, and ende in twelue. This done,
these roundels shalbe brought to their perfectiō. Moze-
ouer, you shall make a Triangle, with a ryght Angle,
hauiing two equal sydes that may make the right angle.
Euery of these sydes, must be as longe as is the Semi-
diameter of the greatest roundell: Also vpon and aboute
the right angle, you shall make a lytle circle, which shall
haue the same angle for his center: And on the one syde
of this triangle, set two rayed plates as in the Astrola-
bie. On the contrary syde of these rayed plates, must be
a hole, so farre distant from the center or angle, as is the
Semidiameter of the circle of the lesse roundell. In this
hole you must put a threade, hangyng thereat a lytle
weyght or plomet onely sufficient to holde the threade
streight, so that it cause nothing of the roundels to turn,
or the instrument to decline. Furthermoze, in a circle as
bigge as the lesse of the lesse roundell, you shall deuyde
into. 32. partes the eight wyndes, and halfe wyndes, and
quarters of wyndes. And beynge thus reduced to theyr
Diameter (as is done in the Equinoctial) you shal tran-
slate them in the sydes of the triangle: In the whiche, by
the center of his little circle, and by the center of the roū-
dels, all the three pieces must be made fast with an Aris
or a nayle, so that they may be turned about close and ve-
ry iust. Then put a ryng in the handle of the instrumēt,
wherby it may hange, as in the Astrolabie: And so shall
the instrument be fynished and brought to perfection.

This

**This is the trace or diallogite of
the Instrument.**



To knowe at
what houre
the Sunne
risseth or fal-
leth.

To knowe at what houre the Sunne risseth and fal-
leth (by the Instrument folowynge) you shall put the pole
of the lesse roundell (whiche is the Index) to the left
hande in the greatest rundle, in so many degrees aboue
the Horizon, in howe many degrees the Pole is rayfed
in that lande or place. Then put the Triangle (which is
the Horizon) in his place. That is to saye, if the Sunne
shalbe in the North sygnes, put it to the left hande. And
yf it shalbe in the South sygnes, to the ryght hande. And
thē the triangle shal cut the paralele where the Sunne
goeth in. 10. or. 20. or. 30. degrees, or proportionallye
wher it is. And there shal you see on the sydes of the Zo-
diac, the houres when the Sunne risseth and falleth. And
lyke wyse at what wynde the Sunne risseth and falleth
to be, you shall see in the wyndes of the Triangle.

At what
wynde the
Sunne risseth
or falleth.

To knowe by the elevation of the Sunne the houre
that is, put the Pole or Index so farre distant from the
Zenith or handle of the Instrument, as it is in that place
or paralele aboue the Horizon. Then turne the triangle
toward the Sunne vntyll the beames thereof enter in
at the rayfed plates. And then the threade with the plo-
met, shall cutte the paralele of the Sunne by the
houre that shalbe. And consequently the tri-
angle shalbe distant from the Zenith
the degrees that the Sunne shall
be rayfed that houre aboue
the Horizon.

(.)

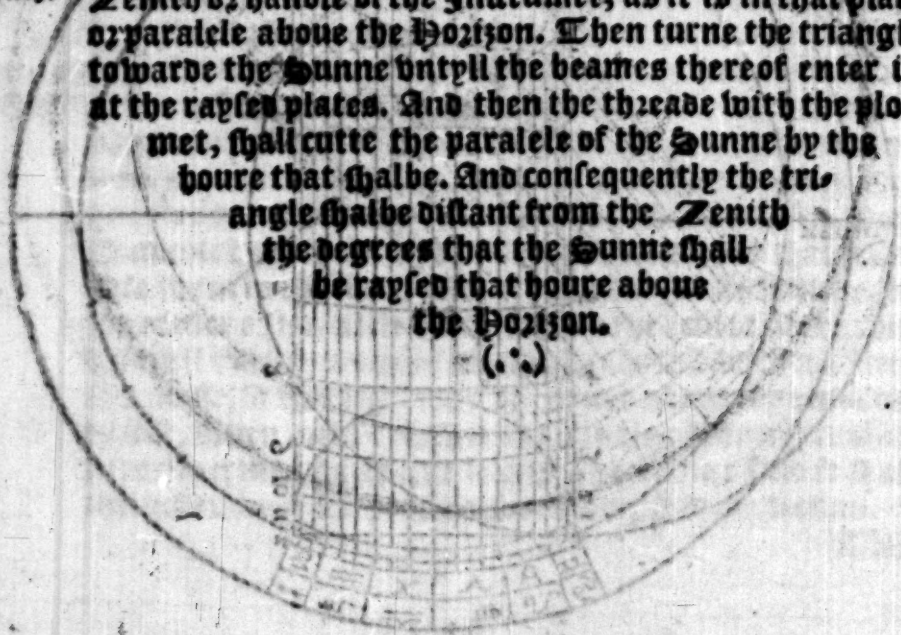
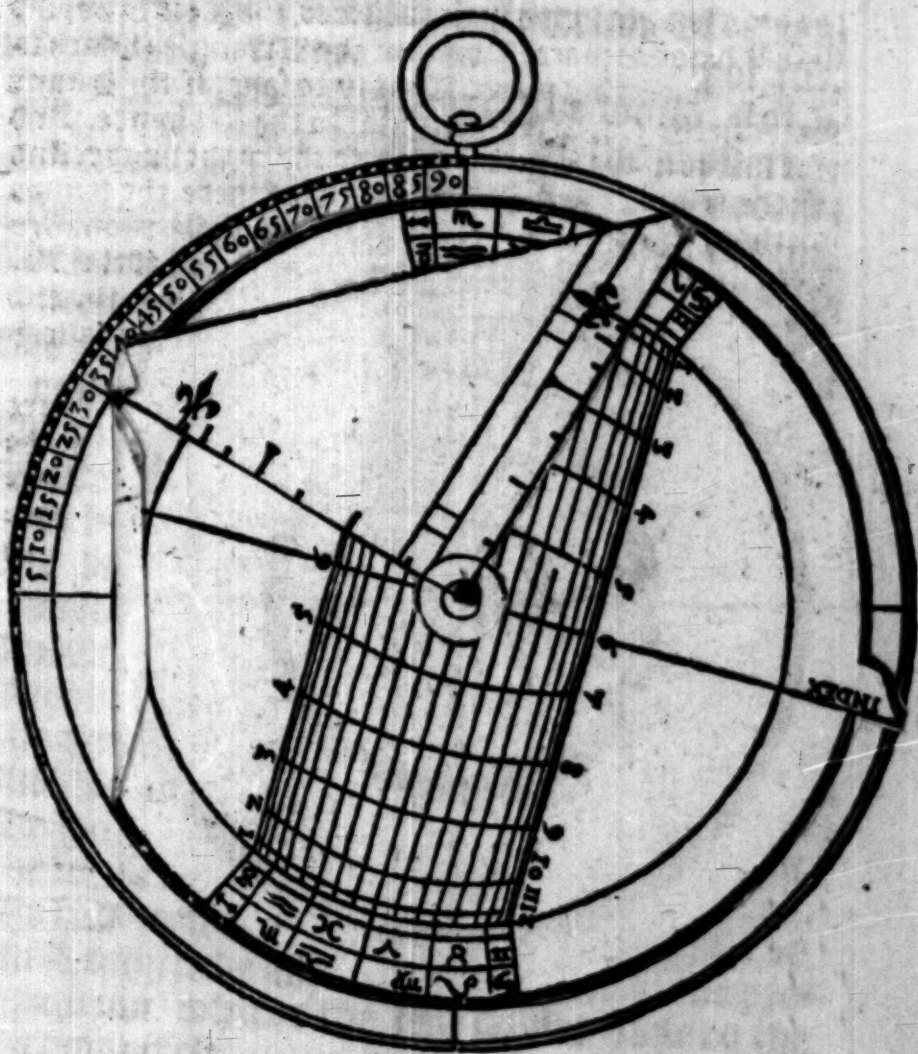


Fig. 3. 1st.

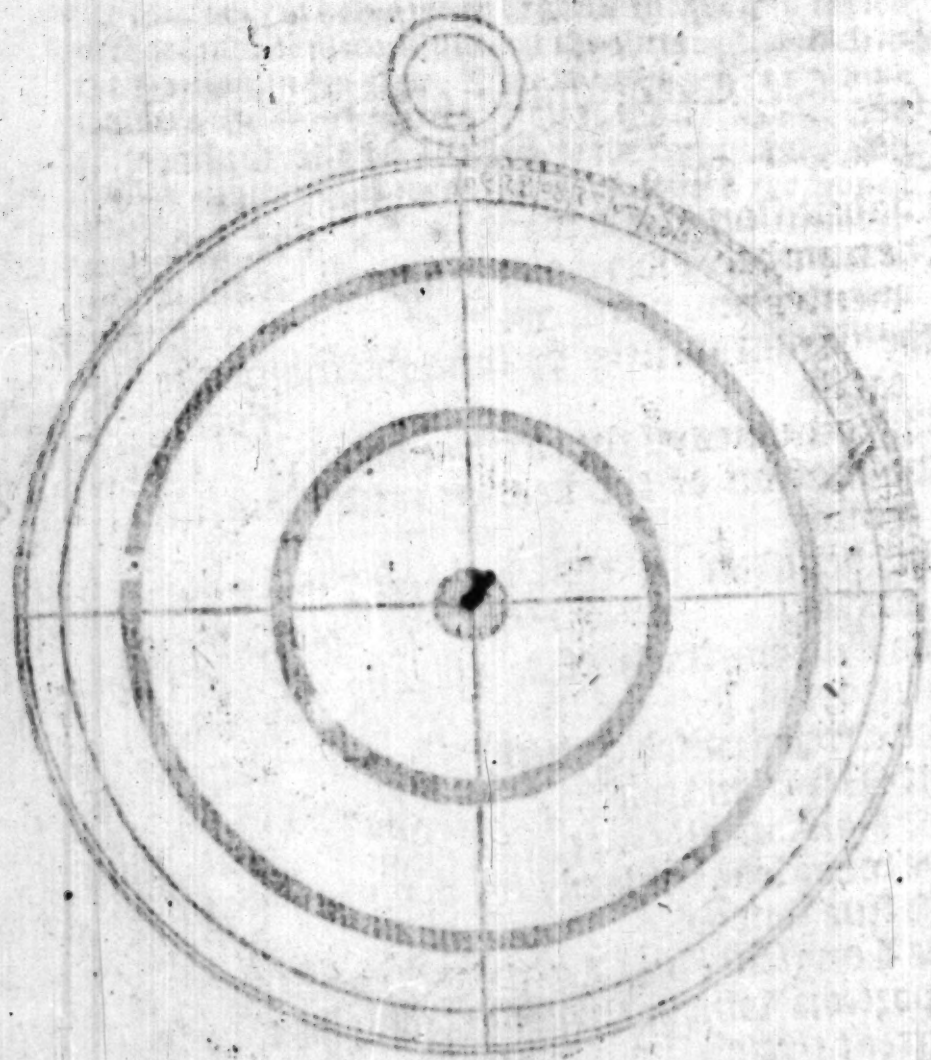
Following

¶ This is the Demonstration.



FINIS

THE ...
... ..



FINIS

Here beginneth the Table of this booke.

The Contentes of the Chapters of the
first part.

T he generall distinction of Creatures.	Fol. iiii.
The definition of the world.	Fol. v.
The definition of the Sphere.	Folio eodem.
The deuision of the worlde.	Fol. eodem.
The number, order, and propertie of the Elementes and heauens.	Fol. vi.
The immutabilitie or immobilitie of the earth.	Fol. viii.
The roundnes of the earth and water.	eodē.
The motion of the heauens and Elementes.	Folio x.
The deuision of the Sphere into formall partes.	Fol. eodem.
The Equinoctiall circle.	Fol. xii.
The zodiac.	Fol. eodem.
The Circles called Coluri.	Fol. xiii.
The Meridian circle.	Fol. xiiii.
The Horizontall circle.	eodem.
The foure lesse circles.	Fol. xv.
The five zones.	Fol. xvi.
The Longitude and Latitude. And of the proportion whiche the lesse circles haue to the great circle.	Fol. xviii.
The circuite or compasse of the earth and water, accordyng to the opinions of the auncient and later auctours.	Fol. xix.
The. vii. Climates.	eodem.
Certen principles of this science.	Fol. xxi.

The Table.

The Contentes of the second part.

T he course of the Sunne in the zodiac.	xxii.
Folio.	
The true place of the Sunne in the zodiac.	fol. xxiii.
The declination of the Sunne.	fol. xxv.
The entraunce of the sunne in the. xii. signes: And of the Equinoctials & Solstitials which deuide the foure tymes of the yere.	fol. xxvii.
Of the Moone and her motions and proper- ties.	fol. xxix.
The coniunctiōs & oppositions of the Sunne and Moone.	fol. xxx.
The declaration and vse of an Instrument, by the which is founde the place & declination of the Sunne, with the dayes and place of the Moone.	fol. xxxi.
The Eclipses of the Moone and the Sunne. Folio	xxxiii.
Of Time & the definitions therof.	fol. xxxv.
Of the yere and the diuers beginninges and recheninges or computacion had thereof in olde tyme.	fol. xxxvi.
Of the moneth, & of his differences.	fo. xxxvii.
Of the weeke.	fol. xxxix.
Of the day and the nyght.	fol. eodem.
Of houres.	fol. xl.
The making and vse of a vniuersall Diall for the day.	fol. xli.
Of certen perticuler Dials Murall and Hori- zontall.	fol. xliii.
The composition and vse of an instrument for houres of the nyght.	fol. xlv.
The	

The Table.

The tyme of the Tydes, or rysing and falling
of the Sea. fol. xlviii.

Of certen signes which pronosticate tempestes
or fayre weather. fol. l.

Of the bright & Wynyng exhalations that ap-
peare in tempestes, which the Mariners cal
Santelmo or Corpus sancti. fol. li.

The Contentes of the thyrdo part.

The number, order, and names of the
wyndes. fol. liii.

The composition of cardes for the Sea.

folio

lvi.

The vertue & propertie of the Lode stone, cal-
led in Latin Magnes, and in Spanysh Piedray-
man. fol. lxxii.

The makynge of the Maryners compasse for
Navigation. fol. lxxiii.

The effecte & propertie that the Compasse hath
to Northeastynge or Northwestynge, wherby
is knowen the variation of the Compasse.

folio

lxxiii.

The Introduction and principles of the Arte
of Navigation. fol. lxxvii.

The making & vse of the Astrolabie with the
which the Mariners take the altitudes of
the Sunne. fol. lxxviii.

The definition of the Altitudes. And howe the
Altitudes of the Pole may well be knowen
by the Meridian Altitude & declination of
the Sunne. fol. lxxxi.

The makynge of the Crossestaffe wherwith the
M^r Mary.

The Table.

- Mariners take the Altitude of the North
starre. fol. lxxii.
How the Altitude of the Pole is knowen by the
Altitude of the North starre. fol. lxxiii.
The composition and vse of an instrument, by
the whiche, without obseruing the South
Sunne or mydday, is knowen the Altitude
of the Pole, & the houre that is. fol. lxxvi.
Of the leaques that are runne for a degree, ac-
cording vnto diuers courses. fol. lxxix.
Howe to sette or make a pricke in the Carde of
Navigation. fol. lxxx.
Of the making and vse of an Instrument ge-
nerall, to know the houres and quantities
of the day: And at what wynde the Sunne
risseth and falleth. fol. lxxxi.

FEEL.

Imprinted at Lon-

don in Bowles Church yerde, by

Richard Jugge, Printer
to the Quenes
Majestie.

& J. de la Roche, Printer

