ERRORS IN NAVIGATION,

1 Error of two, or three whole points of the Compas, and more ſomtimes, by reaſon of making the ſea-chart after the accuſtomed manor, with right lined rumbes, and equall degrees of latitude.

2 Error of one whole point, and more many times, by neglecting the variation of the Compaſſe.

3 Error of a degree and more ſometimes, in the vſe of the croſſe ſtaffe, eſpecially by not regarding the eccentricitie of the eie.

4 Error of 11. or 12. minures in the declination of the Sunne, as it is ſet foorth in the regiments moſt commonly vſed among Mariners: and conſequently error of halfe a degree in the place of the Sunne.

5 Error of halfe a degree, yea an whole degree and more many times in the declinations of the principall fixed ſtarres, ſet forth to be obſerued by mariners at ſea.

Detected and corrected by often and diligent obſeruation.

Whereto is adioyned, the right H. the Earle of Cumberland his voyage to the Azores in the yeere 1589. wherin were taken 19. Spaniſh and Leaguers ſhips, together with the towne and platforme of Fayal.

By Edward Wright.

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A correction of Errors.

Till the Printer had thus farre proceeded, I was purposed to haue published the whole Table before mencioned, in such sort as I had made it, (supposing a Meridian of the nauticall Planisphære to be diuided, beginning at the aequinoctial) into such parts whereof a minute of the aequinoctial containeth 10. 000. and setting downe by which of these parts euerie minute of latitude is to be drawne, till you come within a minute of the Pole.

But vpon further aduice it was thought more meet to abridge the same as followeth, to euery tenth minute, & to cut off throughout the Table the three first figures towards the right hand, meaning not at this time to trouble thee with more then mought be of vse, for the true diuiding of the Meridian in the Sea Chart into degrees, and sixt parts of a degree, without sensible error which may be sufficient for the greatest sort of Sea Charts or Maps, that hitherto haue beene commonly vsed.

This Table is diuided into two columnes, whereof the first containeth degrees, and tennes of minutes, of the Meridian of the nauticall planisphare, beginning at the aequinoctial. The second columne containeth equal parts of the same Meridian, beginning likewise to be numbred from the aequinoctial: (of which parts euery minute of the aequinoctial is vnderstoode to contain 10.) and sheweth how many of these parts are answerable to any degree or Decade of minutes of latitude, in the nauticall Planisphære or Sea Chart.

The vse hereof followeth after the Table.

A Table for the true diuiding

1 Col.		2 Col.
De	Mi	
0	10	100
0	20	200
0	30	300
0	40	400
0	50	500
1	0	600
1	10	700
1	20	800
1	30	900
1	40	1000
1	50	1100
2	0	1200
2	10	1300
2	20	1400
2	30	1500
2	40	1601
2	50	1701
3	0	1801
3	10	1901
3	20	2001
3	30	2101
3	40	2201
3	50	2302
4	0	2402
4	10	2502
4	20	2602
4	30	2703
4	40	2803
4	50	2903
5	0	3004

1. Col.		2. Col.
De	Mi	
5	10	3104
5	20	3205
5	30	3305
5	40	3405
5	50	3506
6	0	3606
6	10	3707
6	20	3808
6	30	3908
6	40	4009
6	50	4110
7	0	4210
7	10	4311
7	20	4412
7	30	4513
7	40	4614
7	50	4715
8	0	4815
8	10	4916
8	20	5018
8	30	5119
8	40	5220
8	50	5321
9	0	5422
9	10	5523
9	20	5625
9	30	5726
9	40	5827
9	50	5929
10	0	6030

1 Col.		2 Col.
De	Mi	
10	10	6132
10	20	6234
10	30	6335
10	40	6437
10	50	6539
11	0	6641
11	10	6743
11	20	6845
11	30	6947
11	40	7049
11	50	7151
12	0	7253
12	10	7355
12	20	7458
12	30	7560
12	40	7662
12	50	7765
13	0	7868
13	10	7970
13	20	8073
13	30	8176
13	40	8279
13	50	8382
14	0	8485
14	10	8588
14	20	8691
14	30	8794
14	40	8897
14	50	9001
15	0	9104

of the meridians in the sea Chart.

1. Col.	2. Col.
De Mi	
15 10	9208
15 20	9312
15 30	9415
15 40	9519
15 50	9623
16 0	9727
16 10	9831
16 20	9935
16 30	10039
16 40	10144
16 50	10248
17 0	10353
17 10	10457
17 20	10562
17 30	10667
17 40	10772
17 50	10877
18 0	10982
18 10	11087
18 20	11192
18 30	11298
18 40	11403
18 50	11509
19 0	11615
19 10	11720
19 20	11826
19 30	11932
19 40	12038
19 50	12145
20 0	12251

1. Col.	2 Col
De Mi	
20 10	12358
20 20	12464
20 30	12571
20 40	12678
20 50	12785
21 0	12892
21 10	12999
21 20	13105
21 30	13213
21 40	13321
21 50	23429
22 0	13537
22 10	13645
22 20	13753
22 30	13861
22 40	13969
22 50	14078
23 0	14186
23 10	14295
23 20	14404
23 30	14513
23 40	14622
23 50	14731
24 0	14840
24 10	14950
24 20	15060
24 30	15170
24 40	15280
24 50	15390
25 0	15500

1 Col	2. Col.
De Mi	
25 10	15610
25 20	15721
25 30	15832
25 40	15942
25 50	16053
26 0	16165
26 10	16276
26 20	16388
26 30	16499
26 40	16611
26 50	16723
27 0	16835
27 10	16947
27 20	17060
27 30	17173
27 40	17285
27 50	17398
28 0	17512
28 10	17625
28 20	17738
28 30	17852
28 40	17966
28 50	18080
29 0	18194
29 10	18309
29 20	18423
29 30	18538
29 40	18653
29 50	18768
30 0	18884

A table for the true diuiding

1. Col.	2 Col.
De Mi	
30 10	18999
30 20	19115
30 30	19231
30 40	19347
30 50	19464
31 0	19580
31 10	19697
31 20	19814
31 30	19931
31 40	20048
31 50	20166
32 0	20284
32 10	20402
32 20	20520
32 30	20639
32 40	20757
32 50	20876
33 0	20995
33 10	21115
33 20	21234
33 30	21354
33 40	21474
33 50	21594
34 0	21715
34 10	21836
34 20	21957
34 30	22078
34 40	22199
34 50	22321
35 0	22443

1 Coll.	2 Col.
De Mi	
35 10	22565
35 20	22688
35 30	22811
35 40	22934
35 50	23057
36 0	23180
36 10	23304
36 20	23428
36 30	23552
36 40	23677
36 50	23802
37 0	23927
37 10	24052
37 20	24178
37 30	24304
37 40	24430
37 50	24556
38 0	24683
38 10	24810
38 20	24938
38 30	25065
38 40	25193
38 50	25321
39 0	25450
39 10	25579
39 20	25708
39 30	25837
39 40	25967
39 50	26097
40 0	26228

1 Col.	2 Col.
De Mi	
40 10	26358
40 20	26489
40 30	26621
40 40	26752
40 50	26884
41 0	27017
41 10	27149
41 20	27282
41 30	27416
41 40	27549
41 50	27683
42 0	27818
42 10	27953
42 20	28088
42 30	28223
42 40	28359
42 50	28495
43 0	28632
43 10	28769
43 20	28906
43 30	29044
43 40	29182
43 50	29320
44 0	29459
44 10	29598
44 20	29738
44 30	29878
44 40	30018
44 50	30159
45 0	30300

of the meridians in the sea Chart.

1 Col.		2 Col.
De	Mi	
45	10	30442
45	20	30584
45	30	30726
45	40	30869
45	50	31013
46	0	31156
46	10	31301
46	20	31445
46	30	31590
46	40	31736
46	50	31882
47	0	32028
47	10	32175
47	20	32322
47	30	32470
47	40	32618
47	50	32767
48	0	32916
48	10	33066
48	20	33216
48	30	33367
48	40	33518
48	50	33670
49	0	33822
49	10	33975
49	20	34128
49	30	34282
49	40	34436
49	50	34591
50	0	34746

1 Col.		2 Col.
De	Mi	
50	10	34902
50	20	35058
50	30	35215
50	40	35373
50	50	35531
51	0	35690
51	10	35849
51	20	36009
51	30	36169
51	40	36330
51	50	36491
52	0	36654
52	10	36816
52	20	36980
52	30	37144
52	40	37308
52	50	37473
53	0	37639
53	10	37806
53	20	37973
53	30	38141
53	40	38309
53	50	38478
54	0	38648
54	10	38819
54	20	38990
54	30	39162
54	40	39334
54	50	39506
55	0	39682

1. Col.		2 Col.
De	Mi	
55	10	39857
55	20	40032
55	30	40208
55	40	40385
55	50	40563
56	0	40741
56	10	40921
56	20	41101
56	30	41282
56	40	41463
56	50	41646
57	0	41829
57	10	42013
57	20	42198
57	30	42384
57	40	42570
57	50	42758
58	0	42946
58	10	43135
58	20	43325
58	30	43516
58	40	43708
58	50	43901
59	0	44095
59	10	44289
59	20	44485
59	30	44681
59	40	44879
59	50	45078
60	0	45277

A table for the true diuiding

1 Col.		2 Col.
De	Mi	
60	10	45478
60	20	45679
60	30	45882
60	40	46085
60	50	46290
61	0	46496
61	10	46703
61	20	46911
61	30	47120
61	40	47330
61	50	47541
62	0	47754
62	10	47967
62	20	48182
62	30	48398
62	40	48616
62	50	48834
63	0	49054
63	10	49275
63	20	49497
63	30	49720
63	40	49945
63	50	50171
64	0	50399
64	10	50628
64	20	50858
64	30	51090
64	40	51323
64	50	51557
65	0	51793

1 Coll.		2 Col.
De	Mi	
65	10	52030
65	20	52269
65	30	52510
65	40	52752
65	50	52995
66	0	53241
66	10	53487
66	20	53736
66	30	53986
66	40	54237
66	50	54491
67	0	54746
67	10	55003
67	20	55262
67	30	55522
67	40	55784
67	50	56049
68	0	56315
68	10	56583
68	20	56853
68	30	57124
68	40	57398
68	50	57674
69	0	57953
69	10	58233
69	20	58515
69	30	58800
69	40	59086
69	50	59375
70	0	59667

1 Col.		2 Col.
De	Mi	
70	10	59960
70	20	60257
70	30	60555
70	40	60856
70	50	61159
71	0	61465
71	10	61774
71	20	62085
71	30	62399
71	40	62716
71	50	63035
72	0	63357
72	10	63682
72	20	64011
72	30	64342
72	40	64676
72	50	65014
73	0	65354
73	10	65698
73	20	66045
73	30	66396
73	40	66750
73	50	67107
74	0	67468
74	10	67833
74	20	68202
74	30	68574
74	40	68950
74	50	69331
75	0	69715

of the meridians in the ſea Chart.

1 Col.		2 Col.
De	Mi	
75	10	70104
75	20	70497
75	30	70894
75	40	71296
75	50	71703
76	0	72114
76	10	72530
76	20	72951
76	30	73377
76	40	73808
76	50	74245
77	0	74687
77	10	75134
77	20	75588
77	30	76047
77	40	76512
77	50	76984
78	0	77462
78	10	77947
78	20	78438
78	30	78937
78	40	79442
78	50	79955
79	0	80476
79	10	81004
79	20	81541
79	30	82085
79	40	82639
79	50	83201
80	0	83773

1 Col.		2 Col.
De	Mi	
80	10	84354
80	20	84945
80	30	85546
80	40	86158
80	50	86781
81	0	87415
81	10	88061
81	20	88719
81	30	89389
81	40	90073
81	50	90771
82	0	91483
82	10	92210
82	20	92952
82	30	93711
82	40	94486
82	50	95280
83	0	96091
83	10	96923
83	20	97775
83	30	98648
83	40	99544
83	50	100464
84	0	101409
84	10	102380
84	20	103380
84	30	104409
84	40	105471
84	50	106565
85	0	107696

1. Col.		2 Col.
De	Mi	
85	10	108865
85	20	110075
85	30	111328
85	40	112630
85	50	113982
86	0	115389
86	10	116856
86	20	118389
86	30	119993
86	40	121675
86	50	123444
87	0	125209
87	10	127180
87	20	129272
87	30	131498
87	40	133879
87	50	136437
88	0	139200
88	10	142205
88	20	145497
88	30	149139
88	40	153213
88	50	157834
89	0	163176
89	10	169501
89	20	177259
89	30	187284
89	40	201513
89	50	226223
90	0	*Infinite.*

The vſe of the former Table.

THe vſe of this table for making the ſea Chart, is this: ouerthwart the midſt of the plaine ſuperficies, whereuppon you will draw the lineaments of the Chart, deſcribe a right line, (repreſenting the equinoctiall circle) which you ſhall diuide into 360 parts or degrees, and croſſe the ſame ſquirewiſe with right lines, by euery fift or tenth degree. Then take with your compaſſes the length of half the equinoctiall, (that is, 180 degrees) and ſetting one foote of your compaſſes in the mutuall interſection of the equinoctiall, with the perpendicular or meridian that paſſeth by either end of the equinoctiall, with the other foote make a pricke in the ſame perpendicular or meridian: the ſpace contained betwixt this pricke and the equinoctial, diuide firſt into three equall parts, and euerie one of theſe into other three, ſo haue you nine in all: and again euery one of theſe into three, ſo haue you 27 parts, and euerie one of theſe parts diuide into foure, ſo haue you 108 parts: And againe (if there bee ſpace inough) diuide euerie one of theſe into 10 or 100. ſo ſhall you haue 1080, or 10800 parts. Then note euerie fift and tenth part with blacke lead, and ſet figures at them, beginning at the equinoctiall, and from thence proceeding northwardes and ſouthwardes. Then looke what numbers ſtand ouer againſt each degree in this Table (omitting alwaies one or two of the firſt figures towardes the right hand) and at the ſame numbers of parts in the perpendiculars, make prickes on either ſide the equinoctiall: by which (pricks) draw right lines equidiſtant from the equinoctiall, for they ſhall be the

parallels

The vſe of the former Table.

parallels of the nauticall Planiſphære.

Notwithſtanding theſe parallels are all of them a little further diſtant from the æquinoctiall then in trueth they ſhould be: and ſo much the more the further they are from the equinoctiall. Which error might be ſomething the leſſe, if the former Table had beene firſt made to ſmaller partes then minutes. But that were a matter more curious then neceſſarie, the table here before ſet downe being ſo neare the trueth, that it is not poſsible by any rules or inſtruments of nauigation, to diſcouer any ſenſible error in the ſea Chart, ſo farre foorth as it ſhall be made according thereto.

The figure following containeth onely one part of the nauticall Planiſphære, from the equinoctiall northwardes, becauſe the other part from the equinoctiall ſouthwardes is altogether like to this. Herein firſt drawe the æquinoctiall A C. and diuide it into 360 degrees, drawing perpendiculars from euerie tenth degree thereof, which ſhal be the meridians euerie where equidiſtant each from other. Then take halfe the length of the equinoctiall with your compaſſes, and ſetting one foote in the ende of the equinoctiall at C with the other foote make a pricke at D. in the perpendicular or meridian C D. The ſpace contained betwixt C and D. diuided into 1080 partes, in ſuch ſort as before hath beene ſhewed, and ſet figures to them, as heere you ſee, that you may the more readily number thoſe parts. Then looke in the former table what number anſwereth to euerie tenth degree, and (caſting away

away two of the firſt figures next the right hande) finde out the parts anſwerable to the numbers remaining in the line C D. and at thoſe parts make prickes, by which you ſhall drawe the parallels.

As for example: in the table, the number ouer-againſt 10 degrees, is 60 (caſting away the two firſt figures towardes the right hande) therefore I looke 60 in the line C D. and by that part I drawe the parallel of 10 degrees diſtance from the æquinoctiall. And after this manner I draw all the reſt, as you may ſee in the former draught.

Now becauſe the nauticall Planiſphære (as before hath been ſhewed) is nothing elſe but a plaine parallelogramme ſuperficies made by extenſion of a ſphæricall ſuperficies inſcribed into a concaue cylinder, wherein the rumbes, or lines of the Compaſſe make æquall angles with euerie meridian: therefore in this nauticall planiſphære if a circle be drawne and diuided into 32. equall partes, beginning at the meridian paſsing by the centre of that circle: right lines drawne from the centre by thoſe diuiſions ſhall bee the rumbes or lines which the ſhippe deſcribeth in ſayling vpon thoſe poynts, becauſe they make equal angles with euery meridian of the nautical planiſphære, thoſe meridians being euery where æquidiſtant one from an other. Example hereof you haue in the former figure.

By help of this planiſphære with the meridians, rumbes, and parallels thus deſcribed therein, the rumbs may much more eaſily & truly be drawn in the globe then by theſe mæchanical wayes which *Petrus Nonius* teacheth *cap. 26 lib. 2. de obſer. Reg.*