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**An account of the trigonometrical survey, carried on in the years  
1797, 1798, and 1799**

**Mudge**

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XX. *An Account of the Trigonometrical Survey, carried on in the Years 1797, 1798, and 1799, by Order of Marquis Cornwallis, Master-General of the Ordnance. By Captain William Mudge, of the Royal Artillery, F.R.S. Communicated by his Grace the Duke of Richmond, F.R.S.*

Read July 3, 1800.

INTRODUCTION.

HAVING interspersed in the following Paper, with as much attention to brevity as the subject admits, every intelligence relating to the Trigonometrical Survey, I think it unnecessary to swell the bulk of the communication, by giving a long pre-fatory account of its progress since the year 1796.

The contents of the work now meeting the public eye, are important and numerous: I have divided it into sections. The first contains the calculations of the sides of the principal and secondary triangles extended over the country in 1797, 1798, and 1799; together with an account of the measurement of a new base line on Sedgemoor, and a short historical narrative of each year's operation. The second section contains the computed latitudes and longitudes of those places, on the western coast, intersected in 1795 and 1796, and also such others, since determined, as lie conveniently situated to the newly-observed meridians. This section also contains the directions of those meridians; one on Black Down, in Dorsetshire; another on But-terton Hill, in Devonshire; and another on St. Agnes Beacon,



in Cornwall. Among the contents are likewise to be numbered the bearings, distances, &c. of the stations and intersected objects, from the parallels and meridians.

The third and last section contains the triangles which have been carried over Essex, the western part of Kent, and portions of the counties joining the former, Suffolk and Hertfordshire. It is with satisfaction I am enabled to state, that Mr. GARDNER, the chief Draftsman, with his assistants, has almost completed the Survey of this extensive tract, which, no doubt, like the map of Kent, will be given to the public: the materials for these different surveys are ample, and will be found in this section, which concludes with the altitudes of the stations and mean refractions.

Before I had advanced far in my work, I entertained ideas of condensing all the *data* in my possession, and distributing them in it; but, when I found my paper would, in that case, be too large for the Philosophical Transactions, I desisted, contenting myself with presenting little more than a moiety: it is, even now, of inconvenient magnitude, but I could not, with propriety, still farther abridge it, for I have, in several instances, rejected important matter. I shall, therefore, take an early opportunity of compiling a fourth account, in which will be given the latitudes and longitudes of those places, in Essex, Kent, &c. found in the last section.

It is right I should observe that, knowing from experience, how liable surveyors are to mistake the names of places, and also, how utterly impracticable it is to detect errors, till the interiors of the great triangles have been *filled up*, I have been cautious to give only the distances of such objects as could not be easily mistaken. I do not mean to insinuate that, among



the great number now published, instances may not be found of misnomers, or even wrong bearings; but I rely with great confidence on their general accuracy, and particularly on those constituting the surveys of Essex and the northern shore of the Thames, as the whole of them have been *verified* by Mr. GARDNER. Indeed this is to be understood as holding good throughout the last section, in which are 375 triangles. In our former accounts of this survey, we were particularly guarded in not intermixing their contents with distances determined from numerous doubtful intersections; and experience has hitherto not detected above three or four errors arising from wrong bearings or misnomers. Previously, indeed, to the compilation of them, a great part of the objects in Sussex, Hampshire, and the Isle of Wight, were verified by Mr. GARDNER, in process of an extensive survey, carried on by the order, and performed for the service, of the Board of Ordnance. This gentleman will also have it in his power to detect any errors, if such exist, in the names of places to the westward; as the Master General has been pleased to issue his directions for the survey of Devonshire, and as much of Somersetshire and Cornwall as will *square* the work.

I have mentioned, in the body of the account, that the President and Council of the Royal Society, were pleased to accede to the request made by the Honorable Board of Ordnance, to entrust to my care, the circular instrument used by the late Major General ROY, in his well known operation. It has already been found highly useful, and will shortly prove to be still more so, as one theodolite will be employed in carrying the above orders of Marquis CORNWALLIS into effect, while the other is used in carrying a meridional line through the country; an undertaking begun, and partly executed.



Before I close this Introduction, I am to announce, that Mr. ISAAC DALBY, no longer able to endure the fatigues incident to the service, has retired from it; and it would be a matter of injustice, if I were not to acknowledge the extent of his services, his unremitted labour, and attention. But, whilst I lament the loss of a man so perfectly calculated to assist me in this arduous undertaking, I derive every consolation from a knowledge, founded on experience, of the talents and abilities of Mr. SIMON WOOLCOT, his successor.

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### SECTION FIRST.

#### 1. *Particulars relating to the Operations of the Year 1797.*

The principal object proposed to be accomplished this year, was the determination of the directions of meridians at proper stations, in order to afford the necessary *data* for computing the latitudes and longitudes of places intersected in the surveys of 1795 and 1796.

From errors which are the result of computations made on the supposition of the earth's surface being a plane, it is expedient that new directions of meridians should be observed, when the operations are extended, in eastern or western directions, over spaces of sixty miles from fixed meridians. The distance from Dover to the Land's End being upwards of 300 miles, it becomes necessary, on this principle, that four directions of meridians should be observed; which, with that of Greenwich, amounts to five, dividing this space into six nearly equal parts.

Whatever be the stations farther to the westward, which offer



themselves as fit places for these observations, Dunnose in the Isle of Wight presents itself as highly eligible, not only because it is removed the necessary distance from the meridian of Greenwich, but also because it commands a most extensive view of the western coast: therefore, as the direction of the meridian was observed on this station in 1793, (see *Philosophical Transactions* for 1795, p. 517.) it became necessary to fix on three places only.

In the selection of these stations, it was our wish to have found such as should lie nearly in the same parallel, each intermediate one being visible from those east and west of it; by which means, the differences of latitude between their respective parallels would be accurately determined.

When the party was at Dunnose, in the year 1793, a hill at a very considerable distance, in a direction very nearly west, was seen just rising out of the horizon. It then occurred to us that this spot would, at some future period, be a very proper one for a station whereon a new direction of the meridian might be observed. Experience, in the Survey of 1795, led us to believe this hill was actually Black Down in Dorsetshire; therefore it was determined that our operations should commence at that station, and the event verified the truth of our suppositions.

The party took the field early in April, as observations on the Pole Star, for the purpose in question, are made with superior advantage at this season of the year, because the star comes to its greatest elongations from the meridian at those times, when the sun produces little tremor in the air, by which means, the staff to which the Pole Star is referred, in good weather, is easily perceived.

As the high land in the vicinity of Teignmouth, in Devonshire,



cuts off all view of the southern extremity of Dartmoor from Black Down, the necessary alternative was, the firing of lights on some remote station, communicating with Butterson. Rippin Tor was quickly discovered to be the most proper spot; and that eminence would, in every point of view, be a most eligible one for a new direction of the meridian, if the hills in the middle of the moor were not considerably higher. It was, therefore, chosen only with a view of being subservient to the purpose of finding the latitude of Butterson.

In making observations on the Pole Star, the same precautions were taken to ensure accuracy, as were observed at Dunnose and Beachy Head in the year 1793; (see *Phil. Trans.* for 1795, p. 460.) I shall, therefore, not enumerate them, but content myself with observing, that no pains were spared in this performance.

From Black Down, the party removed to Butterson; at which place but few observations were made, the weather being either tempestuous or hazy, during the greatest part of the time we were at that station: they were, however, made under favourable circumstances, in other respects, and are therefore likely to afford accurate results.

As in the case of Rippin Tor, with respect to Black Down, so Hensbarrow, in Cornwall, was selected as the spot for connecting St. Agnes Beacon with the station on Butterson; for these latter are not visible from each other, the high land about St. Austle, on the northern part of which is situated Hens or Hengist barrow, being higher and intermediate. The staff to which the lights and star were referred, was placed on a hill called Hemmerdon Ball, a secondary station in the series of 1795.

On the 1st of May, the party proceeded to St. Agnes Beacon; at



which place the observations were completed on the 8th. The staff for connecting the observations made on the Pole Star with those made on the lights fired at Hensbarrow, was placed near Peranzabulo; which spot is laid down in the plan, Pl. XXVII.

After these directions of meridians were determined, we proceeded with the survey, and from St. Agnes Beacon repaired to Trevoze Head, a promontory on the northern coast of Cornwall. The ascent from the sea to the station on this headland being very gradual and unobstructed, we took the opportunity of finding its altitude by means of the transit instrument. The levelling was begun on the 30th of May, and finished the following day; from which operation, it was found that the height of the station above low water-mark was 274.2 feet; which is, probably, within six inches of the truth. This base of altitude, will afford the means of computing the heights of the stations in the north of Devon, and also of verifying those in the western part of Cornwall. (See *Phil. Trans.* for 1797, p. 471.)

In giving an account of this and similar articles, it is my intention merely to set forth the order in which the different parts of the survey have been performed. It would be prolix, and perhaps, unnecessary, to assign the reasons for the choice of each station. In the present instance, however, it may not be improper to observe, that a station called Black Down, near Lydford, was selected for the purpose of carrying distances into the north of Devon, by means of the side formed by that station and Carraton Hill. The difficulty of running up the series of triangles from the west, (and it might have been also added, towards the north,) is mentioned in the account of 1797. A tract of country exists in Cornwall, possessing the same characteristic features with Dartmoor, and has thrown in our



way equal embarrassments. The station called Carraton Hill, is situated on its southern extremity, from which no part of the north of Cornwall can be seen : it, therefore, became expedient to erect a staff on the top of the rugged hill Brown Willy, (a spot not accessible to the instrument,) and afterwards to content ourselves with *surveying round it*. This resolution became the more necessary, as by means of it, the triangles in the west of Devon will be hereafter connected with those in the north of Cornwall, in a shorter and more direct way than from the sides in the more southern country. In order, therefore, to observe the staff erected on this station, the instrument was taken a second time to Bodmin Down. The station named Cadon Barrow, near Camelford, and those on St. Stephen's Down, near Launceston, were also visited ; at which time it was judged expedient to discontinue the operations in Devonshire.

In proceeding along the southern coast, in the years 1795 and 1796, with a single chain of triangles, we acted in conformity with our instructions. It was, in many points of view, the most eligible mode of proceeding ; and particularly in that which regarded an early determination of the latitudes and longitudes of the great head-lands in the channel, and also of the Scilly Isles.

When the operations above spoken of were completed, and those instructions carried into full execution, (ample materials being provided for ascertaining the situations of every remarkable point on the English side of the channel,) the want of a spot in the southern part of Cornwall, for the measurement of a base, was felt and regretted ; we were, therefore, unwilling to introduce errors, if any should exist, from the sides in Cornwall, into the north of Devon : our operations were consequently discontinued.



From Devonshire we proceeded to the eastward, for the purpose of carrying on a second series of triangles. These were necessarily intended to originate from the side which connects the station on Beacon Hill, near Amesbury, with that on Wingreen Hill, near Shaftesbury.

In the month of July, the observations were completed at the station on the Mendip Hills, after which the instrument was taken to Bradley Knoll; Dundry Beacon, near Bristol; Lansdown and Farley Down; the station on Lansdown being chosen rather for a secondary than a principal place of observation.

From Bradley Knoll, to which place the instrument was carried from Farley Down, we proceeded to Westbury Down, and from thence to Beacon Hill, near Amesbury; because it was necessary that a new point on the range near Marlborough, commonly named St. Ann's Hills, should be observed. The station formerly chosen at the eastern extremity of this range, and observed in 1794, (see *Phil. Trans.* 1795, p. 471.) was this year found to be useless, as the high land, on the same range, prevented it from being seen at Lansdown: two others were, therefore, selected to the westward of the former, and observed from Beacon Hill; one for the purpose of connecting with Lansdown, and a station near Symmond's Hall, in Gloucestershire; and the other with Inkpin Beacon. The particular circumstances of this range, both as to situation and height, have thrown great impediments in the way of the survey, and are the means of cutting off, in a considerable degree, the connection between the southern triangles and those which have been since carried on in the midland of the kingdom. From Amesbury the party proceeded to Inkpin Beacon, near Hungerford, where the operations terminated.



The stations chosen and observed this year, but not visited with the instrument, were Monymoor, near Penhow; the mountain Twymbawlin, near Newport; and Scilly Point, in Glamorganshire. These stations in South Wales will connect with three in Somersetshire, also selected this season; one on Bleak Down, which is situated on the western extremity of the Mendip range; a second on Brent Beacon; and a third on the Quantock Hills.

Subsequent to the operations on Salisbury Plain, enquiries had been often made after a spot on which a third base might be measured. Experience had almost convinced us that, if Sedgemoor were excepted, the southern part of England did not contain one of sufficient extent for a base of three miles. Aware, therefore, of the imperfect state in which our work must rest, without a fresh base, Mr. DALBY and myself passed over into South Wales, and examined the extensive level between the new Passage House and Cardigan. After, however, a very diligent search, we could not find any spot, four miles in length, sufficiently unobstructed. The advantages which the situation itself holds out, are so great, that we should not have scrupled to dispense with a desideratum, heretofore required, of the base being one continued line. So much, however, is this flat cut up with *rhyndes* and ditches, that we were not able to find any point from which two right lines might be measured, and so inclined to each other as to afford, by means of an including angle, a third side of five miles in length: necessity, therefore, compelled us to think of measuring a base on Sedgemoor, which we immediately examined. That which relates to this situation, will be found in an ensuing article: it is now only necessary to observe, that we concluded the operations of 1797, after the practicability of measuring a base upon it had been decided in the affirmative.



ART. II. *Angles taken in the Year 1797.*

*At Black Down.*

| Between                                           |   |   |                    | Mean.                   |
|---------------------------------------------------|---|---|--------------------|-------------------------|
| Dunnose and Abbotsbury staff                      | - | - | 164 26 33,75<br>37 | } 35,25                 |
| Rippin Tor and Abbotsbury staff                   | - | - | 3 8 51,75<br>52,75 | } 52,5                  |
| Pilsden and Abbotsbury staff                      | - | - | 45 16 15<br>13     | } 14, but 13 preferred. |
| Pole star and Abbotsbury staff, April 17, morning | - | - | 104 19 26,75       |                         |
| 18, morning                                       | - | - | 104 19 19,25       |                         |
| 19, morning                                       | - | - | 104 19 33          |                         |
| 19, afternoon                                     | - | - | 98 42 47           |                         |
| 20, morning                                       | - | - | 104 19 25,25       |                         |
| 20, afternoon                                     | - | - | 98 42 35,5         |                         |

*At Butterton.*

|                                                         |   |   |                    |        |
|---------------------------------------------------------|---|---|--------------------|--------|
| Hemmerdon Ball and Rippin Tor                           | - | - | 121 17 7,25<br>8,5 | } 7,75 |
| Hemmerdon Ball and Hensbarrow                           | - | - | 1 52 2,75<br>6,25  | } 4,5  |
| Pole star and staff on Hemmerdon Ball, May 6, afternoon | - | - | 91 29 13,75        |        |
| 7, morning                                              | - | - | 97 4 14            |        |
| 7, afternoon                                            | - | - | 91 29 12           |        |

*On St. Agnes Beacon.*

|                                                    |   |   |                     |                      |
|----------------------------------------------------|---|---|---------------------|----------------------|
| Hensbarrow and Trevoze Head                        | - | - | 47 10 0,75          |                      |
| Hensbarrow and Peranzabulo staff                   | - | - | 31 50 55,5<br>56,25 | } 56, but 55,5 pref. |
| Pole star and Peranzabulo staff, May 20, afternoon | - | - | 44 0 45,75          |                      |
| 21, afternoon                                      | - | - | 44 0 44,75          |                      |
| 22, morning                                        | - | - | 38 26 1,5           |                      |
| 22, afternoon                                      | - | - | 44 0 33,25          |                      |
| 23, morning                                        | - | - | 38 26 9             |                      |

*At Trevoze Head.*

|                                 |   |   |                         |      |
|---------------------------------|---|---|-------------------------|------|
| St. Agnes Beacon and Hensbarrow | - | - | 65 43 43,75<br>47<br>50 | } 47 |
|---------------------------------|---|---|-------------------------|------|



| Between                      |   |   |   | Mean                 |
|------------------------------|---|---|---|----------------------|
| Hensbarrow and Bodmin Down   | - | - | - | 34 17 45 } 45,5      |
| Bodmin Down and Cadon Barrow | - | - | - | 42 33 43 } rejected. |
|                              |   |   |   | 46,5 } 52            |
|                              |   |   |   | 51,75 } 52           |
|                              |   |   |   | 52,75 } 52           |

*At Hensbarrow.*

|                                    |   |   |   |                    |
|------------------------------------|---|---|---|--------------------|
| St. Agnes Beacon and Trevoise Head | - | - | - | 67 6 13,25 } 13,25 |
|                                    |   |   |   | 13,25 } 13,25      |
| Bodmin Down and Trevoise Head      | - | - | - | 77 20 17,75 } 18,5 |
|                                    |   |   |   | 19,25 } 18,5       |

*At Bodmin Down.*

|                                         |   |   |   |                     |
|-----------------------------------------|---|---|---|---------------------|
| Hensbarrow and Trevoise Head            | - | - | - | 68 21 57,25 } 58,25 |
|                                         |   |   |   | 59,5 } 58,25        |
| Trevoise Head and Cadon Barrow          | - | - | - | 71 55 26,75 } 27    |
|                                         |   |   |   | 27 } 27             |
| Carraton Hill and staff on Brown Willy  | - | - | - | 52 3 59,5 } 1,75    |
|                                         |   |   |   | 4 1,25 } 1,75       |
|                                         |   |   |   | 4,5 } 1,75          |
| Carraton Hill and picket on Brown Willy | - | - | - | 51 36 11 } 11       |
|                                         |   |   |   | 11 } 11             |
| Cadon Barrow and staff on Brown Willy   | - | - | - | 30 58 13 } 13       |
|                                         |   |   |   | 13 } 13             |
| Cadon Barrow and picket on Brown Willy  | - | - | - | 31 26 0,25 } 1,75   |
|                                         |   |   |   | 1,25 } 1,75         |
|                                         |   |   |   | 3,25 } 1,75         |

*On Cadon Barrow.*

|                                                         |   |   |   |                      |
|---------------------------------------------------------|---|---|---|----------------------|
| Trevoise Head and direction post on Bodmin Down         | - | - | - | 68 7 53,75 } 54,25   |
|                                                         |   |   |   | 54 } 54,25           |
|                                                         |   |   |   | 54,25 } 54,25        |
|                                                         |   |   |   | 54,75 } 54,25        |
| Direction post on Bodmin Down and staff on Brown Willy  | - | - | - | 41 12 37,5 } 39,25   |
|                                                         |   |   |   | 39 } 39,25           |
|                                                         |   |   |   | 41 } 39,25           |
| Direction post on Bodmin Down and picket on Brown Willy | - | - | - | 40 40 34 } 35,25     |
|                                                         |   |   |   | 36,75 } 35,25        |
| Tresparrot Down and staff on Brown Willy                | - | - | - | 100 20 52,25 } 54,75 |
|                                                         |   |   |   | 55 } 54,75           |
|                                                         |   |   |   | 57 } 54,75           |
| Tresparrot Down and picket on Brown Willy               | - | - | - | 100 53 1 } 1         |
|                                                         |   |   |   | 1 } 1                |

*At St. Stephen's Down.*

|                                   |   |   |   |                  |
|-----------------------------------|---|---|---|------------------|
| Staff on Brown Willy and Warbstow | - | - | - | 41 18 24,25 } 25 |
|                                   |   |   |   | 25,5 } 25        |



# Trigonometrical Survey.

551

| Between                          |   |   |             | Mean.   |
|----------------------------------|---|---|-------------|---------|
| Warbstow Beacon and Brendon Moor | - | - | 39 41 18,5  | } 18,75 |
|                                  |   |   | 18,75       |         |
| Brendon Moor and Broadbury Down  | - | - | 90 0 40,75  | } 41    |
|                                  |   |   | 41          |         |
| Broadbury Down and Black Down    | - | - | 45 34 36 D  | } 42,25 |
|                                  |   |   | 41,75       |         |
| Black Down and Carraton Hill     | - | - | 91 18 12,25 | } 12,75 |
|                                  |   |   | 13,5        |         |
| Carraton Hill and Kit Hill       | - | - | 37 1 56     | } 13    |
| Black Down and Kit Hill          | - | - | 54 16 13    |         |

## At Maker.

|                              |   |   |         |         |
|------------------------------|---|---|---------|---------|
| Carraton Hill and Black Down | - | - | 53 4 28 | } 29,25 |
|                              |   |   | 30,5    |         |

## At Carraton Hill.

|                              |   |   |             |        |
|------------------------------|---|---|-------------|--------|
| Black Down and Maker Heights | - | - | 74 5 22,5   | } 22,5 |
|                              |   |   | 22,75       |        |
| Treose Head and Bodmin Down  | - | - | 77 20 17,75 | } 18,5 |
|                              |   |   | 19,25       |        |

## At Black Down.

|                                       |   |   |             |        |
|---------------------------------------|---|---|-------------|--------|
| Maker Heights and Carraton Hill       | - | - | 52 50 7,75  | } 9,75 |
|                                       |   |   | 11,75       |        |
| Carraton Hill and St. Stephen's Down  | - | - | 39 44 37,25 | } 39   |
|                                       |   |   | 40,75       |        |
| St. Stephen's Down and Broadbury Down | - | - | 66 49 57,5  | } 58   |
|                                       |   |   | 58,25       |        |
| Carraton Hill and Kit Hill            | - | - | 13 12 58    |        |

## On the Mendip Hills.

|                              |   |   |             |         |
|------------------------------|---|---|-------------|---------|
| Dundon Beacon and Bleak Down | - | - | 85 15 59,25 | } 1,25  |
|                              |   |   | 59,75       |         |
| Bleak Down and Brent Knoll   | - | - | 16 1,5      | } 39,25 |
|                              |   |   | 4,5         |         |
|                              |   |   | 29 11 35,75 | } 39,25 |
|                              |   |   | 38          |         |
|                              |   |   | 41,25       | } 30,5  |
|                              |   |   | 41,75       |         |
| Bleak Down and Dundry Beacon | - | - | 33 39 30,5  | } 30,5  |
|                              |   |   | 30,5        |         |



| Between                         |   |   |   | o  | i  | "                          | Mean.   |
|---------------------------------|---|---|---|----|----|----------------------------|---------|
| Dundry Beacon and Lansdown      | - | - | - | 41 | 3  | 58,5<br>58,75              | } 58,5  |
| Lansdown and Farley Down        | - | - | - | 19 | 32 | 16,5<br>17                 | } 16,75 |
| Farley Down and Westbury Down   | - | - | - | 38 | 55 | 17<br>18,25                | } 17,5  |
| Westbury Down and Bradley Knoll | - | - | - | 37 | 47 | 57<br>57,75<br>58,75<br>59 | } 58,5  |
| Farley Down and Dundry Beacon   | - | - | - | 60 | 36 | 15<br>15,75                | } 15,5  |
| Farley Down and Bradley Knoll   | - | - | - | 76 | 43 | 14<br>18,5<br>21           | } 19,75 |

*At Dundry Beacon.*

|                                          |   |   |   |     |    |                   |         |
|------------------------------------------|---|---|---|-----|----|-------------------|---------|
| Tickenham Down and Grey Hill             | - | - | - | 37  | 44 | 2,25<br>3<br>6,25 | } 3,75  |
| Tickenham Down and Kingsweston           | - | - | - | 60  | 3  | 27,25<br>30       | } 28,75 |
| Kingsweston and Grey Hill                | - | - | - | 22  | 19 | 23,5<br>27,75     | } 25,75 |
| Bleak Down and Grey Hill                 | - | - | - | 120 | 0  | 23<br>24<br>28    | } 25    |
| Lansdown and station on the Mendip Hills | - | - | - | 83  | 34 | 16,25<br>19,75    | } 18    |
| Farley Down and Mendip Hills             | - | - | - | 69  | 52 | 21<br>23          | } 22    |
| Mendip and Bleak Down                    | - | - | - | 54  | 34 | 24<br>25,75       | } 25,5  |

*At Lansdown.*

|                        |   |   |   |    |    |    |  |
|------------------------|---|---|---|----|----|----|--|
| Kingsweston and Dundry | - | - | - | 36 | 38 | 29 |  |
|------------------------|---|---|---|----|----|----|--|

*On Farley Down.*

|                                  |   |   |   |    |    |                               |         |
|----------------------------------|---|---|---|----|----|-------------------------------|---------|
| St. Ann's Hill and Westbury Down | - | - | - | 51 | 44 | 10,75<br>11<br>11,25<br>13,75 | } 11,75 |
| Westbury Down and Bradley Knoll  | - | - | - | 37 | 5  | 30,75<br>31<br>34<br>34,25    | } 32,5  |



*Trigonometrical Survey.*

553

| Between                        |   |   |   | o  | ,  | "                            | Mean.               |
|--------------------------------|---|---|---|----|----|------------------------------|---------------------|
| Westbury Down and Mendip Hills | - | - | - | 77 | 21 | 51,75<br>55,75               | } 53,75             |
| Bradley Knoll and Mendip Hills | - | - | - | 40 | 16 | 23<br>23,75                  | } 23,5              |
| Mendip Hills and Dundry Beacon | - | - | - | 49 | 31 | 15,25<br>21,5<br>23<br>23,75 | } rejected.<br>23,5 |

*On Bradley Knoll.*

|                                  |   |   |   |     |    |                            |         |
|----------------------------------|---|---|---|-----|----|----------------------------|---------|
| Mendip Hills and Westbury Down   | - | - | - | 101 | 23 | 56,5<br>57,75<br>0<br>1,75 | } 59    |
| Westbury Down and Beacon Hill    | - | - | - | 42  | 43 | 29,25<br>30,5              | } 29,75 |
| St. Ann's Hill and Westbury Down | - | - | - | 7   | 28 | 44<br>45,25<br>46,5        | } 45    |
| Westbury Down and Milk Hill      | - | - | - | 10  | 12 | 49,5<br>53,25              | } 51,5  |
| Beacon Hill and Wingreen         | - | - | - | 57  | 50 | 38,25                      |         |
| Beacon Hill and Bull Barrow      | - | - | - | 98  | 34 | 31<br>33,5<br>34           | } 32,5  |
| Wingreen and Bull Barrow         | - | - | - | 40  | 43 | 51,25<br>52,75             | } 52    |
| Bull Barrow and Ash Beacon       | - | - | - | 45  | 43 | 3,25<br>3,75               | } 3,5   |
| Ash Beacon and Mendip Hills      | - | - | - | 71  | 34 | 54,75<br>55,25             | } 55    |
| Mendip Hills and Farley Down     | - | - | - | 63  | 0  | 21,5 D                     |         |

*At Bull Barrow.*

|                            |   |   |   |    |    |                   |      |
|----------------------------|---|---|---|----|----|-------------------|------|
| Ash Beacon and Mintern     | - | - | - | 51 | 26 | 41<br>41,75<br>43 | } 42 |
| Bradley Knoll and Wingreen | - | - | - | 42 | 55 | 32,75             |      |

*At Pilsden Hill.*

|                        |   |   |   |    |   |              |     |
|------------------------|---|---|---|----|---|--------------|-----|
| Mintern and Ash Beacon | - | - | - | 35 | 2 | 59<br>3 3,25 | } 1 |
|------------------------|---|---|---|----|---|--------------|-----|



*The Account of a**At Mintern.*

| Between                    |   |   |   |                     | Mean. |
|----------------------------|---|---|---|---------------------|-------|
| Pilsden and Ash Beacon     | - | - | - | 95 35 21,25<br>22,5 | } 22  |
| Ash Beacon and Bull Barrow | - | - | - | 94,14,22<br>24      | } 23  |

*On Westbury Down.*

|                                |   |   |   |                                 |         |
|--------------------------------|---|---|---|---------------------------------|---------|
| Beacon Hill and Bradley Knoll  | - | - | - | 114 12 18,25<br>18,5<br>18,75   | } 18,5  |
| Bradley Knoll and Mendip Hills | - | - | - | 40 48 1<br>1,75<br>1,75         | } 1,75  |
| Mendip Hills and Farley Down   | - | - | - | 63 42 50,5<br>52                | } 51,25 |
| Farley Down and St. Ann's Hill | - | - | - | 88 50 1<br>3<br>4 $\frac{1}{4}$ | } 2,75  |
| St. Ann's Hill and Beacon Hill | - | - | - | 52 26 42,25<br>43,25            | } 42,75 |
| Beacon Hill and Milk Hill      | - | - | - | 48 7 31<br>36                   | } 33,5  |

*Beacon Hill (Amesbury.)*

|                                  |   |   |   |                     |         |
|----------------------------------|---|---|---|---------------------|---------|
| Bradley Knoll and Westbury Down  | - | - | - | 23 4 15             |         |
| Inkpin Down and Milk Hill        | - | - | - | 66 14 58            |         |
| Inkpin Down and St. Ann's Hill   | - | - | - | 70 51 57,5<br>57,75 | } 57,75 |
| Westbury Down and Milk Hill      | - | - | - | 51 11 9             |         |
| Westbury Down and St. Ann's Hill | - | - | - | 46 34 6<br>9,25     | } 7,75  |

*On Inkpin Down.*

|                                |   |   |   |                           |         |
|--------------------------------|---|---|---|---------------------------|---------|
| White Horse Hill and Highclere | - | - | - | 133 27 57,25<br>57,5      | } 57,5  |
| Highclere and Beacon Hill      | - | - | - | 106 16 52,25<br>54,25     | } 53,25 |
| Beacon Hill and Hewish         | - | - | - | 51 53 31,25<br>33,5<br>35 | } 33,25 |



ART. III. *Particulars relating to the Operations of the Year 1798.*

The object first attained this year, consisted in a trigonometrical survey of the counties adjacent to the northern and southern shores of the Thames.

In the last communication it will be seen, that the survey of Kent had been carried on from the sea-coast, till it reached the range which runs eastward from Wrotham through Hollingbourn, and there terminated. The country to the northward could not be surveyed, because the view from General Roy's station at Wrotham is almost entirely cut off, in that direction. In order, therefore, to obtain a base for the purpose, when the party arrived at Wrotham, a new station was chosen, to the eastward of the former one, and the distance between them accurately measured; by which means, together with the included angle at the old station, and the distance of it from Severndroog Tower, on Shooter's Hill, a new distance was found, which became a base for the survey proposed.

The chief draftsmen and surveyors belonging to the Drawing-room in the Tower, attended our operations in this county, and also those afterwards carried on in Essex. It was, indeed, for their immediate service, that we renewed the survey in this quarter, as the Master-General had given directions to prepare ample materials for completing the map which meets the public eye with this article.

The stations in Kent, besides that of Wrotham, were Gravesend, Gad's Hill, and the Isle of Sheppey; those in Essex were Hadleigh, South End, and Prittlewell. Observations made from these places afforded *data* for the proposed survey: after they were completed, the small circular instrument supplied the



place of the great one, and was used, with good effect, in carrying on the subsequent operations in this quarter.

In our Paper published in the Philosophical Transactions for 1795, an observation is made, of the necessity then existing for the measurement of a base on Salisbury Plain, in consequence of resolutions taken to inclose Sedgemoor: an act for which purpose was passed a few years ago, and partly carried into execution in 1797. At this time, however, King's Sedgemoor was only set out into parochial allotments, as exhibited in Plate XXVIII. accompanying this Account. The ditches, represented by lines on this plan, were generally ten feet broad, and five feet deep; but the principal and secondary drains were much wider, the first being thirty, and the last twenty-five, feet in breadth. The subdivisions on the Moor, or the individual allotments of it, were not traced out in the Somerton quarter, at this time, the task being deferred till the latter part of the following year. The measurement, therefore, of this base, in an early part of the season, became necessary, because fewer obstacles were then expected to present themselves.

As it appeared that many instances would probably occur, in which a chain of 50 feet in length would be useful, if not absolutely necessary, one was provided by Mr. RAMSDEN, in the winter; its make and form being precisely similar to those of the larger chains, used in the measurement of our former bases. Such a chain did, indeed, prove highly serviceable in the subsequent operation; as the handles of the 100-feet chain would very often have had their places in ditches, or been so situated on their banks, as to leave imperfect means of correctly placing the register heads under the handles.

The apparatus for the measurement, consisting of the tressels



belonging to the Royal Society, pickets, iron heads, and a new set of coffers, were sent to Somerton, after Mr. GARDNER had been furnished with the means of proceeding with the survey before spoken of.

The measurement was begun in July, and finished in August; in the course of which, very little interruption arose from any inclemency of weather. It is unnecessary to enter minutely into a description of the difficulties which arose from the frequent intervention of ditches; let it suffice to observe, that, possessed of the 50-feet chain, these were rendered less material than they would otherwise have been.

When we arrived at that point which ends with the 114th chain, an *offset* was taken, and 19 chains measured, in a direction perfectly parallel to that of the base, at the extremity of which we returned into the base itself, and continued the measurement. This interruption proceeded from an accidental and unforeseen circumstance; a great ditch having been excavated in a direction coincident with that of the base, while the measurement was going on at the upper end of it. This, however, cannot be the means of introducing any sensible inaccuracy; for, to proceed in this matter correctly, when it became necessary to take an offset, a silver wire was let fall from the register head, having a plummet, under the point of which a small dot was made, on a stake driven firmly into the ground. *The great theodolite* was then placed over the stake, *and the instrument accurately adjusted over the dot*. A diaphragm, whose aperture was  $\frac{1}{2}$  an inch, was then put over the object-glass of the transit telescope, which was afterwards directed towards the staff at Lugshorn Corner, and then moved round, till it exactly made a right angle with the base. The telescope being sufficiently



depressed, a peg was driven into the ground, with its centre nearly under the cross wires; after which, a pin was moved on the surface of the peg, as directed by a person looking through the telescope, till it came to that point at which it bisected the angle formed by the cross wires. The measurement was then carried on, in this new direction, a space of 19 chains, at the end of which, the same operations were repeated, and the old direction pursued. It does not seem probable, that an error amounting to more than  $\frac{2}{10}$  of an inch, can have resulted from this procedure.

King's Sedgemoor being sufficiently level, the base was measured horizontally; an advantageous circumstance; but, from the soft texture of the soil, the pickets could not be driven into the ground so firmly as to be without some small degree of motion, in case a person stood close to them. Therefore, those who attended the handles of the chains, either used long stools, or placed themselves so as to divide the pressure arising from the weights of their bodies equally on each side of the pickets. The disturbances to which the register-heads were liable, did not discover themselves till a mile of the base had been measured; and, although it became probable that small errors only had resulted from the want of those precautions we afterwards followed, yet we considered what we had done as erroneous, and recommenced the measurement, with the advantage of experience. At present, I shall content myself with observing, that due attention was paid to all necessary minutiae in this measurement, and refer those who are desirous of being more particularly informed, to the Philosophical Transactions for 1795, as the mode of proceeding on the present occasion was perfectly similar to that on Hounslow Heath.



After the conclusion of this operation, we proceeded to select such stations in the neighbourhood of the base, as might afford means of connecting it with the triangles carried on in the preceding year. The two chosen for this purpose, were Dundon Beacon, and a spot near the village of Moor Lynch; both nearer to their respective ends of the base than we wished to have found them; yet, as small rods of only an inch in diameter were placed on those stations, when they were observed from Dundon Beacon and Moor Lynch, and the same erected at the ends of the base, when they were observed from those stations, it becomes probable that very trifling errors resulted from this proceeding.

The station at Ash Beacon was visited subsequent to these just spoken of, and afterwards that on the Mendip Hills, for the purpose of taking the angle between Moor Lynch and Dundon Beacon. The operations of 1798 then terminated with a diligent search after some spot in Cornwall, for a base of only two or three miles in length: this search, however, was fruitless, as in fact we had reason to imagine it would prove to be; but we were not willing to relinquish the hope, that a piece of ground might be discovered proper for so confined a purpose. The contrary, however, being the case, the party returned to London in October.

ART. IV. *Angles taken in the Year 1798.*

*At Wrotham. Station of 1787.*

| Between                                    |          | Mean. |
|--------------------------------------------|----------|-------|
| New Station and staff on Severndroog Tower | 94 19 30 | "     |

*Station of 1798.*

|                                 |                            |      |
|---------------------------------|----------------------------|------|
| Severndroog Tower and Gravesend | 62 54 36.5<br>38.5<br>39.5 | } 38 |
|---------------------------------|----------------------------|------|



## At Gravesend.

| Between                            |   |   |                                             | Mean.   |
|------------------------------------|---|---|---------------------------------------------|---------|
| Severndroog Tower and Wrotham      | - | - | 82 39 21<br>21                              | } 21    |
| Severndroog Tower and Langdon Hill | - | - | 95 53 56<br>59,25                           | } 59    |
| Langdon Hill and Hadleigh          | - | - | 54 1,25<br>34 31 49,5<br>52,5<br>54<br>57,5 | } 53    |
| Halstow and Hadleigh               | - | - | 30 24 17<br>19,75<br>20,5                   | } 19    |
| Halstow and Gad's Hill             | - | - | 31 38 19,75<br>22,25                        | } 21    |
| Severndroog Tower and Hadleigh     | - | - | 130 25 50<br>51,5                           | } 50,75 |

## Isle of Sheppey.

|                           |   |   |                        |         |
|---------------------------|---|---|------------------------|---------|
| Gad's Hill and Halstow    | - | - | 18 18 1,5<br>3<br>3,5  | } 3     |
| Halstow and Hadleigh      | - | - | 31 28 23<br>24,5<br>25 | } 24,25 |
| Langdon Hill and Hadleigh | - | - | 16 26 30               |         |
| Langdon Hill and Rayleigh | - | - | 27 4 46                |         |

## At Halstow.

|                                        |   |   |                      |         |
|----------------------------------------|---|---|----------------------|---------|
| Gad's Hill and Gravesend               | - | - | 24 18 21,25<br>21,25 | } 21,25 |
| Gravesend and Hadleigh                 | - | - | 107 49 5,25<br>5,25  | } 5,25  |
| Hadleigh and Sheppey                   | - | - | 99 18 4<br>7,5       | } 6     |
| Gravesend and centre of Rayleigh Tower | - | - | 111 20 14            |         |
| Sheppey and Rayleigh Tower             | - | - | 95 46 57             |         |

## At Hadleigh.

|                            |   |   |            |  |
|----------------------------|---|---|------------|--|
| Sheppey and South End      | - | - | 38 43 29   |  |
| Sheppey and Halstow        | - | - | 49 13 33,5 |  |
| Gravesend and Halstow      | - | - | 41 46 32   |  |
| Langdon Hill and Gravesend | - | - | 43 11 51   |  |



# Trigonometrical Survey.

561

| Between                         |   |             | Mean.   |
|---------------------------------|---|-------------|---------|
| Gravesend and Severndroog Tower | - | 26 16 56,75 | } 57,25 |
| Langdon Hill and Sheppey        | - | 134 11 55   |         |

## At South End.

|                      |   |          |
|----------------------|---|----------|
| Sheppey and Hadleigh | - | 119 20 5 |
|----------------------|---|----------|

## At Langdon Hill.

|                                                        |   |          |
|--------------------------------------------------------|---|----------|
| Gravesend and Severndroog                              | - | 53 47 25 |
| Centre of Rayleigh Tower and Gravesend                 | - | 122 2 46 |
| Station on Rayleigh Tower and centre of the same Tower | - | 0 0 27   |
| Station on Rayleigh Tower and Danbury Spire            | - | 43 18 2  |
| Severndroog Tower and Frierning                        | - | 95 25 0  |
| Frierning Tower and Station on Rayleigh Tower          | - | 88 44 19 |
| Frierning and Danbury Spire                            | - | 45 26 17 |
| Severndroog Tower and Brentwood Spire                  | - | 66 26 39 |

## At Triptree Heath. 1st Station.

|                                                |   |           |
|------------------------------------------------|---|-----------|
| Tillingham Tower and Station on Rayleigh Tower | - | 68 28 58  |
| Tillingham and Danbury Spire                   | - | 100 28 21 |
| Station on Rayleigh Tower and Langdon Hill     | - | 21 25 14  |
| Station on Rayleigh Tower and Frierning Tower  | - | 47 8 50   |

## At Lugshorn Corner.

|                                   |   |              |      |
|-----------------------------------|---|--------------|------|
| Greylock's Foss and Dundon Beacon | - | 107 44 30,75 | } 31 |
|                                   |   | 31,25        |      |
| Greylock's Foss and Moor Lynch    | - | 15 51 58,5   | } 59 |
|                                   |   | 59           |      |
|                                   |   | 59,75        |      |
| Moor Lynch and Dundon Beacon      | - | 93 52 33,75  |      |

## At Greylock's Foss.

|                                   |   |             |        |
|-----------------------------------|---|-------------|--------|
| Moor Lynch and Lugshorn Corner    | - | 114 9 58,25 | } 59   |
|                                   |   | 59,75       |        |
| Lugshorn Corner and Dundon Beacon | - | 8 29 59,75  | } 0    |
|                                   |   | 30 0,5      |        |
| Dundon Beacon and Moor Lynch      | - | 105 40 0    | } 0,25 |
|                                   |   | 0,5         |        |



## Near Moor Lynch Windmill.

| Between                             |    |                                 | Mean. |
|-------------------------------------|----|---------------------------------|-------|
| Greylock's Foss and Dundon Beacon   | 59 | 58 12,5                         |       |
| Greylock's Foss and Lugshorn Corner | 51 | 58 2,25<br>4,25                 | 3,25  |
| Lugshorn Corner and Dundon Beacon   | 8  | 9 10<br>10,25                   | 10,25 |
| Dundon Beacon and Mendip Hills      | 54 | 38 50<br>50                     | 50    |
| Mendip Hills and Ash Beacon         | 54 | 3 20<br>23,5<br>23,75           | 22,5  |
| Ash Beacon and Pilsden Hill         | 57 | 19 2,5<br>3,75<br>4,5           | 3,5   |
| Dundon Beacon and Pilsden Hill      | 56 | 43 36,25<br>36,5<br>37,25       | 36,75 |
| Pilsden and Quantock Hills          | 87 | 15 6<br>7                       | 6,5   |
| Quantock Hills and Brent Knoll      | 71 | 38 57,75<br>58,5<br>58,5        | 58,25 |
| Brent Knoll and Bleak Down          | 46 | 1 32,75<br>35,25<br>39          | 35,75 |
| Bleak Down and Mendip Hills         | 43 | 41 43,5<br>45<br>45,25<br>46,75 | 45,25 |
| Brent Knoll and Mendip Hills        | 89 | 43 19,5<br>20,5<br>24           | 21,25 |

## On Dundon Beacon.

|                                     |     |                 |       |
|-------------------------------------|-----|-----------------|-------|
| Lugshorn Corner and Moor Lynch      | 78  | 7 14,75<br>14,5 | 14,5  |
| Lugshorn Corner and Greylock's Foss | 63  | 45 28,5<br>29,5 | 29    |
| Greylock's Foss and Moor Lynch      | 108 | 1 51,25<br>53   | 52,25 |
| Moor Lynch and Bleak Down           | 58  | 42 10<br>10,25  | 10,25 |
| Moor Lynch and Mendip Hills         | 101 | 22 54,25<br>55  | 54,5  |



*At Ash Beacon.*

| Between                         |   |   |   | Mean.               |
|---------------------------------|---|---|---|---------------------|
| Moor Lynch and Mendip Hills     | - | - | - | 56 29 50 } 51,5     |
|                                 |   |   |   | 52,25 } 51,5        |
|                                 |   |   |   | 52,25 } 51,5        |
| Mendip Hills and Bradley Knoll  | - | - | - | 50 8 45,25 } 45,5   |
|                                 |   |   |   | 45,75 } 45,5        |
| Bradley Knoll and Bull Barrow   | - | - | - | 93 38 10,5 } 12,5   |
|                                 |   |   |   | 13 } 12,5           |
|                                 |   |   |   | 14 } 12,5           |
| Bull Barrow and Pilsden         | - | - | - | 83 40 33,5 } 34,5   |
|                                 |   |   |   | 35,5 } 34,5         |
| Mintern Hill and Pilsden        | - | - | - | 49 21 35,75 } 38,25 |
|                                 |   |   |   | 39,75 } 38,25       |
|                                 |   |   |   | 39,75 } 38,25       |
| Pilsden and Quantock Hills      | - | - | - | 59 34 40,5 } 41,5   |
|                                 |   |   |   | 42,25 } 41,5        |
| Quantock Hills and Mendip Hills | - | - | - | 72 57 49,75         |

*On the Mendip Hills.*

|                              |   |   |   |                    |
|------------------------------|---|---|---|--------------------|
| Bradley Knoll and Ash Beacon | - | - | - | 58 16 20 } 22      |
|                              |   |   |   | 21,5 } 22          |
|                              |   |   |   | 24,25 } 22         |
| Ash Beacon and Moor Lynch    | - | - | - | 69 26 46,5 } 48,25 |
|                              |   |   |   | 49 } 48,25         |
|                              |   |   |   | 49,25 } 48,25      |
| Dundon Beacon and Moor Lynch | - | - | - | 23 58 16,5 } 17    |
|                              |   |   |   | 17,75 } 17         |

ART. V. *Particulars relating to the Operations of the Year 1799.*

I have shewn in the preceding articles, that sufficient materials are now in my possession, for calculating the latitudes and longitudes of those places whose bearings and distances from given stations are found in the Account of 1797. I have also pointed out the direction which the survey has subsequently taken; and given a short account of the measurement of a new base in Somersetshire. The operations of 1799 now remain to be spoken of.



In very early stages of the work, I had frequent opportunities of observing, that eminent advantages would accrue to the service, were the survey prosecuted on a more extensive scale. The consideration of a grand instrument being laid up in the apartments of the Royal Society, suggested the propriety of obtaining it; therefore, when my appointment to my present situation gave me the means of effecting former ideas, I lost no time in applying to the President and Council, for the loan of their large theodolite, the excellence of which had been incontestibly demonstrated by the late Major General ROY. The distinguished services which the Royal Society have rendered this branch of the public service, leave it almost unnecessary for me to observe how readily they granted my request. The instrument was, accordingly, put into the hands of Mr. RAMSDEN, early in the month of January, for the purpose of being examined, and also of having new microscopes fixed to it; the former ones being much inferior, in construction, to those attached to the instrument belonging to Government.

To carry on so extensive a survey as that which is now the subject of this Paper, much consideration is necessary. I have endeavoured to give it the best effect, both as to design, and celerity of execution. What degree of success has attended my endeavours, the public, in possession of this Paper, can readily determine. In the present stage of the survey, I have been sufficiently impressed with just ideas, as to the importance of the task, and responsibility of my situation. The difficulties which start up, in prosecuting a survey of this kind, become more numerous as it becomes more extensive. In the earliest part of it, when few objects only were in view, speedy execution followed the design; but, circumstances now require every



exertion, as the triangles are branched out into several parts of the kingdom.

Were the length of a degree of the meridian, in these latitudes, accurately known, the most eligible method of carrying on the survey would be, that of working between any two determined parallels of latitude, till the space between them was completed. Yet this mode would manifestly be subject to some slight innovations, from the necessity of measuring bases in certain stages of the work : it would be right, however, to adopt the principle for general practice. Under this idea, it would have been proper to have commenced the operations of this year in Somersetshire, and to have carried on the triangles from the neighbourhood of the new base into the north of Devon.

It is mentioned in one of the former Accounts, that a zenith sector was formerly bespoken of Mr. RAMSDEN, by his Grace the Duke of RICHMOND, for the purpose of aiding the design of measuring the length of a degree of latitude in this country. The pressure of other business caused Mr. RAMSDEN to lay aside this instrument, after he had considerably advanced in its construction. The real necessity, however, for our being supplied with an instrument of this description being made known to him, he resolved to take it in hand again, and complete it. Relying on the strength of his assurances to this effect, I determined to relinquish the intention of proceeding to the westward ; and resolved to commence this year's operations, with running up a series of triangles along the meridian of Blenheim. As it is probable my next communication will contain the result of this interesting part of the survey, I shall now confine myself to such particulars as relate to the subject under consideration.

In a former article, I have observed, that the chief Draftsman,



Mr. GARDNER, has been furnished with materials for surveying the northern shore of the Thames, and the north of Kent: these proved ample, as the map, thence compiled, will sufficiently demonstrate. As the Master-General issued directions, at this time, to survey Essex, and parts of the adjoining counties, in the same manner, and for the same purpose, as Kent has been, I was obliged to suspend, for a short time, my intention of proceeding with the measurement of a meridional degree, and to devise the best means for carrying his Lordship's instructions into execution.

For this purpose, therefore, before any stations were chosen in Essex, the county was very minutely examined; when it appeared, that insuperable difficulties would occur, if the survey were prosecuted with the large theodolite only. The range commencing at Havering Bower, and running to Gallywide Common, cuts off a regular communication between the stations subsequently chosen in the southern and northern parts of Essex. The difficulty resulting from this circumstance, was made still greater, from the want of success in our endeavours to find one spot on this range, proper for a station. The eastern part was, in some degree, found more favourable; but it was discovered that, even here, the small instrument must frequently be used as a substitute for the large one. Under these disadvantages, the survey commenced in March; the large theodolite being taken to a station on Hampstead Heath.

The base chosen for carrying on the distances towards the north, was that constituted by Severndroog Tower on Shooter's Hill and the new station on Hampstead Heath; which distance, although it has not, perhaps, been obtained so correctly as many others, yet is determined with sufficient accuracy for the matter



in hand. When the observations were made on Severndroog Tower, in the year 1787, the angle between Hanger Hill Tower and the cross on the dome of St. Paul's was taken: this was now made use of, in order to get the angle between Hanger Hill Tower and Hampstead Heath; because the former station could not be discovered, on account of the wind blowing the thick and darkened atmosphere of London between the stations, when the instrument this year was carried to Shooter's Hill.

For the purpose of connecting the eastern and western triangles with each other, a station was chosen on Southweald Tower, accessible only to the small instrument. Brentwood Spire was also found to be conveniently situated for carrying on the distances: this will be readily perceived by the plan. Langdon Hill was also selected; which, with the former station at Gravesend, were to become the means of connecting the triangles. A station on Epping Forest was judged necessary; but no spot could be found fit for general purposes, the view towards the north being confined. One was, however, fixed on, called Highbeeche, from which a high building near Berkhamstead was found to be visible, by means of which, the distances in the north of Essex could be verified, as the station on the top of it would connect with Bushy Heath, near Watford, and a point on the elevated range near Dunstable.

From Hampstead, the instrument and portable scaffold were carried to Langdon Hill, and from thence to Triptree Heath, near Malden; from whence the party repaired to Highbeeche, leaving the remainder of the county to be surveyed with the small circular instrument; which seems to have been done with considerable accuracy.

After the necessary observations were made at Highbeeche, I



proceeded to Shotover Hill, in Oxfordshire; and, before May elapsed, had reconnoitred the country. As the distance between Inkpin Hill and Highclere, appeared to be shorter than was necessary for a base on which the northern triangles were to rest, it became certain, that their sides would depend on the base on Hounslow Heath. The only means by which the series now proposed to be carried westwards, (for the double purpose of forwarding the survey, and also of finding a portion of the meridional arc,) could be properly connected with the triangles in the neighbourhood of Salisbury Plain, was the side just spoken of; for the high land in the vicinity of Calne, intercepted the view of the stations on the Marlborough range, from White Horse Hill. In order, however, to make a connection, although imperfect, an intermediate station was chosen on this high intercepting land.

When the ground about Nettlebed was formerly examined by us, it appeared difficult to carry on the triangles from Bagshot Heath towards the northward; because no spot could be found near the former, from which the Chiltern range could be seen. I now, therefore, departed from the usual practice of choosing stations on the ground, and selected Pen Church Tower; by means of which, I found a connection might be made between the triangles carried round the Chiltern range, from White Horse Hill and Nuffield, with those in Hertfordshire.

At Shotover Hill the party separated, each having its instrument. I shall close this article, without entering minutely into the reasons which operated with me for the choice of all the stations selected this year. I shall content myself with enumerating the names of the stations visited and observed, and mentioning that Shotover Hill and Cumner Hill, in Oxfordshire, were selected principally with a view of ascertaining the situations of the



observatories at Oxford and Blenheim. The names of the stations were, Nuffield, White Horse Hill, and Scutchamfly, in Berkshire. Shotover Hill, Cumner Hill, Whiteham Hill, Crouch Hill, and Epwell Hill, all in Oxfordshire. Those in Gloucestershire were, Pen, Cleave, Broadway Beacon, and the Malvern Hills. The Lecky Hills, in Worcestershire. Corley and Nuneaton, in Warwickshire. Bardon Hill, Naseby Field and Barrow Hill, in Leicestershire. Arbury Hill, and Souldrop, in Northamptonshire. Quainton, Brill, Wendover, and Bow Brickhill, in Buckinghamshire. Woburn Park, and Lidlington, in Bedfordshire. Kinsworth, Lillyhoe, Berkhamstead, Tharfield, and Bushy Heath, in Hertfordshire. From the last mentioned station, the party returned to London, in October.

ART. VI. *Angles taken in the Year 1799.*

*On Hampstead Heath.*

| Between                                                    |                 |                     | Mean.   |
|------------------------------------------------------------|-----------------|---------------------|---------|
| Hanger Hill Tower and Stanmore                             | -               | 50 52 15,75<br>17   | } 16,25 |
| Highbeeche and Shooter's Hill                              | -               | 70 6 35,5<br>34,5   | } 35    |
| Highbeeche and St. Paul's, London                          | -               | 83 1 17,25<br>22,75 | } 20    |
| Severndroog Tower on Shooter's Hill, and Hanger Hill Tower | 117 22 13<br>11 |                     | } 12    |

*At Langdon Hill.*

|                                                    |   |          |
|----------------------------------------------------|---|----------|
| Gravesend and Severndroog Tower                    | - | 53 47 25 |
| Centre of Rayleigh Steeple and Gravesend           | - | 122 2 46 |
| Station on Rayleigh Steeple and centre of the same | - | 0 0 27   |
| Station on Rayleigh Steeple and Danbury Spire      | - | 43 18 2  |
| Severndroog Tower and Frierning Steeple            | - | 95 25 0  |
| Frierning Steeple and Station on Rayleigh Steeple  | - | 88 14 19 |
| Frierning Steeple and Danbury Spire                | - | 45 26 17 |
| Severndroog Tower and Brentwood Spire              | - | 66 26 39 |



*At Triptree Heath.*

| Between                                            |   | •   | '  | "  | Mean. |
|----------------------------------------------------|---|-----|----|----|-------|
| Tillingham Steeple and Station on Rayleigh Steeple | - | 68  | 28 | 58 | "     |
| Tillingham Steeple and Danbury Spire               | - | 100 | 28 | 21 |       |
| Station on Rayleigh Tower and Langdon Hill         | - | 21  | 25 | 14 |       |
| Station on Rayleigh Tower and Frierning Steeple    | - | 47  | 8  | 50 |       |

*At Highbeece.*

|                                               |   |     |    |    |        |
|-----------------------------------------------|---|-----|----|----|--------|
| Severndroog Tower and Brentwood Spire         | - | 71  | 16 | 43 | } 44   |
|                                               |   |     |    | 45 |        |
| Severndroog Tower and Southweald              | - | 44  | 34 | 27 | } 28   |
|                                               |   |     |    | 29 |        |
| Severndroog Tower and Hampstead               | - | 58  | 28 | 18 | } 18   |
|                                               |   |     |    | 18 |        |
| Cross on the Dome of St. Paul's and Hampstead | - | 83  | 1  | 11 |        |
| Berkhamstead Gazebo and Hampstead             | - | 138 | 29 | 57 | } 58,5 |
|                                               |   |     | 30 | 0  |        |

*At Shotover Hill.*

|                                         |   |     |    |       |         |
|-----------------------------------------|---|-----|----|-------|---------|
| Nuffield and White Horse Hill           | - | 81  | 53 | 27,75 | } 28,75 |
|                                         |   |     |    | 29,75 |         |
| Scutchamfly Barrow and White Horse Hill | - | 26  | 8  | 7,75  | } 8     |
|                                         |   |     |    | 7,75  |         |
|                                         |   |     |    | 8,25  |         |
| White Horse Hill and Whiteham Hill      | - | 48  | 5  | 31,25 | } 32,75 |
|                                         |   |     |    | 32,75 |         |
|                                         |   |     |    | 33,75 |         |
| Wendover and Scutchamfly Barrow         | - | 117 | 20 | 55    | } 56    |
|                                         |   |     |    | 57,25 |         |

*On Whiteham Hill.*

|                                                          |   |     |    |       |         |
|----------------------------------------------------------|---|-----|----|-------|---------|
| Shotover Hill and White Horse Hill                       | - | 114 | 54 | 34,75 | } 34,75 |
|                                                          |   |     |    | 34,75 |         |
| Shotover Hill and Cumner Hill                            | - | 55  | 52 | 34,5  | } 35    |
|                                                          |   |     |    | 35,5  |         |
| Staff over the Quadrant at Blenheim and White Horse Hill | - | 131 | 25 | 34,5  | } 36,5  |
|                                                          |   |     |    | 38,5  |         |

*On Cumner Hill.*

|                                                                 |   |   |   |    |    |      |        |
|-----------------------------------------------------------------|---|---|---|----|----|------|--------|
| Whiteham Hill and Shotover Hill                                 | - | - | - | 99 | 29 | 47   | } 48,5 |
|                                                                 |   |   |   |    |    | 49,5 |        |
| Shotover Hill and Atlas on the Top of the Observatory at Oxford | } |   | - | 29 | 23 | 34   | } 34   |
|                                                                 |   |   |   |    |    |      |        |



*On White Horse Hill.*

| Between                                         |   |   |                      | Mean.   |
|-------------------------------------------------|---|---|----------------------|---------|
| Nuffield and Shotover Hill                      | - | - | 35 34 22,25<br>23,75 | } 23,25 |
| Nuffield and Brill                              | - | - | 38 48 11,5<br>15,25  | } 13,25 |
| Scutchamfly Barrow and Shotover Hill            | - | - | 111 47 50            |         |
| Whiteham Hill and Staff on Blenheim Observatory | - | - | 10 30 43,5<br>43,5   | } 43,5  |
| Brill and Stow on the Wold                      | - | - | 64 45 42,75<br>44,75 | } 43,75 |
| Station near Calne and Inkpin                   | - | - | 67 10 28,5<br>32,5   | } 30,5  |
| Highclere and Inkpin                            | - | - | 12 4 11,25<br>11,5   | } 11,5  |
| Highclere and Nuffield                          | - | - | 63 7 53,25<br>53,5   | } 53,25 |

*At Nuffield.*

|                                    |   |   |                                       |         |
|------------------------------------|---|---|---------------------------------------|---------|
| Bagshot Heath and Highclere        | - | - | 78 17 16,5<br>17,75<br>18,75<br>19,75 | } 18,25 |
| Highclere and White Horse Hill     | - | - | 53 33 49,5<br>49,75                   | } 49,5  |
| White Horse Hill and Shotover Hill | - | - | 62 32 3,5<br>4,5<br>6,5<br>7          | } 5,25  |
| White Horse Hill and Brill         | - | - | 86 4 15,75<br>16<br>17                | } 16,25 |

*On Scutchamfly Barrow.*

|                                    |   |   |                                    |      |
|------------------------------------|---|---|------------------------------------|------|
| White Horse Hill and Shotover Hill | - | - | 111 47 50                          |      |
| Shotover Hill and Wendover         | - | - | 34 26 50<br>50,75<br>52,75<br>54,5 | } 52 |

*At Stow on the Wold.*

|                            |   |   |                                |         |
|----------------------------|---|---|--------------------------------|---------|
| Cleave and Broadway Beacon | - | - | 54 44 54,5<br>54,5<br>57<br>57 | } 55,75 |
|----------------------------|---|---|--------------------------------|---------|



| Between                     |   |   |   | Mean.             |
|-----------------------------|---|---|---|-------------------|
| Broadway Beacon and Epwell  | - | - | - | 72 38 48,5 } "    |
|                             |   |   |   | 49 } 49,5         |
|                             |   |   |   | 50,5 } "          |
| Epwell and Brill            | - | - | - | 60 56 6 } 6,25    |
|                             |   |   |   | 6,5 } "           |
| White Horse Hill and Cleave | - | - | - | 109 40 36,25 } 37 |
|                             |   |   |   | 36,75 } "         |
|                             |   |   |   | 37 } "            |
|                             |   |   |   | 37,75 } "         |

*At Broadway Beacon.*

|                          |   |   |   |                     |
|--------------------------|---|---|---|---------------------|
| Epwell and Stow          | - | - | - | 69 10 30,75 } 31,75 |
|                          |   |   |   | 31,5 } "            |
|                          |   |   |   | 32,75 } "           |
| Stow and Cleave          | - | - | - | 78 53 6 } 7,75      |
|                          |   |   |   | 8 } "               |
|                          |   |   |   | 9,5 } "             |
| Cleave and Malvern Hills | - | - | - | 60 28 12,5 } 16     |
|                          |   |   |   | 17,75 } "           |
|                          |   |   |   | 18 } "              |
| Malvern and Lecky Hills  | - | - | - | 53 53 19½ } 19,75   |
|                          |   |   |   | 20 } "              |

*At Epwell.*

|                          |   |   |   |                    |
|--------------------------|---|---|---|--------------------|
| Stow and Broadway Beacon | - | - | - | 38 10 43,25 } 44   |
|                          |   |   |   | 43,5 } "           |
|                          |   |   |   | 44 } "             |
|                          |   |   |   | 44,25 } "          |
|                          |   |   |   | 44,5 } "           |
| Stow and Brill           | - | - | - | 86 29 13 } 13,5    |
|                          |   |   |   | 13,5 } "           |
|                          |   |   |   | 13,75 } "          |
| Brill and Arbury Hill    | - | - | - | 85 0 16,5 } 18,5   |
|                          |   |   |   | 20,5 } "           |
| Arbury Hill and Corley   | - | - | - | 54 55 17,5 } 18,75 |
|                          |   |   |   | 19 } "             |
|                          |   |   |   | 20,25 } "          |

*At Corley.*

|                                 |   |   |   |                     |
|---------------------------------|---|---|---|---------------------|
| Bardon Hill and Nuneaton Common | - | - | - | 49 54 50,75 } 51,75 |
|                                 |   |   |   | 53 } "              |
| Nuneaton and Arbury Hill        | - | - | - | 110 20 52 } 52,75   |
|                                 |   |   |   | 52,5 } "            |
|                                 |   |   |   | 52,75 } "           |
|                                 |   |   |   | 53 } "              |



Trigonometrical Survey.

573

| Between                              |   |   |             | Mean  |
|--------------------------------------|---|---|-------------|-------|
| Arbury Hill and Epwell               | - | - | 35 17 34,75 | "     |
|                                      |   |   | 35,75       |       |
|                                      |   |   | 36,25       |       |
|                                      |   |   | 36,75       | 36,75 |
|                                      |   |   | 38          |       |
|                                      |   |   | 39,25       |       |
| Epwell and Broadway Beacon           | - | - | 28 2 46,75  |       |
|                                      |   |   | 50          | 49,75 |
|                                      |   |   | 53          |       |
| Nuneaton and Lecky Hills             | - | - | 133 25 11,5 | 11,5  |
|                                      |   |   | 11,5        |       |
| Nuneaton and Station near Birmingham | - | - | 49 54 50,75 | 52    |
|                                      |   |   | 53          |       |

At Arbury Hill.

|                    |   |   |             |      |
|--------------------|---|---|-------------|------|
| Quainton and Brill | - | - | 16 12 37,25 |      |
|                    |   |   | 37,5        |      |
|                    |   |   | 40,5        | 40   |
|                    |   |   | 42,5        |      |
|                    |   |   | 42,75       |      |
| Brill and Epwell   | - | - | 60 35 43    |      |
|                    |   |   | 43,25       |      |
|                    |   |   | 44,5        |      |
|                    |   |   | 45          | 45,5 |
|                    |   |   | 46,5        |      |
|                    |   |   | 48,5        |      |
|                    |   |   | 48,5        |      |

Near Brill on the Hill.

|                               |   |   |             |       |
|-------------------------------|---|---|-------------|-------|
| White Horse Hill and Stow     | - | - | 50 14 44    |       |
|                               |   |   | 44,5        |       |
|                               |   |   | 44,75       | 44,5  |
| Nuffield and White Horse Hill | - | - | 55 7 33     |       |
|                               |   |   | 34          | 33,5  |
| Stow and Epwell               | - | - | 32 34 42,5  |       |
|                               |   |   | 43,5        |       |
|                               |   |   | 43          | 43    |
|                               |   |   | 43,25       |       |
| Epwell and Arbury Hill        | - | - | 34 23 58,5  |       |
|                               |   |   | 58,75       | 58,5  |
| Arbury Hill and Bow Brickhill | - | - | 68 20 7,75  |       |
| Bow Brickhill and Wendover    | - | - | 57 25 1     |       |
|                               |   |   | 2           | 1,5   |
| Wendover and Shotover Hill    | - | - | 108 5 22    |       |
|                               |   |   | 23,5        | 22,75 |
| Quainton and Wendover         | - | - | 51 34 33,25 |       |
|                               |   |   | 32,75       | 33    |

Near Wendover.

|                                      |   |   |            |  |
|--------------------------------------|---|---|------------|--|
| Scutchamfly Barrow and Shotover Hill | - | - | 28 2 12,75 |  |
|--------------------------------------|---|---|------------|--|

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| Between                    |   |   |   | Mean.              |
|----------------------------|---|---|---|--------------------|
| Brill and Quainton         | - | - | - | 33 26 48 } 48"     |
|                            |   |   |   | 48                 |
|                            |   |   |   | 48,25              |
| Brill and Bow Brickhill    | - | - | - | 80 11 8,25 } 9,25  |
|                            |   |   |   | 10,25              |
| Brill and Shotover Hill    | - | - | - | 23 23 56,25 } 57,5 |
|                            |   |   |   | 58,75              |
| Bow Brickhill and Stanmore | - | - | - | 102 22 29          |
| Pen Tower and Stanmore     | - | - | - | 38 13 16,25 } 18   |
|                            |   |   |   | 19,75              |

*Near Quainton.*

|                            |   |   |   |                     |
|----------------------------|---|---|---|---------------------|
| Bow Brickhill and Wendover | - | - | - | 94 23 49,25 } 50,25 |
|                            |   |   |   | 51,25               |
| Wendover and Brill         | - | - | - | 94 58 36 } 37       |
|                            |   |   |   | 38                  |

*At Bow Brickhill.*

|                              |   |   |   |                     |
|------------------------------|---|---|---|---------------------|
| Brill and Arbury Hill        | - | - | - | 68 22 55,5 } 56,75  |
|                              |   |   |   | 55,75               |
|                              |   |   |   | 57,5                |
|                              |   |   |   | 58,75               |
| Brill and Wendover           | - | - | - | 42 23 50,5 } 50,75  |
|                              |   |   |   | 51                  |
| Wendover and Kinsworth       | - | c | - | 46 18 4,25 } 8,25   |
|                              |   |   |   | 5,75                |
|                              |   |   |   | 9,25                |
|                              |   |   |   | 14                  |
| Kinsworth and Quainton       | - | - | - | 85 9 51,75 } 52,75  |
|                              |   |   |   | 53,75               |
| Kinsworth and Lillyhoe       | - | - | - | 42 10 33,25 } 36,75 |
|                              |   |   |   | 38,5                |
|                              |   |   |   | 39                  |
| Kinsworth and Lidlington     | - | - | - | 80 39 37,25         |
| Trusler Hill and Lillyhoe    | - | - | - | 14 54 38,75 } 42,5  |
|                              |   |   |   | 43,5                |
|                              |   |   |   | 45,5                |
| Trusler Hill and Arbury Hill | - | - | - | 45 49 41,75 } 43    |
|                              |   |   |   | 44                  |

*At Kinsworth.*

|                            |   |   |   |                     |
|----------------------------|---|---|---|---------------------|
| Brill and Bow Brickhill    | - | - | - | 62 55 35,25 } 38,75 |
|                            |   |   |   | 38,5                |
|                            |   |   |   | 39                  |
|                            |   |   |   | 42                  |
| Quainton and Bow Brickhill | - | - | - | 52 17 56,25 } 56,75 |
|                            |   |   |   | 57,25               |
|                            |   |   |   | 57                  |



# Trigonometrical Survey.

575

| Between                                         |   |                               | Mean.   |
|-------------------------------------------------|---|-------------------------------|---------|
| Bow Brickhill and Lillyhoe                      | - | 82 50 26<br>30<br>35          | } 30,5  |
| Lillyhoe and Tharfield Tower                    | - | 12 12 39,75<br>42             | } 40,75 |
| Tharfield and Station on Gazebo at Berkhamstead | - | 50 2 55,5<br>56<br>3 0,5<br>1 | } 53,25 |
| Stanmore and Berkhamstead                       | - | 41 15 56,5<br>57,75           | } 57,25 |
| Bow Brickhill and Stanmore                      | - | 173 37 43<br>45               | } 44    |

## Near Lillyhoe.

|                                                          |   |                                     |         |
|----------------------------------------------------------|---|-------------------------------------|---------|
| Bow Brickhill and Kinsworth                              | - | 54 58 52,5<br>52,5<br>52,5<br>53,75 | } 53    |
| Lidlington and Bow Brickhill                             | - | 23 59 30<br>32                      | } 31    |
| Bow Brickhill and Trusler Hill                           | - | 5 52 11,5                           |         |
| Station on the Ground near Tharfield Tower and Kinsworth | - | 166 4 44,5<br>48                    | } 46,25 |

## At Lidlington.

|                             |   |                            |         |
|-----------------------------|---|----------------------------|---------|
| Kinsworth and Bow Brickhill | - | 68 16 19<br>22,75<br>25,25 | } 22,25 |
|-----------------------------|---|----------------------------|---------|

## At Crouch Hill.

|                  |   |                    |         |
|------------------|---|--------------------|---------|
| Brill and Epwell | - | 145 23 25,75<br>27 | } 26,25 |
|------------------|---|--------------------|---------|

## At Stanmore.

|                                     |   |                                              |        |
|-------------------------------------|---|----------------------------------------------|--------|
| Wendover and Kinsworth              | - | 37 41 39,25<br>43                            | } 41   |
| Pen Tower and Wendover              | - | 23 4 47,5<br>47,5<br>47,75<br>49,25<br>49,25 | } 48,5 |
| Bagshot and Pen Tower               | - | 49 32 29,5                                   |        |
| Bagshot Heath and Hanger Hill Tower | - | 59 55 54,25<br>53,75                         | } 54   |



| Between                               | •  | '  | "     | Mean.   |
|---------------------------------------|----|----|-------|---------|
| Hampstead Heath and Hanger Hill Tower | 45 | 25 | 51    | } 51,75 |
|                                       |    |    | 51,5  |         |
|                                       |    |    | 51,5  |         |
|                                       |    |    | 52,75 |         |

*On Busby Heath.*

|                        |    |    |     |        |
|------------------------|----|----|-----|--------|
| Wendover and Kinsworth | 38 | 22 | 5   | } 6,75 |
|                        |    |    | 8,5 |        |

*On Bagsbot Heath. Station of 1794.*

|                              |    |    |       |         |
|------------------------------|----|----|-------|---------|
| Highclere and Nuffield       | 55 | 32 | 25,5  | } 26    |
|                              |    |    | 25,75 |         |
|                              |    |    | 26,75 |         |
| Nuffield and Pen Tower       | 48 | 47 | 11    | } 12,5  |
|                              |    |    | 12,75 |         |
|                              |    |    | 12,75 |         |
| Pen Tower and St. Ann's Hill | 70 | 30 | 37,25 | } 39,25 |
|                              |    |    | 39    |         |
|                              |    |    | 40    |         |

ART. 7. *Situations of the Stations.*

*Trevoze Head.* The station on this point of land, which is about four miles from Padstow, in Cornwall, is situated on the southern part of it, and is about forty feet from the declivity. The ground seems a little higher than any other part of the Head.

*Cadon Barrow.* The station is on the centre of the Barrow; which is a very remarkable one, and well known about the country. It is about two miles from Tintagel, being in a field lying south of the road leading from that town to Camelford.

*Brown Willy.* The staff is erected on the highest part of this mountain, which is about nine miles southward of Camelford.

*St. Stephen's Down.* The station is about 150 feet from the eastern part of the building erected on this Down. It lies southwest from the corner of it, and about twenty feet from the road.

*Mendip.* The station is in a field on the top of the down, being about two miles north of *Shepton Mallet*. The field is next to the road leading from that place to Bristol, and lies west of it: it is also north of the road which goes from Wells to Frome.



This road crosses the former at right angles. The station is 20 feet north of the southern hedge, and about 200 from the eastern one. The ground round the station is rather higher than any other part of the field.

*Dundry.* The station is on the down, close to, but west of, the town so called. The down is full of holes and pits, from which stones have been taken for the purposes of building. The station, however, may easily be found, as it is situated on a rising which has the appearance of having been a barrow.

*Lansdown.* This place is well known, and near Bath. The station is on the highest part of the broken ground called CROMWELL'S *Camp*, which is near Mr. GRANVILLE'S monument.

*Farley Down.* The station on this Down is 5 feet north of the stone wall, and about 150 feet eastward of the plantation.

*Bradley Knoll.* This is a remarkable hill, very near Maiden Bradley. The highest part of the hill is towards the west, on which there is a small ring, exhibiting an appearance of a ruined plantation. The station is a few feet to the northward of this ring.

*Westbury Down.* There are no objects on this Down, of any kind; therefore, the station cannot be found from measurements. It is, however, just above the *White horse* cut out in the side of the hill.

*Ash Beacon.* This eminence is about four miles north of Sherborne: on the top of it there is a small plantation, round which is a circular wall. The station is 85 feet east of it.

*Dundon Beacon.* This is an insulated hill, at the eastern extremity of King's Sedgemoor; upon it are the remains of a barrow, probably the site of the ancient beacon. The station is about 4 feet eastward of the small cavity in the centre of it.



*Lugsborn Corner*, the eastern extremity of King's Sedgemoor. There is a small rivulet, which separates the moor from the cultivated ground on the Somerton side, and, close to a particular part of it, is a passage called *Somerton Gate*. About a quarter of a mile eastward of this entrance, and in the second field, north of the stream, is the station called *Lugsborn Corner*, one of the ends of the base. The spot is 5 feet from the ditch, and 19 from the gateway. There were but three fields in this part of the moor, at the time the base was measured.

*Greylock's Foss*. This is towards the western extremity of the moor: a causeway leads from *Middlezoy* to *Greinton*, over it. In the second field from the bridge, near the latter, is the other extremity of the base. The station is about 10 feet from the ditch, running parallel to the Foss, and is in the angle formed by the ditch contiguous to the road and the second ditch north of the drain.

*Nuffield*. The station is in the field opposite to the church: it is in the south-west corner of it, 14 feet from the *stile*, and 10 feet from the hedge.

*Scutchamfly*. A very remarkable Barrow, on the Berkshire downs, situated near Little Hendred. The station is on the south-west part of it, and can easily be found.

*White Horse Hill*. This is a well known eminence in Berkshire. The station is on the eastern side of the Saxon work, and on the top of the small parapet surrounding the ditch.

*Shotover Hill*, near Oxford. The station is 150 feet from the hedge eastward of it, and 60 feet from that southward of it; but, when the traces of our former operations are obliterated, it will be difficult to recover this station.

*Stow on the Wold*. The station bearing this name, is in a



field 2 miles eastward of the town: it lies on the north side of the road leading from Stow to Burford, and may be easily distinguished, being that particular field which affords the most commanding view. The station is 32 feet west of the corner of the hedge which forms a right angle with another abruptly running out: it is also 279 feet from the ridge which divides the field.

*Broadway Beacon.* This is a very high and remarkable spot, near the village of Broadway, in Gloucestershire. The station is about 20 feet south-east of the foundation of a building proposed to be erected by the Earl of COVENTRY.

*Corley*, a village in Warwickshire. The station is in the second field eastward of the church, being 180 feet from the eastern hedge, and 230 feet from the stile in the corner of it.

*Epwell*, a village in Oxfordshire. The station is on the apex of the hill, and may easily be found, by measuring 17 feet from the stile, and 14 feet from the hedge which runs across the hill. N. B. The station is west of the hedge.

*Brill on the Hill*, Buckinghamshire. The station is on *Muzzle Hill*, near the town. There is but one field on this hill: it is on the highest part of it. The station is situated in the centre of the field, and in the middle of a rising, once the site of a windmill.

*Arbury Hill.* This hill is still surrounded with the remains of an ancient fortification. The station is on the north-west corner of it, and near the brow, but cannot be easily found, from the want of proper objects to which measurements may be made.

*Wendover*, Buckinghamshire. The station is on the down south of the town, and contiguous to the village of Ellesborough. A road from Wendover, to Sir JOHN RUSSELL's seat, Checquers, runs over the down: but, as there are no marks on it, its pre-



cise situation cannot be easily pointed out by measurement. It may, however, be observed, that it is 14 feet southwards, from the decayed parapet on the top of the hill.

*Quainton*, Buckinghamshire. The station is on the high ground, north of this town. It cannot very easily be found, because the hill is destitute of objects; yet it may, probably, be discovered, by looking for it on the *green ridge* which divides the land: it is in the middle of that boundary, and about 200 feet westward of the pathway.

*Kinsworth*, a village near Dunstable. The station is on the summit of a hill, about half a mile north of the village. A hedge runs across the hill, from which the station is 40 feet north-west: it is likewise *close* to the road.

*Lillyboe*, Hertfordshire. The station is on a commanding eminence, having the *Ickniel way* at the foot of it. There are no objects on this hill, therefore the precise situation cannot be pointed out by means of measurement: it is towards the north-west corner of the hill.

*Stanmore*. This station is on the southern extremity of the range above the town: it is near the trees, and a little to the westward of the broken ground.

*Busby Heath*, near Stanmore. The station cannot be easily found: it is about 1000 feet from the road, but there are no objects near enough to determine it by measurement.

*Wrotham*. This station is  $205\frac{1}{2}$  feet north-east of the old station: it may be easily found, with the assistance of a theodolite, Severndroog Tower making an angle of  $94^{\circ} 19'$  with the new station.

*Gravesend*. The station is on Windmill Hill, and on the western side of it: it is about 50 feet south of the stile, and near the brow.



*Gad's Hill, Kent.* The station is very easily found, being in the middle of the *tumulus*.

*Sheppey, Isle of.* The station is on the bare hill, westward of, and contiguous to, the high range: it cannot be found through means of measurement.

*Hampstead.* The station is on the heath, but cannot easily be found, on account of the rugged and broken ground which surrounds it: it is situated 40 feet from the road, and among the sand holes.

*Langdon Hill, Essex.* The station is in the middle of the field on the top of this hill: it is about 400 feet from either of the stiles.

*Hadleigh.* The station is on a remarkable hill, in shape very like a barrow, and is about a mile south-west of the town.

*Southend.* The station is in the second field westward from the terrace: it cannot be easily found.

#### *Interior Stations.*

*Hope's Nose*, the north projecting point of Torbay. The only spot fit for a station in this part is the one chosen: it can easily be found, for it is the high and bare rising, just above the Nose.

*Ball's Obelisk.* This object is on the eastern part of Great Haldon, in Devonshire. The station can be easily found, for it is close to the gate of the inclosure, and on the only spot not covered with heath.

*Evercrutch*, in Somersetshire. The hill on which the station is, commands an extensive view, and is not far from the town of Evercrutch. Bruton is also near it. The station is in the middle of the flat place on the top of the hill.

*Crouch Hill*, near Banbury, in Oxfordshire. The hill is well



known, and the station easily found; for the apex of the hill appears as if it were truncated, and in the middle of the smooth part is the station.

*Cumner Hill*, near Oxford. The station is about 130 feet westward from the centre of the clump of trees.

*Whiteham Hill*, Oxfordshire. There are a few trees contiguous to the station, which bear eastward from it, and are about 80 feet distant. The station is on the highest and smoothest part of the hill.

*Lidlington*, a village near Ampthill in Bedfordshire. This station can easily be found, for a tumulus, whose centre is the station, has been erected, to render it conspicuous.

*Trusler Hill*, in Woburn Park. The station is on a tumulus likewise; and can be found without any difficulty.

*Stations in Essex, Suffolk, and Hertfordshire.*

*Prittlevell Steeple.*

*Rayleigh Steeple.* The station is in the north-east corner, 20 inches from the north parapet, and 4 feet from the eastern one.

*Danbury Steeple.* The instrument was placed in the four angles of the Steeple, as circumstances rendered it necessary. The points are readily found, as there is scarcely room in the corners to place an instrument. Stations were also selected on the following Steeples, &c.

|                   |                                   |                    |
|-------------------|-----------------------------------|--------------------|
| Canewden Steeple. | West Mersea St.                   | Little Bentley St. |
| Frierning St.     | Colchester, St. Mary's Staircase. | Woodbridge St.     |
| Tillingham St.    | Tattingstone St.                  | Butely St.         |
| Thorp St.         | Rushmere St.                      | Otley St.          |
| Stoke St.         | Great Tey St.                     | Henley St.         |
| Dover Court St.   | St. Osyth Priory, Flagstaff.      | Falkenham St.      |
| Peldon St.        | Shobury Ness, Staff.              | Copdock St.        |



|                        |                         |                       |
|------------------------|-------------------------|-----------------------|
| Naughton St.           | Beauchamp Roding St.    | Westham St.           |
| Lavenham St.           | Hornchurch St.          | Barking, Staircase.   |
| Bulmer St.             | Naseing St.             | Berkhampstead, Ga-    |
| Glemsford St.          | Henham on the Mount St. | zebo.                 |
| Toppesfield St.        | Thorley St.             | Gallywood Common.     |
| Twinestead St.         | Albury St.              | Purfleet Cliff.       |
| Southweald St.         | Elmdon St.              | Babraham Mount.       |
| Pleshley St.           | Rickling St.            | Epping Mill, Base.    |
| High Easter St.        | Thaxted St.             | Brentwood Spire, sur- |
| Hatfield Broad Oak St. | Balsham St.             | veyed round.          |

*Stations in Kent.*

|                                 |                 |                 |
|---------------------------------|-----------------|-----------------|
| Frant Steeple. Station of 1787. | Seal Chart.     | Ash St.         |
| Botley Hill. Do.                | Tunbridge St.   | North Fleet St. |
| Chiddingstone St.               | Oxford Mount.   | Stockbury St.   |
| Mount Sion.                     | Silverden Farm. | Hernhill St.    |
| East Peckham St.                | Well Hill.      |                 |
| Tudely St.                      | Crayford St.    |                 |

The stations chosen for the survey of Essex, and parts of the adjoining counties, as also for completing the survey of Kent, are mostly towers, as may be seen from the above. When the tops of the towers have been smooth and even, the stations were always in the centres of them; but, when they were covered with roofs, or had spires upon them, stations were chosen in the most convenient places, and staffs always erected. I have omitted giving the measurements by which the stations may be exactly found, Rayleigh and Prittlewell excepted, in order to avoid swelling this article to an inconvenient length.



ART. VIII. *Particulars relating to the Base on King's Sedgemoor, and the Reduction of that Base.* Plate XXVIII.

*\*Comparisons of the Chains.*

As the chains, after the measurement on Salisbury Plain, were oiled, and laid up in the Tower, no apprehensions were entertained that either of them was elongated by the rusting of the joints. It was, however, our wish to have compared them with each other, previous to the commencement of this operation, and attempts were made, but rendered unsatisfactory, from the want of sufficient firmness in the soil. It was not till we arrived at the 70th chain, that a good opportunity presented itself: the measuring chain A, was then compared with the standard B, and found to be thirteen divisions of the micrometer head, attached to the brass scale, in excess. In these trials, the temperature remained constant; the mercury in FAHRENHEIT'S thermometer being at  $66\frac{1}{2}^{\circ}$ .

The 50-feet chain, spoken of in a former article, came from the hands of Mr. RAMSDEN without being very accurately measured; therefore it now became proper to ascertain its length, by means of the standard chain. This was accordingly done at the present time; when B was found to exceed twice the length of the 50-feet chain, by 14 divisions of the micrometer screw; the thermometer, at the time of trial, standing at  $69\frac{1}{2}^{\circ}$ .

At the conclusion of the measurement, the chains were again compared, when the working chain A, was found to exceed the standard,  $17\frac{1}{4}$  divisions on the micrometer head: this was after 273 chains were measured. Now, when 70 chains only had been measured, the difference between A and B was 13 of those



divisions; consequently  $17\frac{1}{4} - 13 = 4\frac{1}{4}$  divisions, was the wear of B, in measuring 203 chains. Therefore, the whole wear is found by this proportion, *viz.*  $203 : 4\frac{1}{4} :: 273 : 5,223$  divisions,  $= \frac{2}{100}$  of an inch; which very inconsiderable quantity, like the wear on Salisbury Plain, no doubt, arose from the pivots and pivot holes of the joints being polished by continual use. This supposition seems just; as the wear of the chain, after the measurement on Hounslow Heath, was found to be much greater.

The length of the chain A, as well as that of the standard B, was accurately ascertained by Mr. RAMSDEN, in the year 1793, as particularly shewn in the Philosophical Transactions for 1795. In the temperature of  $54^{\circ}$ , A was found to exceed 100 feet,  $\frac{1.1425}{100000}$  of an inch; therefore, adding the wear which took place on Salisbury Plain, *viz.*  $\frac{1}{200}$  part of an inch, we get the length of A at the commencement of the measurement on Sedgemoor  $= 100,01009$  feet.

From repeated trials, as before observed, the standard B was found to exceed the length of twice that of the new fifty-foot chain, 14 divisions of the micrometer head; and, *after* the measurement, the same chain fell short of A,  $17\frac{1}{4}$  of those divisions: hence, A exceeds twice the length of the 50-foot chain,  $31\frac{1}{4}$  divisions. Therefore the length of the short chain, in the temperature of  $54^{\circ}$ , may be taken at 50,00075 feet.



ART. IX. *Table of the Measurement of the Base of Verification  
on King's Sedgemoor.*

| Days. | Spaces<br>measured.<br>Yards. | Mean<br>temp. by<br>15 therm. | Days.  | Spaces<br>measured.<br>Yards. | Mean<br>temp. by<br>15 therm. | Days. | Spaces<br>measured.<br>Yards. | Mean<br>temp. by<br>15 therm. |
|-------|-------------------------------|-------------------------------|--------|-------------------------------|-------------------------------|-------|-------------------------------|-------------------------------|
| July  | 100                           | 69,7                          |        | 3200                          | 79,27                         | 6     | 6300                          | 92,26                         |
|       | 200                           | 65,56                         |        | 3300                          | 79,96                         |       | 6400                          | 86,73                         |
| 11    | 300                           | 62,73                         | 25     | 3400                          | 62,06                         |       | 6500                          | 68,30                         |
|       | 400                           | 67,40                         |        | 3500                          | 65,90                         | 7     | 6600                          | 82,06                         |
|       | 500                           | 64,10                         | 26     | 3600                          | 67,63                         |       | 6700                          | 91,06                         |
| 12    | 600                           | 65,30                         |        | 3700                          | 65,83                         |       | 6800                          | 89,76                         |
|       | 700                           | 73,40                         | 27     | 3800                          | 67,72                         |       | 6900                          | 93,43                         |
|       | 800                           | 69,36                         |        | 3900                          | 75,53                         | 8     | 7000                          | 75,94                         |
|       | 900                           | 68,06                         |        | 4000                          | 71,40                         |       | 7100                          | 81,57                         |
| 13    | 1000                          | 66,05                         |        | 4100                          | 71,23                         |       | 7200                          | 81,93                         |
|       | 1100                          | 70,30                         |        | 4200                          | 67,14                         |       | 7300                          | 79,36                         |
|       | 1200                          | 69,33                         | 31     | 4300                          | 66,56                         |       | 7400                          | 68,20                         |
|       | 1300                          | 62,83                         | Aug. 1 | 4400                          | 71,16                         | 9     | 7500                          | 78,18                         |
| 14    | 1400                          | 63,93                         | 2      | 4500                          | 64,60                         |       | 7600                          | 76,50                         |
|       | 1500                          | 61,40                         |        | 4600                          | 65,16                         |       | 7700                          | 71,26                         |
|       | 1600                          | 57,03                         |        | 4700                          | 68,16                         |       | 7800                          | 72,13                         |
| 16    | 1700                          | 66,36                         |        | 4800                          | 70,16                         |       | 7900                          | 70,8                          |
|       | 1800                          | 65,80                         |        | 4900                          | 76,23                         | 13    | 8000                          | 71,5                          |
|       | 1900                          | 71,03                         |        | 5000                          | 70,66                         |       | 8100                          | 8,4                           |
| 17    | 2000                          | 75,70                         |        | 5100                          | 64,23                         |       | 8200                          | 84,53                         |
|       | 2100                          | 80,43                         | 3      | 5200                          | 64,46                         |       | 8300                          | 76,13                         |
|       | 2200                          | 77,53                         |        | 5300                          | 63,96                         |       | 8400                          | 69,56                         |
| 18    | 2300                          | 65,96                         |        | 5400                          | 63,86                         |       | 8500                          | 66,63                         |
|       | 2400                          | 69,79                         |        | 5500                          | 67,13                         | 14    | 8600                          | 85,53                         |
|       | 2500                          | 69,56                         | 4      | 5600                          | 78,53                         |       | 8700                          | 83,73                         |
|       | 2600                          | 68,16                         |        | 5700                          | 73,84                         |       | 8800                          | 85,87                         |
| 19    | 2700                          | 68,19                         |        | 5800                          | 69,83                         |       | 8900                          | 78,46                         |
|       | 2800                          | 72,66                         |        | 5900                          | 65,86                         |       | 9000                          | 78,36                         |
|       | 2900                          | 69,23                         |        | 6000                          | 61,50                         | 15    | 9100                          | 73,77                         |
| 21    | 3000                          | 70,76                         |        | 6100                          | 76,46                         | 16    | 9225,4943                     | 63,00                         |
|       | 3100                          | 79,68                         |        | 6200                          | 84,26                         |       |                               |                               |



ART. X. *Reduction of the Base.*

The overplus of the 273d chain was measured by Mr. RAMSDEN, and found to be 23,517 feet; wherefore, the apparent length of the base was - 27676,4830

Feet.

From the measurement in the Riding-house of his Grace the Duke of MARLBOROUGH, the chain A was found to exceed 100 feet, in the temperature of  $54^{\circ}$ , 0,11425 parts of an inch; to which, adding the wear by the measurement on Salisbury Plain, viz.  $\frac{1}{260}$ , and also half the wear by the measurement of this base, viz.  $\frac{1}{100}$  part of an inch, we get  $\frac{0,1191}{12}$  for the excess of the chain's length above 100 feet; therefore,  $\frac{0,1191}{12} \times 272,8 = 2,7075$  feet; which add - - - - - +2,7075

The sum of all the degrees shewn by the thermometer was 98511; wherefore,  $\frac{98511}{5} - 54^{\circ} \times 272,8 \times \frac{0,0075}{12} = 3,1069$  feet; which also add - +3,1069

Again, from the comparison of the 50-feet chain with the standard B, it appeared that the excess above 50 feet, in the temperature of  $54^{\circ}$ , was 0,09075 parts of an inch; therefore,  $\frac{0,09075}{12} \times 8 = 0,0605$  parts of a foot. This likewise add - +0,0605

The sum of all the degrees shewn by the thermometers placed by the sides of the 50-feet chain, was 1372; therefore  $\frac{1372}{5} - 54^{\circ} \times 4 \times \frac{0,0075}{12} = 0,0365$  parts of a foot: and this add - - - +0,0365  
27682,3944



27682,3944

And, for the reduction of the base to the temperature of 62°, viz. for 8° on the brass scale, we have

$$\frac{0,01237 \times 272,8 \times 8^\circ}{12} = 2,2497 \text{ feet ; which subtract } \underline{\underline{-2,2497}}$$

Therefore, the length of the base is - - - feet 27680,1447 which, neglecting decimals, may be taken at 27680 feet.

As to the probable error of the above conclusion, I know not how to form a just opinion. On ground sufficiently hard, and otherwise favourable, I think a base of 5 miles might be measured so accurately, as to afford a result not differing from the truth more than three inches : but, on this occasion, I should not suppose the error can be less than six, nor more than nine inches. Motives for adopting this supposition, have been related in a foregoing article.

ART. XI. *Calculation of the Sides of certain principal Triangles in Cornwall and Devonshire.* Plate XXVII.

Distance from Hensbarrow to St. Agnes Beacon, 97084,8 Feet. Phil. Trans. 1797. p. 461.

| No. of triangles | Names of stations.  | Observed angles. | Diff. | Spherical excess. | Error. | Angles corrected for calculation. | Distances. |
|------------------|---------------------|------------------|-------|-------------------|--------|-----------------------------------|------------|
|                  |                     | ° ' "            | "     | "                 | "      | ° ' "                             | Feet.      |
| 1.               | St. Agnes Beacon    | 47 10 0,75       | -0,15 |                   |        | 47 10 3,25                        |            |
|                  | Hensbarrow - -      | 67 6 13,25       | -0,58 |                   |        | 67 6 13                           |            |
|                  | Trevoze Head -      | 65 43 47         | -0,57 |                   |        | 65 43 43,75                       |            |
|                  |                     | 180 0 1          |       | 1,31              | -0,31  |                                   |            |
|                  | Trevoze Head from { |                  |       |                   |        |                                   |            |
|                  | St. Agnes Beacon -  |                  |       |                   |        |                                   | 98108,1    |
|                  | Hensbarrow - -      |                  |       |                   |        |                                   | 78099,9    |



# Trigonometrical Survey.

589

Distance from Hensbarrow to Bodmin Down, 47337,2 Feet. Phil. Trans. 1797. p. 460.

| No. of triangles | Names of stations.                                                      | Observed angles. | Diff. | Spherical excess. | Error. | Angles corrected for calculation. | Distances. |
|------------------|-------------------------------------------------------------------------|------------------|-------|-------------------|--------|-----------------------------------|------------|
|                  |                                                                         |                  |       |                   |        |                                   | Feet.      |
| II.              | Hensbarrow - -                                                          | 77 20 18,5       | -0,30 | "                 | "      | 77 20 17,5                        |            |
|                  | Bodmin Down - -                                                         | 68 21 58,25      | -0,32 |                   |        | 68 21 57,25                       |            |
|                  | Trevoze Head - -                                                        | 34 17 45,5       | -0,23 |                   |        | 34 17 45,25                       |            |
|                  |                                                                         | 180 0 2,25       |       | 0,86              | +1,39  |                                   |            |
|                  | Trevoze Head from { Bodmin Down - - - 81967,6<br>Hensbarrow - - - 78093 |                  |       |                   |        |                                   |            |

Mean distance from Hensbarrow to Trevoze Head, 78096,4 feet.

|      |                                                                         |          |       |  |  |             |  |
|------|-------------------------------------------------------------------------|----------|-------|--|--|-------------|--|
| III. | Trevoze Head - -                                                        | 42 33 52 | -0,32 |  |  | 42 33 51,25 |  |
|      | Bodmin Down - -                                                         | 71 55 27 | -0,43 |  |  | 71 55 26,75 |  |
|      | Cadon Barrow - -                                                        | . . .    |       |  |  | 65 30 42,0  |  |
|      |                                                                         |          |       |  |  |             |  |
|      | Cadon Barrow from { Trevoze Head - - - 85625<br>Bodmin Down - - - 60925 |          |       |  |  |             |  |

|     |                                                                        |            |       |  |  |              |  |
|-----|------------------------------------------------------------------------|------------|-------|--|--|--------------|--|
| IV. | Bodmin Down - -                                                        | 30 58 13   | -0,05 |  |  | 30 58 12,75  |  |
|     | Cadon Barrow - -                                                       | 43 49 50,5 | -0,04 |  |  | 43 49 50     |  |
|     | Brown Willy - -                                                        | . . .      |       |  |  | 105 11 57,25 |  |
|     |                                                                        |            |       |  |  |              |  |
|     | Brown Willy from { Bodmin Down - - - 43722<br>Cadon Barrow - - - 32488 |            |       |  |  |              |  |

Distance from Carraton Hill to Maker Heights, 82600,3 feet. Phil. Trans. 1797. p. 458.

|    |                                                                            |            |       |      |       |            |  |
|----|----------------------------------------------------------------------------|------------|-------|------|-------|------------|--|
| V. | Carraton Hill - -                                                          | 74 5 22,5  | -0,60 |      |       | 74 5 21,75 |  |
|    | Maker Heights - -                                                          | 53 4 29    | -0,48 |      |       | 53 4 28,75 |  |
|    | Black Down - -                                                             | 52 50 9,75 | -0,48 |      |       | 52 50 9,5  |  |
|    |                                                                            | 180 0 1,25 |       | 1,57 | -0,32 |            |  |
|    | Black Down from { Maker Heights - - - 99680<br>Carraton Hill - - - 82860,4 |            |       |      |       |            |  |



| No. of triangles | Names of stations.                            | Observed angles. | Diff. | Spherical excess. | Error. | Angles corrected for calculation. | Distances. |
|------------------|-----------------------------------------------|------------------|-------|-------------------|--------|-----------------------------------|------------|
|                  |                                               |                  |       |                   |        |                                   | Feet.      |
| VI.              | Carraton Hill - -                             | ° 48 57 8,25     | —0,24 | "                 | "      | ° 48 57 9,25                      |            |
|                  | Black Down - -                                | 39 44 39         | —0,22 |                   |        | 39 44 38,5                        |            |
|                  | St. Stephen's Down                            | 91 18 12,75      |       |                   |        | 91 18 12,25                       |            |
|                  |                                               | 180 0 0          |       | 0,89              | —0,89  |                                   |            |
|                  | St. Stephen's Down from { Carraton Hill - - - |                  |       |                   |        |                                   | 52991,3    |
|                  | Black Down - - -                              |                  |       |                   |        |                                   | 62506,7    |

Distance from Carraton Hill to Kit Hill, 33427 feet. Phil. Trans. 1797. p. 459.

|      |                                               |          |       |  |  |             |         |
|------|-----------------------------------------------|----------|-------|--|--|-------------|---------|
| VII. | Carraton Hill - -                             | 70 15 32 | —0,14 |  |  | 70 15 32,25 |         |
|      | St. Stephen's Down                            | 37 1 56  | —0,11 |  |  | 37 1 55,75  |         |
|      | Kit Hill - -                                  | . . .    |       |  |  | 72 42 32    |         |
|      |                                               |          |       |  |  |             |         |
|      | St. Stephen's Down from { Carraton Hill - - - |          |       |  |  |             | 52994   |
|      | Kit Hill - - -                                |          |       |  |  |             | 52240,4 |

Mean distance from St. Stephen's Down to Carraton Hill, 52292,7 feet.

|       |                                  |          |       |  |  |            |         |
|-------|----------------------------------|----------|-------|--|--|------------|---------|
| VIII. | St. Stephen's Down               | 54 16 13 | —0,19 |  |  | 54 16 12,5 |         |
|       | Black Down - -                   | 52 57 37 | —0,19 |  |  | 52 57 36,5 |         |
|       | Kit Hill - -                     | . . .    |       |  |  | 72 46 11   |         |
|       |                                  |          |       |  |  |            |         |
|       | Black Down from { Kit Hill - - - |          |       |  |  |            | 53128   |
|       | St. Stephen's Down - - -         |          |       |  |  |            | 62509,2 |

Hence the mean distance from Black Down to St. Stephen's Down, is 62508 feet.

In the third triangle, the angle at Cadon Barrow is supplementary. When the observations were made at that station, a direction-post at Bodmin Down was mistaken for the staff, (to which it was similar in shape,) erected at no great distance from it. This error was not detected till long after: and, although it has been a maxim to which we have generally adhered, of observing all the angles of



each triangle, yet, for the reasons assigned in the preface, I have chosen to depart from it on the present occasion. In another principal triangle, the angle at Brown Willy is also supplementary: it has already been mentioned, that an instrument cannot be got on the top of it. As to the angles at Kit Hill, in the two last triangles, being inferred ones, it may be proper to mention, that Black Down was chosen for a station, after the observations were made at the former. To have visited Kit Hill a second time would have been unnecessary, because there are not any distances, except to interior objects, which depend upon those triangles.

ART. XII. *Calculation of the Sides of a Set of principal Triangles, carried on from the Side which joins the Stations on Beacon Hill, near Amesbury, and Wingreen Hill, near Shaftsbury, towards the Base of Verification on King's Sedgemoor. Plate XXIX.*

Distance from Beacon Hill to Wingreen Hill, 114522,4 Feet. Phil. Trans. 1795. p. 501.

| No. of triangles | Names of stations.                                       | Observed angles. | Diff. | Spherical excess. | Error. | Angles corrected for calculation. | Distances.        |
|------------------|----------------------------------------------------------|------------------|-------|-------------------|--------|-----------------------------------|-------------------|
|                  |                                                          |                  |       |                   |        |                                   | Feet.             |
| ix.              | Wingreen Hill -                                          | 89° 57' 37,75    | -0,97 | "                 | "      | 89° 57' 37                        |                   |
|                  | Beacon Hill -                                            | 32° 11' 43,25    | -0,48 |                   |        | 32° 11' 43                        |                   |
|                  | Bradley Knoll                                            | 57° 50' 38,25    | -0,48 |                   |        | 57° 50' 40                        |                   |
|                  |                                                          | 179 59 59,25     |       | 1,93              | -2,68  |                                   |                   |
|                  | Bradley Knoll from { Wingreen - - -<br>Beacon Hill - - - |                  |       |                   |        |                                   | 72074<br>135272,3 |
| x.               | Bradley Knoll -                                          | 40° 43' 52       | -0,26 |                   |        | 40° 43' 51,5                      |                   |
|                  | Wingreen -                                               | 96° 20' 37       | -0,65 |                   |        | 96° 20' 36,25                     |                   |
|                  | Bull Barrow -                                            | 42° 55' 32,75    | -0,25 |                   |        | 42° 55' 32,25                     |                   |
|                  |                                                          | 180 0 1,75       |       | 1,16              | +0,55  |                                   |                   |
|                  | Bull Barrow from { Bradley Knoll - - -<br>Wingreen - - - |                  |       |                   |        |                                   | 105180<br>69053,6 |

In the Philosophical Transactions for 1797, p. 455, the distance from Bull Barrow to Wingreen is said to be 69058, being  $4\frac{1}{2}$  feet greater than the above conclusion.



| No of triangles                                                               | Names of stations.                                      | Observed angles.                                                                                             | Diff.                   | Spherical excess. | Error. | Angles corrected for calculation.                                                         | Distances.          |
|-------------------------------------------------------------------------------|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-------------------------|-------------------|--------|-------------------------------------------------------------------------------------------|---------------------|
|                                                                               |                                                         |                                                                                                              |                         |                   |        |                                                                                           | Feet.               |
| x i.                                                                          | Bull Barrow -<br>Bradley Knoll<br>Ash Beacon -          | <div style="text-align: center;">°   '   "</div> 40 38 47,75<br>45 43 3,5<br>93 38 12,5<br><hr/> 180 0 3,75  | —0,28<br>—0,28<br>—0,65 | "                 | "      | <div style="text-align: center;">°   '   "</div> 40 38 45,25<br>45 43 3,25<br>93 38 11,5  | 68650,6<br>75451    |
|                                                                               | Ash Beacon from {                                       |                                                                                                              |                         |                   |        | Bradley Knoll -<br>Bull Barrow -                                                          | -<br>-              |
|                                                                               |                                                         |                                                                                                              |                         |                   |        |                                                                                           |                     |
| x ii.                                                                         | Beacon Hill -<br>Bradley Knoll<br>Westbury Down         | <div style="text-align: center;">°   '   "</div> 23 4 15<br>42 43 29,75<br>114 12 18,5<br><hr/> 180 0 3,25   | —0,08<br>+0,07<br>—0,97 |                   |        | <div style="text-align: center;">°   '   "</div> 23 4 14,75<br>42 43 28,25<br>114 12 17   |                     |
|                                                                               | Westbury Down from {                                    |                                                                                                              |                         |                   |        | Beacon Hill -<br>Bradley Knoll -                                                          | 100625,1<br>58118,2 |
|                                                                               |                                                         |                                                                                                              |                         |                   |        |                                                                                           |                     |
| x iii.                                                                        | Westbury Down<br>Bradley Knoll -<br>Mendip Hills -      | <div style="text-align: center;">°   '   "</div> 40 48 1,75<br>101 23 59<br>37 47 58,5<br><hr/> 179 59 59,25 | —0,12<br>—0,48<br>—0,16 |                   |        | <div style="text-align: center;">°   '   "</div> 40 48 1,75<br>101 23 59,75<br>37 47 58,5 |                     |
|                                                                               | Mendip Hills from {                                     |                                                                                                              |                         |                   |        | Westbury Down -<br>Bradley Knoll -                                                        | 92954,0<br>61961,1  |
|                                                                               |                                                         |                                                                                                              |                         |                   |        |                                                                                           |                     |
| <i>Base of verification.</i> —Greylock's Foss to Lugshorn Corner, 27680 feet. |                                                         |                                                                                                              |                         |                   |        |                                                                                           |                     |
| x iv.                                                                         | Lugshorn Corner<br>Greylock's Foss -<br>Dundon Beacon - | <div style="text-align: center;">°   '   "</div> 107 44 31<br>8 30 0<br>63 45 29<br><hr/> 180 0 0            |                         |                   |        | <div style="text-align: center;">°   '   "</div> 107 44 31<br>8 30 0<br>63 45 29          |                     |
|                                                                               | Dundon Beacon from {                                    |                                                                                                              |                         |                   |        | Lugshorn Corner -<br>Greylock's Foss -                                                    | 4561,5<br>29393     |
|                                                                               |                                                         |                                                                                                              |                         |                   |        |                                                                                           |                     |







| No. of triangles | Names of stations.                                      | Observed angles. | Diff. | Spherical excess. | Error. | Angles corrected for calculation. | Distances.         |
|------------------|---------------------------------------------------------|------------------|-------|-------------------|--------|-----------------------------------|--------------------|
|                  |                                                         | ° ' "            | "     | "                 | "      | ° ' "                             | Feet.              |
| xix.             | Moor Lynch -                                            | 54 3 22,5        | -0,42 |                   |        | 54 3 22                           |                    |
|                  | Mendip Hills -                                          | 69 26 48,25      | -0,49 |                   |        | 69 26 47                          |                    |
|                  | Ash Beacon -                                            | 56 29 51,5       | -0,42 |                   |        | 56 29 51                          |                    |
|                  |                                                         | 180 0 2,25       |       | 1,33              | +0,92  |                                   |                    |
|                  | Ash Beacon from { Moor Lynch - -<br>Mendip Hills - -    |                  |       |                   |        |                                   | 88571<br>76851     |
| xx.              | Mendip Hills -                                          | 58 16 22         | -0,30 |                   |        | 58 16 21,5                        |                    |
|                  | Ash Beacon -                                            | 50 8 45,5        | -0,28 |                   |        | 50 8 45,25                        |                    |
|                  | Bradley Knoll -                                         | 71 34 55         | -0,36 |                   |        | 71 34 54,25                       |                    |
|                  |                                                         | 180 0 2,5        |       | 0,95              | +1,55  |                                   |                    |
|                  | Bradley Knoll from { Mendip Hills - -<br>Ash Beacon - - |                  |       |                   |        |                                   | 61963,5<br>68653,6 |

The distance from Bradley Knoll to the station on Mendip Hills, and also to that on Ash Beacon, is given in the preceding triangles, independent of the above values. The first is 61961,1, and the second 68650,6 feet: these distances have their origin in the base on Salisbury Plain. The other distances are 61963,5, and 68653,6 feet; and these depend on the base of verification on King's Sedgemoor. There is, therefore, a difference of  $2\frac{4}{10}$  feet between the values of one distance, (12 miles nearly,) and 3 feet between those of the other, which is about 13 miles in length. If the computations had been carried on from one base to another, the difference between the measured base on Sedgemoor and the computed base, would have appeared to be *one foot nearly*. I have already delivered it as my opinion, that an error of nine inches may exist in the new base: therefore, these results must be considered as satisfactory enough. A different correction of the observed angles, or another selection of



the angles themselves, might afford a closer agreement; but I can see no just reason for making any alterations in one or the other. I shall now take the means of the distances, as derived from both bases, and consider 68652,2 feet as the true distance from Ash Beacon to Bradley Knoll; and 61962,3 feet for that between Bradley Knoll and the station on Mendip Hills.

In one of the foregoing triangles, (Bull Barrow, Bradley Knoll, and Ash Beacon,) the distance between Ash Beacon and Bull Barrow is found to be 75451 feet. If the *mean distance* between Bradley Knoll and Ash Beacon, *viz.* 61962,3 feet, be now used, 75452,7 feet becomes the distance between those stations; and this I shall use, in computing the sides of the two triangles which immediately follow.

| No. of triangles | Names of stations.              | Observed angles. | Diff. | Spherical excess. | Error. | Angles corrected for calculation. | Distances. |
|------------------|---------------------------------|------------------|-------|-------------------|--------|-----------------------------------|------------|
|                  |                                 |                  |       |                   |        | ° ' "                             | Feet.      |
| xxi.             | Ash Beacon -                    | 34 18 56,25      | -0,14 | "                 | "      | 34 18 55,75                       |            |
|                  | Bull Barrow -                   | 51 26 42         | -0,13 |                   |        | 51 26 41,75                       |            |
|                  | Mintern -                       | 94 14 23         | -0,32 |                   |        | 94 14 22,5                        |            |
|                  |                                 | 180 0 1,25       |       | 0,59              | +0,66  |                                   |            |
|                  | Mintern from { Ash Beacon - - - |                  |       |                   |        |                                   | 59166,6    |
|                  | { Bull Barrow - - -             |                  |       |                   |        |                                   | 42653,7    |
| xxii.            | Pilsden - -                     | 35 3 1           | -0,24 |                   |        | 35 3 0,75                         |            |
|                  | Ash Beacon -                    | 49 21 38,25      | -0,24 |                   |        | 49 21 38                          |            |
|                  | Mintern -                       | 95 35 22         | -0,60 |                   |        | 95 35 21,25                       |            |
|                  |                                 | 180 0 1,25       |       | 1,08              | +0,17  |                                   |            |
|                  | Pilsden from { Ash Beacon - - - |                  |       |                   |        |                                   | 102535     |
|                  | { Mintern - - -                 |                  |       |                   |        |                                   | 78177,6    |

In our last account, (see Phil. Trans. 1797. p. 455 and 456,) the distance from Bull Barrow to Mintern was found to be 42653,4 feet; and the distance from Pilsden to Mintern 78177 feet. The distances derived from the above triangles are very nearly the same; a difference of a few inches only existing between them.



| No. of triangles | Names of stations.            | Observed angles.                       | Diff.        | Spherical excess. | Error.       | Angles corrected for calculation.      | Distances.                    |
|------------------|-------------------------------|----------------------------------------|--------------|-------------------|--------------|----------------------------------------|-------------------------------|
|                  |                               | <sup>°</sup> <sup>'</sup> <sup>"</sup> | <sup>"</sup> | <sup>"</sup>      | <sup>"</sup> | <sup>°</sup> <sup>'</sup> <sup>"</sup> | <sup>F</sup> <sub>ee</sub> t. |
| xxiii.           | Moor Lynch -                  | 57 19 3,5                              | -0,64        |                   |              | 57 19 2,5                              |                               |
|                  | Ash Beacon -                  | 76 2 36,5                              | -0,39        |                   |              | 76 2 36                                |                               |
|                  | Pilsden -                     | . . .                                  |              |                   |              | 46 38 21,5                             |                               |
|                  | Pilsden from Moor Lynch - - - |                                        |              |                   |              |                                        | 118230                        |

But Pilsden was also observed from Dundon Beacon; from which, and the angle observed at Moor Lynch, between Dundon Beacon and Pilsden, results the following triangle.

|       |                               |             |       |  |  |             |          |
|-------|-------------------------------|-------------|-------|--|--|-------------|----------|
| xxiv. | Moor Lynch - -                | 56 43 36,75 | +0,03 |  |  | 56 43 36,5  |          |
|       | Dundon Beacon -               | 108 1 52    | -0,64 |  |  | 108 1 51,75 |          |
|       | Pilsden - -                   | . . .       |       |  |  | 15 14 31,75 |          |
|       | Pilsden from Moor Lynch - - - |             |       |  |  |             | 118233,6 |

Hence, the mean distance from Moor Lynch to Pilsden is 118231,8 feet; and this is the side from which the series about to be carried on, for the survey of the north of Devonshire, is to originate.

In the triangle formed by the stations on Mendip Hills, Bradley Knoll, and Westbury Down, the distance between the first and last is 92954,0 feet; but, computing with the mean distance from Mendip to Bradley Knoll, (61962,3 feet,) as found from both bases, the distance from Mendip to Westbury Down proves to be 92955,9 feet; which distance is used in the remaining principal triangles in this quarter.

|      |                                 |             |       |      |       |             |         |
|------|---------------------------------|-------------|-------|------|-------|-------------|---------|
| xxv. | Farley Down - -                 | 77 21 53,75 | -0,44 |      |       | 77 21 52,75 |         |
|      | Westbury Down -                 | 63 42 51,25 | -0,34 |      |       | 63 42 49,75 |         |
|      | Mendip Hills -                  | 38 55 17,5  | -0,30 |      |       | 38 55 17,5  |         |
|      |                                 | 180 0 2,5   |       | 1,10 | +1,40 |             |         |
|      | Mendip from { Farley Down - - - |             |       |      |       |             | 85412,2 |
|      | { Westbury Down - - -           |             |       |      |       |             | 92955,9 |



| No. of triangles. | Names of stations. | Observed angles   | Diff. | Spherical excess. | Error. | Angles corrected for calculation. | Distances. |
|-------------------|--------------------|-------------------|-------|-------------------|--------|-----------------------------------|------------|
|                   |                    |                   |       |                   |        |                                   | Feet.      |
| xxvi.             | Mendip - -         | 60 36 15,5        | -0,40 | "                 | "      | 60 36 15                          |            |
|                   | Dundry - -         | 69 52 22          | -0,44 |                   |        | 69 52 22                          |            |
|                   | Farley Down -      | 49 31 23,5        | -0,37 |                   |        | 49 31 23                          |            |
|                   |                    | 180 0 1           |       | 1,21              | -0,21  |                                   |            |
|                   | Dundry from {      | Farley Down - - - |       |                   |        |                                   | 79255,3    |
|                   |                    | Mendip - - -      |       |                   |        |                                   | 69196      |
| xxvii.            | Mendip - -         | 41 3 58,5         | -0,25 |                   |        | 41 3 58,25                        |            |
|                   | Dundry - -         | 83 34 18          | -0,40 |                   |        | 83 34 17,5                        |            |
|                   | Lansdown - -       | . . .             |       |                   |        | 55 21 44,25                       |            |
|                   |                    |                   |       |                   |        |                                   |            |
|                   | Lansdown from {    | Mendip - - -      |       |                   |        |                                   | 83573,2    |
|                   |                    | Dundry - - -      |       |                   |        |                                   | 55249,2    |
| xxviii.           | Dundry - -         | 13 41 56,25       | -0,09 |                   |        | 13 41 56                          |            |
|                   | Farley Down -      | 27 5 27,5         | -0,11 |                   |        | 27 5 27,25                        |            |
|                   | Lansdown - -       | . . .             |       |                   |        | 139 12 36,75                      |            |
|                   |                    |                   |       |                   |        |                                   |            |
|                   | Lansdown from {    | Farley Down - - - |       |                   |        |                                   | 28730,4    |
|                   |                    | Dundry - - -      |       |                   |        |                                   | 55248,7    |

Wherefore, the mean distance from Dundry to Lansdown is 52248,9 feet.

ART. XIII. *Calculation of the sides of certain principal Triangles, carried on from the side Bagsbot Heath and Highclere, towards the north.* Plate XXXI.

Distance from Bagshot Heath to Highclere, 142952,6 feet. Phil. Trans. 1795. p. 496.

|       |                 |                     |       |      |       |             |          |
|-------|-----------------|---------------------|-------|------|-------|-------------|----------|
| xxix. | Bagshot Heath - | 55 32 26            | -0,89 |      |       | 55 32 25,25 |          |
|       | Highclere - -   | 46 10 18,25         | -0,83 |      |       | 46 10 17,75 |          |
|       | Nuffield - -    | 78 17 18,25         | -1,20 |      |       | 78 17 17    |          |
|       |                 | 180 0 2,5           |       | 2,94 | -0,43 |             |          |
|       | Nuffield from { | Bagshot Heath - - - |       |      |       |             | 105321,2 |
|       |                 | Highclere - - -     |       |      |       |             | 120374   |



| No. of triangles. | Names of stations.                                        | Observed angles.                       | Diff. | Spherical excess. | Error. | Angles corrected for calculation.      | Distances.           |
|-------------------|-----------------------------------------------------------|----------------------------------------|-------|-------------------|--------|----------------------------------------|----------------------|
|                   |                                                           | <sup>°</sup> <sup>'</sup> <sup>"</sup> |       | "                 | "      | <sup>°</sup> <sup>'</sup> <sup>"</sup> | Feet.                |
| xxx.              | White Horse Hill                                          | 63 7 53,25                             | -0,94 |                   |        | 63 7 53,5                              |                      |
|                   | Highclere - -                                             | 63 18 16,75                            | -0,94 |                   |        | 63 18 17                               |                      |
|                   | Nuffield - -                                              | 53 33 49,5                             | -0,86 |                   |        | 63 33 49,5                             |                      |
|                   |                                                           | 179 59 59,5                            |       | 2,74              | -3,24  |                                        |                      |
|                   | White Horse Hill from { Nuffield - - -<br>Highclere - - - |                                        |       |                   |        |                                        | 120557,7<br>108563,1 |

Distance from Beacon Hill to Highclere, 98694,4 feet. Phil. Trans. 1795. p. 497.

|         |                                                         |              |       |      |       |             |                     |
|---------|---------------------------------------------------------|--------------|-------|------|-------|-------------|---------------------|
| xxxii.  | Beacon Hill - -                                         | 17 42 38,5   | -0,12 |      |       | 17 42 38,25 |                     |
|         | Highclere - -                                           | 56 0 29,75   | +0,08 |      |       | 56 0 29,25  |                     |
|         | Inkpin Hill - -                                         | 106 16 53,25 | -0,47 |      |       | 106 16 52,5 |                     |
|         |                                                         | 180 0 1,5    |       | 0,50 | +1,0  |             |                     |
|         | Inkpin Hill from { Highclere - - -<br>Beacon Hill - - - |              |       |      |       |             | 31278,8<br>85247,9  |
| xxxiii. | Highclere - -                                           | 34 27 50,75  | +0,38 |      |       | 34 27 50,75 |                     |
|         | Inkpin Hill - -                                         | 133 27 57,5  | -0,91 |      |       | 133 27 58   |                     |
|         | White Horse Hill                                        | 12 4 11,5    | +0,04 |      |       | 12 4 11,25  |                     |
|         |                                                         | 179 59 59,75 |       | 0,49 | -1,24 |             |                     |
|         | White Horse Hill from { Highclere - - -<br>Inkpin - - - |              |       |      |       |             | 108565,5<br>84647,1 |

In the following computations, I shall use 120557,7 feet for the distance between White Horse Hill and Nuffield: this is derived from the base on Hounslow Heath. By the last triangle, White Horse Hill, from Highclere, is distant 108565,5 feet; which is computed from the base on Salisbury Plain. The distance between those stations, found by the second of the above triangles, is 108563,1 feet. Therefore, whether the distance between White Horse Hill and Nuffield be founded on the base measured on Salisbury Plain, or Hounslow Heath, nearly the same conclusion is derived: the difference will



not amount to four feet; a small quantity in a side of three-and-twenty miles. I shall, however, use 120557.7, because I think it the most accurate determination.

| No. of triangles. | Names of stations.                                                         | Observed angles. | Diff. | Spherical excess. | Error. | Angles corrected for calculation. | Distances. |
|-------------------|----------------------------------------------------------------------------|------------------|-------|-------------------|--------|-----------------------------------|------------|
|                   |                                                                            |                  |       |                   |        |                                   | Fect.      |
| xxxiii.           | White Horse Hill                                                           | 38° 48' 13.25"   | -0.67 | "                 | "      | 38° 48' 12.5"                     |            |
|                   | Nuffield - -                                                               | 86° 4' 16.25"    | -1.21 |                   |        | 86° 4' 15"                        |            |
|                   | Brill - - -                                                                | 55° 7' 33.5"     | -0.71 |                   |        | 55° 7' 32.5"                      |            |
|                   |                                                                            | 180 0 3          |       | 2.6               | +0.4   |                                   |            |
|                   | Brill from { White Horse Hill - - - 146603.2<br>Nuffield - - - - - 92085.5 |                  |       |                   |        |                                   |            |
| xxxiv.            | Brill - - -                                                                | 50° 14' 44.5"    | -1.18 |                   |        | 50° 14' 45"                       |            |
|                   | White Horse Hill                                                           | 64° 45' 43.75"   | -1.34 |                   |        | 64° 45' 42.5"                     |            |
|                   | Stow on the Wold                                                           | 64° 59' 32"      | -1.35 |                   |        | 64° 59' 45"                       |            |
|                   |                                                                            | 180 0 0.25       |       | 3.88              | -3.63  |                                   |            |
|                   | Stow from { White Horse Hill - - - 124365.6<br>Brill - - - - - 146326.3    |                  |       |                   |        |                                   |            |
| xxxv.             | Brill - - -                                                                | 32° 34' 43"      | -0.61 |                   |        | 32° 34' 42.25"                    |            |
|                   | Stow - - -                                                                 | 60° 56' 6.25"    | -0.64 |                   |        | 60° 56' 5.5"                      |            |
|                   | Epwell - - -                                                               | 86° 29' 13.5"    | -1.11 |                   |        | 86° 29' 12.25"                    |            |
|                   |                                                                            | 180 0 2.75       |       | 2.37              | +0.38  |                                   |            |
|                   | Epwell from { Stow - - - - - 78938.2<br>Brill - - - - - 128140             |                  |       |                   |        |                                   |            |
| xxxvi.            | Epwell - - -                                                               | 38° 10' 44"      | -0.25 |                   |        | 38° 10' 42.75"                    |            |
|                   | Stow - - -                                                                 | 72° 38' 49.5"    | -0.34 |                   |        | 72° 38' 47.5"                     |            |
|                   | Broadway Beacon                                                            | 69° 10' 31.75"   | -0.32 |                   |        | 69° 10' 29.75"                    |            |
|                   |                                                                            | 180 0 5.25       |       | 0.92              | +4.33  |                                   |            |
|                   | Broadway Beacon from { Stow - - - - - 52203.2<br>Epwell - - - - - 80611.4  |                  |       |                   |        |                                   |            |







It will now be expedient to compute the distance from Bow Brickhill to Brill, by means of another set of triangles. And it was for the express purpose of verifying this distance found by the last triangle, that Scutchamfly Barrow, in Berkshire, and the station above Wendover, were chosen. The base on which these triangles are to rest, is the distance between Nuffield and White Horse Hill, viz. 120557,7 feet.

| No. of triangles | Names of stations.                           | Observed angles. | Diff. | Spherical excess. | Error. | Angles corrected for calculation. | Distances. |
|------------------|----------------------------------------------|------------------|-------|-------------------|--------|-----------------------------------|------------|
|                  |                                              |                  |       |                   |        |                                   | Feet.      |
| XL I.            | Nuffield -                                   | 62 32 5,25       | -0,53 | "                 | "      | 62 32 6                           |            |
|                  | White Horse Hill                             | 35 34 23,25      | -0,47 |                   |        | 35 34 24                          |            |
|                  | Shotover Hill -                              | 81 53 29,75      | -0,74 |                   |        | 81 53 30                          |            |
|                  |                                              | 179 59 58,25     |       | 1,75              | -3,5   |                                   |            |
|                  | Shotover Hill from { White Horse Hill -      |                  |       |                   |        |                                   | 108050,2   |
|                  | { Nuffield -                                 |                  |       |                   |        |                                   | 70842,1    |
| XL II.           | Shotover Hill -                              | 26 8 8           | -0,12 |                   |        | 26 8 8                            |            |
|                  | White Horse Hill                             | 42 4 2           | -0,04 |                   |        | 42 4 2                            |            |
|                  | Scutchamfly Barrow                           | 111 47 50        | -0,70 |                   |        | 111 47 50                         |            |
|                  |                                              | 180 0 0          |       | 0,86              | -0,86  |                                   |            |
|                  | Scutchamfly Barrow from { White Horse Hill - |                  |       |                   |        |                                   | 51261,9    |
|                  | { Shotover Hill -                            |                  |       |                   |        |                                   | 77968,3    |
| XL III.          | Shotover Hill -                              | 117 30 56        | -1,41 |                   |        | 117 30 55,25                      |            |
|                  | Scutchamfly Barrow                           | 34 26 52         | -0,01 |                   |        | 34 26 52                          |            |
|                  | Wendover -                                   | 28 2 12,75       | -0,09 |                   |        | 28 2 12,75                        |            |
|                  |                                              | 180 0 0,75       |       | 1,52              | -0,77  |                                   |            |
|                  | Wendover from { Scutchamfly Barrow -         |                  |       |                   |        |                                   | 147113,3   |
|                  | { Shotover -                                 |                  |       |                   |        |                                   | 93828,6    |



| No. of triangles | Names of Stations.                | Observed angles. | Diff. | Spherical excess. | Error. | Angles corrected for calculation. | Distances. |
|------------------|-----------------------------------|------------------|-------|-------------------|--------|-----------------------------------|------------|
|                  |                                   |                  |       |                   |        |                                   | Feet.      |
| XLIV.            | Wendover -                        | 23 23 57,5       | 0,11  | "                 | "      | 23 23 57,25                       |            |
|                  | Shotover Hill -                   | 48 30 39,75      | 0,04  |                   |        | 48 30 40,5                        |            |
|                  | Brill -                           | .                | .     |                   |        | 108 5 22,25                       |            |
|                  |                                   |                  |       | 1,21              |        |                                   |            |
|                  | Brill from { Wendover - -         |                  |       |                   |        |                                   | 73940,3    |
|                  | { Shotover Hill - -               |                  |       |                   |        |                                   | 39200,2    |
| XLV.             | Wendover -                        | 80 11 9,25       | -0,67 |                   |        | 80 11 8,5                         |            |
|                  | Brill -                           | 57 25 1,5        | -0,47 |                   |        | 57 25 0,75                        |            |
|                  | Bow Brickhill -                   | 42 23 50,75      | -0,44 |                   |        | 42 23 50,75                       |            |
|                  |                                   | 180 0 1,51       |       | 1,58              | -0,07  |                                   |            |
|                  | Bow Brickhill from { Wendover - - |                  |       |                   |        |                                   | 92400,7    |
|                  | { Brill - -                       |                  |       |                   |        |                                   | 108055     |

According to the first determination, the distance from Bow Brickhill to Brill is 108058,9 feet, and by the last, 108855 feet. There is, therefore, a difference of 4 feet nearly; a quantity which must be deemed inconsiderable; hence, 108056,9 feet may be taken for the true distance.

|        |                            |             |  |      |       |             |          |
|--------|----------------------------|-------------|--|------|-------|-------------|----------|
| XLVI.  | Kinsworth -                | 62 55 38,75 |  |      |       | 62 55 38,5  |          |
|        | Bow Brickhill -            | 88 42 0     |  |      |       | 88 41 59,25 |          |
|        | Brill -                    | .           |  |      |       | 28 22 22,25 |          |
|        | Kinsworth from { Brill - - |             |  |      |       |             | 121322,5 |
|        | { Bow Brickhill - -        |             |  |      |       |             | 57668    |
| XLVII. | Wendover -                 | 33 26 48    |  |      |       | 33 26 49    |          |
|        | Quainton -                 | 94 58 37    |  |      |       | 94 58 38    |          |
|        | Brill -                    | 51 34 33    |  |      |       | 51 34 33    |          |
|        |                            | 179 59 58   |  | 0,55 | -2,55 |             |          |
|        | Quainton from { Brill - -  |             |  |      |       |             | 40908    |
|        | { Wendover - -             |             |  |      |       |             | 58146,4  |



| No. of triangles | Names of Stations.           | Angles observed. | Diff. | Spherical excess. | Error. | Angles corrected for calculation. | Distances. |
|------------------|------------------------------|------------------|-------|-------------------|--------|-----------------------------------|------------|
|                  |                              |                  |       |                   |        |                                   | Feet.      |
| XLVIII.          | Bow Brickhill -              | 38 51 40,75      | "     | "                 | "      | 38 51 40,75                       |            |
|                  | Wendover - -                 | 46 44 29,5       |       |                   |        | 46 44 29,25                       |            |
|                  | Quainton - -                 | 94 23 50,25      |       |                   |        | 94 23 50                          |            |
|                  |                              | 180 0 1,25       |       | 0,83              | +0,42  |                                   |            |
|                  | Quainton from { Wendover - - |                  |       |                   |        |                                   | 58146,9    |
|                  | { Bow Brickhill - -          |                  |       |                   |        |                                   | 67491,3    |

In the above triangle, I have computed the distances of Wendover and Bow Brickhill from Quainton with 92400,7 feet, the side Wendover and Bow Brickhill, as determined in a former triangle.

|       |                               |             |  |  |  |          |         |
|-------|-------------------------------|-------------|--|--|--|----------|---------|
| XLIX. | Bow Brickhill -               | 85 9 52,75  |  |  |  | 85 9 52  |         |
|       | Kinsworth - -                 | 52 17 56,75 |  |  |  | 52 17 56 |         |
|       | Quainton - -                  | . . .       |  |  |  | 42 32 12 |         |
|       |                               |             |  |  |  |          |         |
|       | Quainton from { Kinsworth - - |             |  |  |  |          | 84997   |
|       | { Bow Brickhill - -           |             |  |  |  |          | 67490,3 |

Therefore, 67490 may be considered as nearly the true distance, in feet, between Quainton and Bow Brickhill.

|    |                               |             |  |      |       |            |         |
|----|-------------------------------|-------------|--|------|-------|------------|---------|
| L. | Bow Brickhill -               | 42 10 36,75 |  |      |       | 42 10 36,5 |         |
|    | Kinsworth - -                 | 82 50 30,5  |  |      |       | 82 50 30   |         |
|    | Lillyhoe - -                  | 54 38 53    |  |      |       | 54 38 53,5 |         |
|    |                               | 180 0 0,25  |  | 1,26 | -1,50 |            |         |
|    | Lillyhoe from { Kinsworth - - |             |  |      |       |            | 47278,7 |
|    | { Bow Brickhill - -           |             |  |      |       |            | 69867   |

As the stations Lidlington, Trusler Hill, together with Crouch Hill, Cumner Hill, and Whiteham Hill, have been used for purposes of greater importance than secondary ones have been generally applied to, I shall insert the triangles formed by their intersections in this article.



| No. of triangles | Names of stations.                | Observed angles. | Diff. | Spherical excess. | Error. | Angles corrected for calculation. | Distances. |
|------------------|-----------------------------------|------------------|-------|-------------------|--------|-----------------------------------|------------|
| L.I.             | Kinsworth -                       | 31 4 5           | "     | "                 | "      | 31 4 4                            | Feet.      |
|                  | Bow Brickhill -                   | 80 39 37,25      |       |                   |        | 80 39 34,75                       |            |
|                  | Lidlington -                      | 68 16 22,25      |       |                   |        | 68 16 21,25                       |            |
|                  |                                   | 180 0 4,5        |       | 0,42              | +4,92  |                                   |            |
|                  | Lidlington from { Bow Brickhill - |                  |       |                   |        |                                   | 32035,6    |
|                  | { Kinsworth -                     |                  |       |                   |        |                                   | 61255,3    |
| L.II.            | Lillyhoe -                        | 78 58 26         |       |                   |        | 78 58 26                          |            |
|                  | Kinsworth -                       | 51 46 22         |       |                   |        | 51 46 22                          |            |
|                  | Lidlington -                      | . . .            |       |                   |        | 49 15 12                          |            |
|                  |                                   |                  |       |                   |        |                                   |            |
|                  | Lillyhoe from { Kinsworth -       |                  |       |                   |        |                                   | 47280      |
|                  | { Lidlington -                    |                  |       |                   |        |                                   | 49025      |

The distance from Lillyhoe to Kinsworth, as found in a former triangle, is 47278,1 feet, and by the last 47280 feet; therefore, 47279,3 may be taken for the true distance in feet.

|        |                              |          |  |  |  |           |         |
|--------|------------------------------|----------|--|--|--|-----------|---------|
| L.III. | Bow Brickhill -              | 38 28 56 |  |  |  | 38 28 56  |         |
|        | Lillyhoe -                   | 23 59 31 |  |  |  | 23 59 31  |         |
|        | Lidlington -                 | . . .    |  |  |  | 117 31 33 |         |
|        |                              |          |  |  |  |           |         |
|        | Lillyhoe from { Lidlington - |          |  |  |  |           | 49027,3 |
|        | { Bow Brickhill -            |          |  |  |  |           | 69869   |

And this triangle, with that preceding it, gives the mean distance between Lillyhoe and Lidlington = 49026,1 feet; and, with the triangle Lillyhoe, Kinsworth, and Bow Brickhill, it assigns 69868 feet for the mean distance between Lillyhoe and Bow Brickhill.

|       |                                     |             |  |  |  |             |         |
|-------|-------------------------------------|-------------|--|--|--|-------------|---------|
| L.IV. | Lillyhoe -                          | 5 52 11,5   |  |  |  | 5 52 11,5   |         |
|       | Bow Brickhill -                     | 14 54 42,75 |  |  |  | 14 54 42,75 |         |
|       | Trusler Hill -                      | . . .       |  |  |  | 159 13 5,75 |         |
|       |                                     |             |  |  |  |             |         |
|       | Trusler Hill from { Bow Brickhill - |             |  |  |  |             | 20138,7 |
|       | { Lillyhoe -                        |             |  |  |  |             | 50673,6 |



[illegible]

Distance from White Horse Hill to Shotover Hill 108050.2 feet.

|       |                                         |              |  |  |  |             |  |
|-------|-----------------------------------------|--------------|--|--|--|-------------|--|
| L.V.  | Shotover Hill -                         | 48 5 32,75   |  |  |  | 48 5 32,25  |  |
|       | White Horse -                           | 16 59 53,75  |  |  |  | 16 59 53,25 |  |
|       | Whiteham Hill -                         | 114 54 34,75 |  |  |  | 114 54 34,5 |  |
|       |                                         | 180 0 1,25   |  |  |  |             |  |
|       | Whiteham Hill from { White Horse Hill - |              |  |  |  | 88662,2     |  |
|       | Shotover Hill -                         |              |  |  |  | 34827,4     |  |
| L.VI. | Whiteham Hill -                         | 55 52 35     |  |  |  | 55 52 36    |  |
|       | Shotover Hill -                         | 24 37 36     |  |  |  | 24 37 37    |  |
|       | Cumner Hill -                           | 99 29 48,5   |  |  |  | 99 29 47    |  |
|       |                                         | 179 59 59,5  |  |  |  |             |  |
|       | Cumner Hill from { Shotover Hill - -    |              |  |  |  | 29231,5     |  |
|       | Whiteham Hill -                         |              |  |  |  | 14714,3     |  |

And, because the Observatory of his Grace the Duke of MARLBOROUGH, at Blenheim, together with that at Oxford, have been observed with the same care and attention as the principal stations, and also because precise determinations of the situations are of great importance, I shall here insert the triangles formed by their intersections.



| No. of triangles | Names of stations.                                                        | Observed angles. | Diff. | Spherical excess. | Error. | Angles corrected for calculation. | Distances.          |
|------------------|---------------------------------------------------------------------------|------------------|-------|-------------------|--------|-----------------------------------|---------------------|
|                  |                                                                           | ° ' "            | "     | "                 | "      | ° ' "                             | Feet.               |
| LVII.            | Shotover Hill - -                                                         | 23 11 5          |       |                   |        | 23 11 5                           |                     |
|                  | Cumner Hill - -                                                           | 29 23 33         |       |                   |        | 29 23 33                          |                     |
|                  | The Atlas on the top of the Observatory at Oxford                         | . . .            |       |                   |        | 127 25 22                         |                     |
|                  | Oxford Observatory from { Cumner Hill - - -<br>Shotover Hill - - -        |                  |       |                   |        |                                   | 14492<br>18065,1    |
| LVIII.           | Whiteham Hill -                                                           | 131 25 36,5      |       |                   |        | 131 25 35,5                       |                     |
|                  | White Horse Hill -                                                        | 10 30 43,5       |       |                   |        | 10 30 43,75                       |                     |
|                  | Blenheim Observatory                                                      | . . .            |       |                   |        | 38 3 40,75                        |                     |
|                  | Blenheim Observatory from { White Horse Hill - - -<br>Whiteham Hill - - - |                  |       |                   |        |                                   | 107831,9<br>26237,6 |

ART. XIV. *Triangles for connecting the Series carried on from Scutchamfly Barrow and White Horse Hill, in Berkshire, into Buckinghamshire and Bedfordshire, with the Series carried on for the Survey of Essex.*

The angle at St. Ann's Hill, between the station on Hanger Hill Tower and Hampton Poor House, inferred from General Roy's Account, is  $25^{\circ} 33' 58''.5$ . In 1793, the angle between the staff on Pen Church Tower and Hampton Poor House was taken, and found  $= 95^{\circ} 57' 34''.5$ ; therefore, the angle between Pen Tower and Hanger Hill is  $70^{\circ} 23' 36''$ .

The distance from St. Ann's Hill to Pen is determined by



the following triangle, in which the distance between St. Ann's Hill and Bagshot Heath, viz. 46955,3 feet, (see Phil. Trans. for 1795, p. 496,) is used for the base.

| No. of triangles                                                           | Names of stations. | Observed angles. | Diff. | Spherical excess. | Error. | Angles corrected for calculation. | Distances. |
|----------------------------------------------------------------------------|--------------------|------------------|-------|-------------------|--------|-----------------------------------|------------|
| LIX.                                                                       | St. Ann's Hill     | 80° 43' 48"      | "     | "                 | "      | 80° 43' 48"                       | Fect.      |
|                                                                            | Bagshot - -        | 70° 30' 37"      |       |                   |        | 70° 30' 37"                       |            |
|                                                                            | Pen Tower -        | . . .            |       |                   |        | 28° 45' 35"                       |            |
| Pen Tower from { St. Ann's Hill - - - 92000,5<br>Bagshot Heath - - - 96318 |                    |                  |       |                   |        |                                   |            |

The distance from St. Ann's Hill to Hanger Hill Tower is 68895,8 feet: this is derived from the *mean* length of the base on Hounslow Heath. This side, together with St. Ann's Hill and Pen, using the included angle at St. Ann's Hill, as found above, give 94640,5 feet, for the distance between Pen and Hanger Hill Towers.

The angle at St. Ann's Hill, between Bagshot Heath and Hanger Hill Tower, is 151° 7' 24",25: this, with the sides Bagshot Heath and St. Ann's, St. Ann's and Hanger Hill, give 17° 13' 48", for the angle at Bagshot Heath, between Hanger Hill Tower and St. Ann's Hill: hence we have the following triangle.

|               |     |             |
|---------------|-----|-------------|
| Bagshot Heath | - - | 16° 45' 43" |
| Hanger Hill   | - - | 103 18 23   |
| Stanmore      | - - | 59 55 54    |
| I 2           |     |             |



Which triangle gives 37431 feet, for the distance between Stanmore and Hanger Hill Tower.

The angle at the station on Bow Brickhill, (see the preceding article,) between Wendover and Kinsworth, is  $46^{\circ} 18' 8'',5$ ; and the distances from it to these stations are 92402,2 feet, and 57668 feet respectively: these give the following triangle.

|               |   |   |                          |
|---------------|---|---|--------------------------|
| Bow Brickhill | - |   | $46^{\circ} 18' 8'',5$   |
| Wendover      | - | - | $38^{\circ} 25' 21'',25$ |
| Kinsworth     | - | - | $95^{\circ} 16' 30'',25$ |

From which the distance between Wendover and Kinsworth is found = 67090,7 feet. The observed angle at Wendover, between Bow Brickhill and Stanmore, is  $102^{\circ} 22' 29''$ ; from which, subtracting  $38^{\circ} 25' 21'',25$ , the angle between Bow Brickhill and Kinsworth, we get  $63^{\circ} 57' 7'',75$ , for the angle between Kinsworth and Stanmore. Again, the observed angle at Kinsworth, between Bow Brickhill and Stanmore, is  $173^{\circ} 37' 44''$ ; from which, subtracting the angle between Bow Brickhill and Wendover, we get  $78^{\circ} 21' 13'',75$ , for the angle between Stanmore and Wendover. If these *computed* angles are actually such as might be observed, were Kinsworth and Wendover visible from each other, the angle at Stanmore between those stations ought to be  $37^{\circ} 41' 39''$ , nearly: but the observed angle was  $37^{\circ} 41' 41'',75$ ; which is so nearly the computed one, as to leave little doubt of the accuracy of those *data* from which the angles are derived. The distance from Wendover to Kinsworth is 67090,7 feet.

|           |   |                          |                                              |
|-----------|---|--------------------------|----------------------------------------------|
| Wendover  | - | $63^{\circ} 57' 7'',75$  | } which, corrected for calculation, becomes, |
| Kinsworth | - | $78^{\circ} 21' 13'',75$ |                                              |
| Stanmore  | - | $37^{\circ} 41' 41'',75$ |                                              |
|           | - | $180^{\circ} 0' 3,25$    |                                              |



|           |   |             |                      |
|-----------|---|-------------|----------------------|
| Wendover  | - | 63° 57' 7"  |                      |
| Kinsworth | - | 78° 21' 12" |                      |
| Stanmore  | - | 37° 41' 41" | which triangle gives |

the distance of Stanmore from  $\left\{ \begin{array}{l} \text{Wendover} = 107464,1 \\ \text{Kinsworth} = 98577,5 \end{array} \right\}$  feet.

In consequence of Bushy Heath intercepting the view towards the east from Stanmore, it became necessary to choose a station on the former. To determine the distance, the angles at the two stations were taken very accurately; they were as follows,

|             |   |                |                                                    |
|-------------|---|----------------|----------------------------------------------------|
| Stanmore    | - | 42° 11' 21,5"  |                                                    |
| Bushy Heath | - | 135° 35' 40,5" |                                                    |
| Kinsworth,  | . | .              | which gives 5483,3 feet for the required distance. |

To determine the distance of the station on Pen Church Tower, we have two angles in the following triangle, *viz.*

|           |   |                |                                              |
|-----------|---|----------------|----------------------------------------------|
| Wendover  | - | 38° 13' 18"    | } which, corrected for calculation, becomes, |
| Stanmore  | - | 23° 44' 48"    |                                              |
| Pen Tower | - | 118° 1' 54"    |                                              |
| Wendover  | - | 38° 13' 18,25" |                                              |
| Stanmore  | - | 23° 44' 48,25" |                                              |
| Pen Tower | - | 118° 1' 54,5"  | which triangle gives                         |

the distance of Pen from  $\left\{ \begin{array}{l} \text{Wendover} = 49027 \\ \text{Stanmore} = 75325,4 \end{array} \right\}$  feet.

With this distance of Stanmore from Pen, found from the last triangle, and also that between Stanmore and Hanger Hill, derived from the triangle, Bagshot Heath, Hanger Hill, and Stanmore, together with the included angle at Stanmore, *viz.* 109° 28' 22",5, we get the distance of Pen to Hanger Hill Tower = 94631,8 feet. The same distance has been found before, in a shorter and more direct way, being 94640,5 feet: the difference is only 8,7 feet; a sufficient proof that the distances given for the survey of this intricate and woody country, are



sufficiently correct. It will be more convenient to show how these triangles are connected with those to the eastward, when I arrive at that part of the work which treats of the survey of Essex, than at present. I shall, therefore, proceed to the following article, after observing, that by the help of Harrow Spire, (the situation of which has been determined by General Roy,) and by observations hereafter to be made with the small instrument on Pen Tower, less difficulty will occur in the interior survey than was at first expected.

ART. XV. *Triangles formed by the intersections of Churches, Windmills, and other Objects.*

| Triangles.                                   | Angles<br>observed. | Distances of the Stations from the<br>intersected Objects. |                |
|----------------------------------------------|---------------------|------------------------------------------------------------|----------------|
| Little Haldon - - -                          | 0 23 54 50          | } Great Haldon - {                                         | Feet.<br>18974 |
| Ball's Obelisk - - -                         | 132 41 8            |                                                            | 19366          |
| <i>Great Haldon, secondary station</i>       |                     |                                                            |                |
| Great Haldon from Ball's Obelisk 19366 feet. |                     |                                                            |                |
| Great Haldon - - -                           | 68 0 35             | } Topsham Steeple - {                                      | 28316          |
| Ball's Obelisk - - -                         | 71 32 30            |                                                            | 27679          |
| <i>Topsham Steeple</i>                       |                     |                                                            |                |
| Little Haldon from Furland 72776 feet.       |                     |                                                            |                |
| Little Haldon - - -                          | 18 2 2              | } Hope's Nose - {                                          | 37656          |
| Furland - - -                                | 18 42 53            |                                                            | 39028          |
| <i>Hope's Nose, secondary station</i>        |                     |                                                            |                |
| Bodmin from Trevoze 81967,6 feet.            |                     |                                                            |                |
| Bodmin - - -                                 | 15 48 43            | } St. Minvern Steeple {                                    | 45936          |
| Trevoze - - -                                | 21 28 36            |                                                            | 36866          |
| <i>St. Minvern Steeple</i>                   |                     |                                                            |                |
| Bodmin - - -                                 | 12 5 33             | } St. Minvern Windmill {                                   | 34852          |
| Trevoze - - -                                | 8 46 51             |                                                            | 48478          |
| <i>St. Minvern Windmill</i>                  |                     |                                                            |                |



Trigonometrical Survey.

611

Trevose from Cadon Barrow 85624.8 feet.

| Triangles.         | Angles<br>observed. | Distances of the stations from the<br>intersected objects. |       |
|--------------------|---------------------|------------------------------------------------------------|-------|
| Trevose - - -      | ° 38' 59"           | } St. Isey Steeple - {                                     | 29256 |
| Cadon Barrow - - - | 55 19 15 48         |                                                            | 73216 |
| St. Isey Steeple   |                     |                                                            |       |
| Trevose - - -      | 58 41 39            | } St. Merian Steeple - {                                   | 10894 |
| Cadon Barrow - - - | 6 38 22             |                                                            | 80504 |
| St. Merian Steeple |                     |                                                            |       |

Black Down from St. Stephen's 62506.7 feet.

|                          |           |                             |       |
|--------------------------|-----------|-----------------------------|-------|
| Black Down - - -         | 4 46 37   | } Werrington Steeple - {    | 61289 |
| St. Stephen's Down - - - | 74 20 14  |                             | 5301  |
| Werrington Steeple       |           |                             |       |
| Black Down - - -         | 15 18 49  | } Boyton Steeple - {        | 69897 |
| St. Stephen's - - -      | 104 53 9  |                             | 19101 |
| Boyton Steeple           |           |                             |       |
| Black Down - - -         | 1 8 22    | } St. Stephen's Steeple {   | 60448 |
| St. Stephen's - - -      | 30 7 22   |                             | 2395  |
| St. Stephen's Steeple    |           |                             |       |
| Black Down - - -         | 5 31 36   | } North Petherwin Steeple { | 77698 |
| St. Stephen's - - -      | 153 13 23 |                             | 16610 |
| North Petherwin Steeple  |           |                             |       |

Carraton from St. Stephen's 52994 feet.

|                        |          |                            |       |
|------------------------|----------|----------------------------|-------|
| Carraton - - -         | 50 40 15 | } Stokeclimsland Steeple { | 32886 |
| St. Stephen's - - -    | 38 21 4  |                            | 40997 |
| Stokeclimsland Steeple |          |                            |       |
| Carraton - - -         | 6 11 7   | } Launceston Steeple {     | 49613 |
| St. Stephen's - - -    | 55 32 16 |                            | 6483  |
| Launceston Steeple     |          |                            |       |
| Carraton - - -         | 5 58 26  | } Launceston Chapel - {    | 49404 |
| St. Stephen's - - -    | 53 7 35  |                            | 6427  |
| Launceston Chapel      |          |                            |       |

Long Knoll from Westbury 58118.2 feet.

|                  |          |                     |       |
|------------------|----------|---------------------|-------|
| Long Knoll - - - | 45 5 0   | } Frome Steeple - { | 33765 |
| Westbury - - -   | 34 53 50 |                     | 41793 |
| Frome Steeple    |          |                     |       |



## Lansdown from Farley Down 28730,4 feet.

| Triangles.        | Angles<br>observed. | Distances of the stations from the<br>intersected objects. |                |
|-------------------|---------------------|------------------------------------------------------------|----------------|
| Lansdown - - -    | 56 43 16            | } Cold Aston - -                                           | Feet.<br>13563 |
| Farley Down - - - | 28 2 35             |                                                            | 24120          |
| Cold Aston        |                     |                                                            |                |

## Moor Lynch from Dundon 32688,8 feet.

|                        |           |                          |       |
|------------------------|-----------|--------------------------|-------|
| Moor Lynch - - -       | 15 54 56  | } Walton Windmill - -    | 20406 |
| Dundon - - -           | 23 11 6   |                          | 14213 |
| Walton Windmill        |           |                          |       |
| Moor Lynch - - -       | 123 0 11  | } Westonzoyland Steeple  | 17688 |
| Dundon - - -           | 19 18 55  |                          | 44848 |
| Westonzoyland Steeple  |           |                          |       |
| Moor Lynch - - -       | 91 5 56   | } Middlezoy Steeple - -  | 15691 |
| Dundon - - -           | 25 26 0   |                          | 36530 |
| Middlezoy Steeple      |           |                          |       |
| Moor Lynch - - -       | 153 58 50 | } Chedzoy Steeple - -    | 19454 |
| Dundon - - -           | 9 39 13   |                          | 29556 |
| Chedzoy Steeple        |           |                          |       |
| Moor Lynch - - -       | 29 20 18  | } Highham Windmill       | 24457 |
| Dundon - - -           | 46 30 22  |                          | 16518 |
| Highham Windmill       |           |                          |       |
| Moor Lynch - - -       | 36 25 56  | } Highham Steeple - -    | 21567 |
| Dundon - - -           | 39 51 57  |                          | 19982 |
| Highham Steeple        |           |                          |       |
| Moor Lynch - - -       | 147 57 0  | } Bridgewater Spire - -  | 33656 |
| Dundon - - -           | 16 15 14  |                          | 63768 |
| Bridgewater Spire      |           |                          |       |
| Moor Lynch - - -       | 69 52 39  | } Burton Pynsent Obelisk | 40063 |
| Dundon - - -           | 63 18 59  |                          | 42101 |
| Burton Pynsent Obelisk |           |                          |       |
| Moor Lynch - - -       | 12 12 41  | } Somerton Steeple - -   | 40792 |
| Dundon - - -           | 129 45 57 |                          | 11221 |
| Somerton Steeple       |           |                          |       |



Dundry from Lansdown 55248.9 feet.

| Triangles.                             |   |   | Angles observed. |    | Distances of the stations from the intersected objects. |       |
|----------------------------------------|---|---|------------------|----|---------------------------------------------------------|-------|
|                                        |   |   |                  |    |                                                         | Feet. |
| Dundry                                 | - | - | 22               | 7  | } Puckle Church Steeple                                 | 57757 |
| Lansdown                               | - | - | 85               | 25 |                                                         | 21819 |
| <i>Puckle Church Steeple</i>           |   |   |                  |    |                                                         |       |
| Dundry                                 | - | - | 30               | 37 | } Westleigh Steeple                                     | 61842 |
| Lansdown                               | - | - | 86               | 18 |                                                         | 31566 |
| <i>Westleigh Steeple</i>               |   |   |                  |    |                                                         |       |
| Dundry                                 | - | - | 51               | 19 | } Bristol Cathedral                                     | 21920 |
| Lansdown                               | - | - | 22               | 23 |                                                         | 44935 |
| <i>Bristol Cathedral</i>               |   |   |                  |    |                                                         |       |
| Dundry                                 | - | - | 44               | 18 | } Redcliff Steeple                                      | 22096 |
| Lansdown                               | - | - | 21               | 22 |                                                         | 42346 |
| <i>Redcliff Steeple</i>                |   |   |                  |    |                                                         |       |
| Dundry                                 | - | - | 78               | 18 | } Long Aston Steeple                                    | 13883 |
| Lansdown                               | - | - | 14               | 32 |                                                         | 54168 |
| <i>Long Aston Steeple</i>              |   |   |                  |    |                                                         |       |
| Dundry                                 | - | - | 67               | 33 | } Clifden Windmill                                      | 12860 |
| Lansdown                               | - | - | 13               | 17 |                                                         | 51725 |
| <i>Clifden Windmill</i>                |   |   |                  |    |                                                         |       |
| Dundry                                 | - | - | 75               | 37 | } Blaze Castle                                          | 38391 |
| Lansdown                               | - | - | 39               | 7  |                                                         | 58932 |
| <i>Blaze Castle</i>                    |   |   |                  |    |                                                         |       |
| Dundry                                 | - | - | 89               | 10 | } Penpole Park Gazebo                                   | 35391 |
| Lansdown                               | - | - | 32               | 52 |                                                         | 65180 |
| <i>Penpole Park Gazebo</i>             |   |   |                  |    |                                                         |       |
| Dundry                                 | - | - | 32               | 16 | } St. George's Steeple                                  | 32391 |
| Lansdown                               | - | - | 31               | 49 |                                                         | 32795 |
| <i>St. George's Steeple</i>            |   |   |                  |    |                                                         |       |
| Dundry                                 | - | - | 44               | 54 | } Duke of Beaufort's House                              | 41168 |
| Lansdown                               | - | - | 48               | 5  |                                                         | 39064 |
| <i>Duke of Beaufort's House, Stoke</i> |   |   |                  |    |                                                         |       |
| Dundry                                 | - | - | 57               | 15 | } Harfield Steeple                                      | 35182 |
| Lansdown                               | - | - | 39               | 14 |                                                         | 46773 |
| <i>Harfield Steeple</i>                |   |   |                  |    |                                                         |       |



| Triangles.           | Angles<br>observed. | Distances of the Stations from the<br>intersected Objects. |                |
|----------------------|---------------------|------------------------------------------------------------|----------------|
| Dundry - - - -       | 13 58 8             | } Durham Steeple - {                                       | Feet.<br>66541 |
| Lansdown - - - -     | 120 8 3             |                                                            | 18573          |
| Durham Steeple       |                     |                                                            |                |
| Dundry - - - -       | 63 45 11            | } Knowle Steeple - {                                       | 56512          |
| Lansdown - - - -     | 59 9 55             |                                                            | 59030          |
| Knowle Steeple       |                     |                                                            |                |
| Dundry - - - -       | 29 42 10            | } Mangotsfield Steeple - {                                 | 47845          |
| Lansdown - - - -     | 59 59 41            |                                                            | 27376          |
| Mangotsfield Steeple |                     |                                                            |                |
| Dundry - - - -       | 46 12 31            | } Winterbourn Steeple - {                                  | 55045          |
| Lansdown - - - -     | 66 38 49            |                                                            | 43280          |
| Winterbourn Steeple  |                     |                                                            |                |

Mendip from Dundry 69196 feet.

|                         |           |                             |       |
|-------------------------|-----------|-----------------------------|-------|
| Dundry - - - -          | 15 0 54   | } Leigh Steeple on Mendip { | 76847 |
| Mendip - - - -          | 104 10 15 |                             | 20533 |
| Leigh Steeple on Mendip |           |                             |       |
| Dundry - - - -          | 90 22 22  | } Dundry Steeple - {        | 1417  |
| Mendip - - - -          | 1 10 22   |                             | 69221 |
| Dundry Steeple          |           |                             |       |

Mendip from Long Knoll 61962.3 feet.

|                    |          |                       |       |
|--------------------|----------|-----------------------|-------|
| Long Knoll - - - - | 7 20 24  | } Doultling Spire - { | 49286 |
| Mendip - - - -     | 25 42 22 |                       | 14517 |
| Doultling Spire    |          |                       |       |

Farley Down from Westbury 59849.5 feet.

|                     |          |                       |       |
|---------------------|----------|-----------------------|-------|
| Westbury - - - -    | 81 25 20 | } Devizes Steeple - { | 51197 |
| Farley Down - - - - | 44 6 53  |                       | 72726 |
| Devizes Steeple     |          |                       |       |

Whitehorse from Scutchamfly 51261.9 feet.

|                     |          |                      |       |
|---------------------|----------|----------------------|-------|
| Whitehorse - - - -  | 32 55 51 | } Abingdon Spire - { | 72898 |
| Scutchamfly - - - - | 104 3 27 |                      | 40852 |
| Abingdon Spire      |          |                      |       |



| Triangles.                                                                     | Angles<br>observed.             | Distances of the Stations from the<br>intersected Objects. |                          |
|--------------------------------------------------------------------------------|---------------------------------|------------------------------------------------------------|--------------------------|
| Whitehorse - - - - -<br>Scutchamfly - - - - -<br><i>Wallingford Steeple</i>    | 0 10 15<br>39 39 52<br>30 30 26 | } Wallingford Steeple -                                    | Fect.<br>101693<br>52185 |
| Whitehorse - - - - -<br>Scutchamfly - - - - -<br><i>Great Coxwell Windmill</i> | 121 21<br>19 7<br>20 0          | } Great Coxwell Windmill                                   | { 30295<br>71834         |
| Whitehorse - - - - -<br>Scutchamfly - - - - -<br><i>Highworth Steeple</i>      | 153 11<br>24 21<br>7 56         | } Highworth Steeple -                                      | { 38449<br>87355         |
| Whitehorse - - - - -<br>Scutchamfly - - - - -<br><i>Drayton Steeple</i>        | 28 99<br>6 45<br>9 35           | } Drayton Steeple -                                        | { 63991<br>30586         |
| Whitehorse - - - - -<br>Scutchamfly - - - - -<br><i>Radley Steeple</i>         | 34 109<br>8 33<br>57 56         | } Radley Steeple -                                         | { 81618<br>48624         |
| Whitehorse - - - - -<br>Scutchamfly - - - - -<br><i>Buckland Steeple</i>       | 75 44<br>25 15<br>57 50         | } Buckland Steeple -                                       | { 41189<br>57115         |
| Whitehorse - - - - -<br>Scutchamfly - - - - -<br><i>Witney Steeple</i>         | 81 62<br>19 34<br>12 49         | } Witney Steeple -                                         | { 57229<br>86007         |
| Whitehorse - - - - -<br>Scutchamfly - - - - -<br><i>Bampton Steeple</i>        | 90 48<br>57 27<br>40 50         | } Bampton Steeple -                                        | { 58992<br>78799         |

Whiteham from Brill 62066,1 feet.

|                                                                   |                         |                       |                  |
|-------------------------------------------------------------------|-------------------------|-----------------------|------------------|
| Whiteham - - - - -<br>Brill - - - - -<br><i>Islip Steeple</i>     | 19 14<br>47 55<br>5 46  | } Islip Steeple - -   | { 28983<br>38073 |
| Whiteham - - - - -<br>Brill - - - - -<br><i>Woodstock Steeple</i> | 78 25<br>47 3<br>7 58   | } Woodstock Steeple - | { 27956<br>64725 |
| Whiteham - - - - -<br>Brill - - - - -<br><i>Kidlington Spire</i>  | 38 18<br>39 59<br>25 22 | } Kidlington Spire -  | { 24677<br>47373 |



Whitehorse from Brill 146603.2 feet,

| Triangles.              | Angles<br>observed. | Distances of the Stations from the<br>intersected Objects. | Feet.  |
|-------------------------|---------------------|------------------------------------------------------------|--------|
| Whitehorse - - -        | 46° 10' 15"         | } Witchwood Forest Beacon {                                | 95439  |
| Brill - - -             | 40° 32' 9"          |                                                            | 105936 |
| Witchwood Forest Beacon |                     |                                                            |        |

Broadway from Epwell 80611.4 feet.

|                              |              |                              |        |
|------------------------------|--------------|------------------------------|--------|
| Broadway - - -               | 46° 51' 21"  | } Warwick Steeple - {        | 109337 |
| Epwell - - -                 | 85° 48' 34"  |                              | 79992  |
| Warwick Steeple              |              |                              |        |
| Broadway - - -               | 49° 43' 19"  | } St. Martin's, Coventry - { | 158205 |
| Epwell - - -                 | 100° 10' 39" |                              | 122627 |
| St. Martin's Spire, Coventry |              |                              |        |
| Broadway - - -               | 71° 52' 32"  | } Soleyhull Spire - {        | 142027 |
| Epwell - - -                 | 74° 53' 55"  |                              | 139806 |
| Soleyhull Spire              |              |                              |        |

Corley from Arbury Hill 117463 feet.

|                                            |              |                           |        |
|--------------------------------------------|--------------|---------------------------|--------|
| Corley - - -                               | 10° 17' 47"  | } Dun Church Windmill {   | 70621  |
| Arbury - - -                               | 18° 1' 45"   |                           | 44249  |
| Dun Church Windmill                        |              |                           |        |
| Corley - - -                               | 107° 11' 9"  | } Gazebo on Bardon Hill { | 106471 |
| Arbury - - -                               | 34° 20' 2"   |                           | 180344 |
| Gazebo on Bardon Hill, Leices-<br>tershire |              |                           |        |
| Corley - - -                               | 100° 41' 54" | } Markfield Windmill - {  | 103373 |
| Arbury - - -                               | 36° 37' 26"  |                           | 170270 |
| Markfield Windmill                         |              |                           |        |
| Corley - - -                               | 2° 45' 41"   | } Newnham Windmill - {    | 118771 |
| Arbury - - -                               | 101° 33' 35" |                           | 5845   |
| Newnham Windmill                           |              |                           |        |

Corley from Broadway 171570 feet.

|                          |             |                              |        |
|--------------------------|-------------|------------------------------|--------|
| Broadway - - -           | 96° 31' 27" | } Building on Breadon Hill { | 46201  |
| Corley - - -             | 14° 33' 9"  |                              | 182682 |
| Building on Breadon Hill |             |                              |        |



Epwell from Crouch Hill 29668,8 feet,

| Triangles.                                                      | Angles<br>observed.                                                                | Distances of the Stations from the<br>intersected Objects. | Feet..                                                 |
|-----------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------|--------------------------------------------------------|
| Epwell - - - - -<br>Crouch Hill - - - - -<br>Deddington Steeple | $\begin{smallmatrix} 0 & 4 & 28 \\ 24 & 43 & 28 \\ 124 & 8 & 31 \end{smallmatrix}$ | } Deddington Steeple - {                                   | $\begin{smallmatrix} 47493 \\ 24000 \end{smallmatrix}$ |
| Epwell - - - - -<br>Crouch Hill - - - - -<br>Bloxham Spire      | $\begin{smallmatrix} 22 & 2 & 57 \\ 89 & 27 & 20 \end{smallmatrix}$                | } Bloxham Spire - {                                        | $\begin{smallmatrix} 31887 \\ 11971 \end{smallmatrix}$ |
| Epwell - - - - -<br>Crouch Hill - - - - -<br>Aynoe Steeple      | $\begin{smallmatrix} 12 & 41 & 39 \\ 155 & 28 & 33 \end{smallmatrix}$              | } Aynoe Steeple - {                                        | $\begin{smallmatrix} 60070 \\ 31802 \end{smallmatrix}$ |
| Epwell - - - - -<br>Crouch Hill - - - - -<br>Adderbury Spire    | $\begin{smallmatrix} 12 & 45 & 23 \\ 143 & 29 & 30 \end{smallmatrix}$              | } Adderbury Spire - {                                      | $\begin{smallmatrix} 43823 \\ 16265 \end{smallmatrix}$ |
| Epwell - - - - -<br>Crouch Hill - - - - -<br>Farthingo Steeple  | $\begin{smallmatrix} 9 & 33 & 29 \\ 162 & 29 & 20 \end{smallmatrix}$               | } Farthingo Steeple - {                                    | $\begin{smallmatrix} 64520 \\ 35605 \end{smallmatrix}$ |

Epwell from Arbury Hill 83098,4 feet.

|                                                                               |                                                                    |                              |                                                         |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------|------------------------------|---------------------------------------------------------|
| Epwell - - - - -<br>Arbury Hill - - - - -<br>Round House, Edge Hills          | $\begin{smallmatrix} 27 & 30 & 1 \\ 8 & 9 & 42 \end{smallmatrix}$  | } Round House, Edge Hills {  | $\begin{smallmatrix} 20235 \\ 65816 \end{smallmatrix}$  |
| Epwell - - - - -<br>Arbury Hill - - - - -<br>St. Martin's, Coventry           | $\begin{smallmatrix} 50 & 9 & 8 \\ 87 & 15 & 6 \end{smallmatrix}$  | } St. Martin's, Coventry - { | $\begin{smallmatrix} 122636 \\ 94262 \end{smallmatrix}$ |
| Epwell - - - - -<br>Arbury Hill - - - - -<br>Round House Windmill, Edge Hills | $\begin{smallmatrix} 28 & 31 & 46 \\ 7 & 34 & 6 \end{smallmatrix}$ | } Round House Windmill {     | $\begin{smallmatrix} 18576 \\ 67364 \end{smallmatrix}$  |

Brill from Quainton 40908,6 feet.

|                                                           |                                                                      |                        |                                                        |
|-----------------------------------------------------------|----------------------------------------------------------------------|------------------------|--------------------------------------------------------|
| Brill - - - - -<br>Quainton - - - - -<br>Wingrove Steeple | $\begin{smallmatrix} 19 & 36 & 52 \\ 140 & 7 & 47 \end{smallmatrix}$ | } Wingrove Steeple - { | $\begin{smallmatrix} 75747 \\ 39665 \end{smallmatrix}$ |
| Brill - - - - -<br>Quainton - - - - -<br>Hardwick Steeple | $\begin{smallmatrix} 16 & 25 & 48 \\ 128 & 12 & 5 \end{smallmatrix}$ | } Hardwick Steeple - { | $\begin{smallmatrix} 55539 \\ 19989 \end{smallmatrix}$ |



| Triangles.                             | Angles<br>observed.                                                              | Distances of the Stations from the<br>intersected Objects. |               |
|----------------------------------------|----------------------------------------------------------------------------------|------------------------------------------------------------|---------------|
| Brill - - - - -                        | $\begin{smallmatrix} 0 & 1 & 0 \\ 16 & 42 & 12 \\ 4 & 24 & 16 \end{smallmatrix}$ | } Luggersal Steeple - {                                    | Feet.<br>8710 |
| Quainton - - - - -                     |                                                                                  |                                                            | 32664         |
| Luggersal Steeple                      |                                                                                  |                                                            |               |
| Brill - - - - -                        | $\begin{smallmatrix} 8 & 30 & 43 \\ 144 & 20 & 22 \end{smallmatrix}$             | } Granborough Steeple - {                                  | 52266         |
| Quainton - - - - -                     |                                                                                  |                                                            | 13270         |
| Granborough Steeple                    |                                                                                  |                                                            |               |
| Brill - - - - -                        | $\begin{smallmatrix} 105 & 7 & 30 \\ 32 & 10 & 53 \end{smallmatrix}$             | } Bicester Steeple - {                                     | 32132         |
| Quainton - - - - -                     |                                                                                  |                                                            | 58210         |
| Bicester Steeple                       |                                                                                  |                                                            |               |
| Brill - - - - -                        | $\begin{smallmatrix} 17 & 37 & 12 \\ 9 & 28 & 57 \end{smallmatrix}$              | } House at Wooton - {                                      | 14793         |
| Quainton - - - - -                     |                                                                                  |                                                            | 27181         |
| Centre of the Great House at<br>Wooton |                                                                                  |                                                            |               |

Stow from Broadway 52203,2 feet.

|                    |                                                                       |                      |       |
|--------------------|-----------------------------------------------------------------------|----------------------|-------|
| Stow - - - - -     | $\begin{smallmatrix} 123 & 23 & 50 \\ 19 & 25 & 43 \end{smallmatrix}$ | } Sarsden Chapel - { | 28720 |
| Broadway - - - - - |                                                                       |                      | 72115 |
| Sarsden Chapel     |                                                                       |                      |       |
| Stow - - - - -     | $\begin{smallmatrix} 56 & 10 & 42 \\ 49 & 34 & 47 \end{smallmatrix}$  | } Walford Spire - {  | 41295 |
| Broadway - - - - - |                                                                       |                      | 45063 |
| Walford Spire      |                                                                       |                      |       |
| Stow - - - - -     | $\begin{smallmatrix} 14 & 3 & 44 \\ 21 & 32 & 40 \end{smallmatrix}$   | } Bourton Chapel - { | 32926 |
| Broadway - - - - - |                                                                       |                      | 21786 |
| Bourton Chapel     |                                                                       |                      |       |

Stow from Epwell 78938,2 feet.

|                          |                                                                    |                        |       |
|--------------------------|--------------------------------------------------------------------|------------------------|-------|
| Stow - - - - -           | $\begin{smallmatrix} 60 & 30 & 20 \\ 6 & 37 & 9 \end{smallmatrix}$ | } Stow on the Wold - { | 9876  |
| Epwell - - - - -         |                                                                    |                        | 74573 |
| Stow on the Wold Steeple |                                                                    |                        |       |

Wendover from Brill 92400,7 feet.

|                    |                                                                     |                         |       |
|--------------------|---------------------------------------------------------------------|-------------------------|-------|
| Brill - - - - -    | $\begin{smallmatrix} 43 & 30 & 12 \\ 46 & 37 & 4 \end{smallmatrix}$ | } Pitchcot Windmill - { | 53739 |
| Wendover - - - - - |                                                                     |                         | 50901 |
| Pitchcot Windmill  |                                                                     |                         |       |



| Triangles.                 |   |   | Angles<br>observed. | Distances of the Stations from the<br>intersected Objects. |                |
|----------------------------|---|---|---------------------|------------------------------------------------------------|----------------|
| Brill                      | - | - | 24 15 12            | } Ivinghoe Spire                                           | Feet.<br>98663 |
| Wendover                   | - | - | 111 33 40           |                                                            | 43577          |
| Ivinghoe Spire             | - | - |                     |                                                            |                |
| Brill                      | - | - | 66 36 4             | } Padbury Steeple                                          | 72943          |
| Wendover                   | - | - | 46 32 33            |                                                            | 92401          |
| Padbury Steeple (doubtful) | - | - |                     |                                                            |                |
| Brill                      | - | - | 46 40 52            | } Quainton Steeple                                         | 39009          |
| Wendover                   | - | - | 31 1 48             |                                                            | 55056          |
| Quainton Steeple           | - | - |                     |                                                            |                |

Wendover from Quainton 72889,4 feet.

|                  |   |   |          |                    |       |
|------------------|---|---|----------|--------------------|-------|
| Wendover         | - | - | 34 46 37 | } Wing Steeple     | 52487 |
| Quainton         | - | - | 45 9 20  |                    | 42230 |
| Wing Steeple     | - | - |          |                    |       |
| Wendover         | - | - | 44 58 11 | } Crindon Windmill | 66472 |
| Quainton         | - | - | 61 9 59  |                    | 53626 |
| Crindon Windmill | - | - |          |                    |       |

Quainton from Bow Brickhill 67490,6 feet.

|                                    |   |   |          |                    |       |
|------------------------------------|---|---|----------|--------------------|-------|
| Quainton                           | - | - | 75 15 34 | } Southern Obelisk | 58876 |
| Bow Brickhill                      | - | - | 47 19 1  |                    | 77449 |
| Southern Obelisk, Stow Park, Bucks | - | - |          |                    |       |
| Quainton                           | - | - | 75 4 46  | } Northern Obelisk | 61881 |
| Bow Brickhill                      | - | - | 49 13 49 |                    | 78942 |
| Northern Obelisk, Stow Park        | - | - |          |                    |       |

Wendover from Kinsworth 84462 feet.

|                        |   |   |          |                    |       |
|------------------------|---|---|----------|--------------------|-------|
| Kinsworth              | - | - | 69 56 52 | } Leighton Buzzard | 35317 |
| Wendover               | - | - | 31 6 26  |                    | 64215 |
| Leighton Buzzard Spire | - | - |          |                    |       |

Kinsworth from Quainton 84996,3 feet.

|                   |   |   |          |                     |       |
|-------------------|---|---|----------|---------------------|-------|
| Kinsworth         | - | - | 17 49 12 | } Aylesbury Steeple | 70886 |
| Quainton          | - | - | 51 5 23  |                     | 27879 |
| Aylesbury Steeple | - | - |          |                     |       |



## Bow Brickhill from Lidlington 32035.6 feet.

| Triangles.                | Angles<br>observed. | Distances of the Stations from the<br>intersected Objects. |                |
|---------------------------|---------------------|------------------------------------------------------------|----------------|
| Bow Brickhill - - -       | 57 43 21            | } North Crawley Spire - {                                  | Fect.<br>34968 |
| Lidlington - - -          | 65 40 39            |                                                            | 32444          |
| North Crawley Spire       |                     |                                                            |                |
| Bow Brickhill - - -       | 45 8 47             | } Pavenham Spire - {                                       | 77064          |
| Lidlington - - -          | 112 13 11           |                                                            | 59014          |
| Pavenham Spire            |                     |                                                            |                |
| Bow Brickhill - - -       | 24 15 25            | } St. Paul's, Bedford - {                                  | 68727          |
| Lidlington - - -          | 137 19 21           |                                                            | 41652          |
| St. Paul's Spire, Bedford |                     |                                                            |                |
| Bow Brickhill - - -       | 48 2 42             | } Sharnbrook Spire - {                                     | 84080          |
| Lidlington - - -          | 111 8 15            |                                                            | 67038          |
| Sharnbrook Spire          |                     |                                                            |                |
| Bow Brickhill - - -       | 38 42 47            | } Woburn Market House - {                                  | 12656          |
| Lidlington - - -          | 19 39 20            |                                                            | 23533          |
| Woburn Market House       |                     |                                                            |                |
| Bow Brickhill - - -       | 5 3 35              | } Ridgemont Station - {                                    | 21484          |
| Lidlington - - -          | 10 6 1              |                                                            | 10804          |
| Ridgemont Station         |                     |                                                            |                |
| Bow Brickhill - - -       | 25 51 29            | } Wootton Spire - {                                        | 46959          |
| Lidlington - - -          | 116 31 15           |                                                            | 22889          |
| Wootton Spire             |                     |                                                            |                |
| Bow Brickhill - - -       | 36 40 14            | } Cranfield Spire - {                                      | 29599          |
| Lidlington - - -          | 64 51 26            |                                                            | 19526          |
| Cranfield Spire           |                     |                                                            |                |

## Lillyhoe from Lidlington 49026.1 feet.

|                       |           |                             |       |
|-----------------------|-----------|-----------------------------|-------|
| Lillyhoe - - -        | 3 1 25    | } Pollux Hill Spire - {     | 24604 |
| Lidlington - - -      | 3 2 16    |                             | 24489 |
| Pollux Hill Spire     |           |                             |       |
| Lillyhoe - - -        | 23 13 23  | } Bow Brickhill Steeple - { | 70224 |
| Lidlington - - -      | 119 15 11 |                             | 31738 |
| Bow Brickhill Steeple |           |                             |       |
| Lillyhoe - - -        | 49 54 3   | } Colmworth Spire - {       | 97617 |
| Lidlington - - -      | 100 30 33 |                             | 75944 |
| Colmworth Spire       |           |                             |       |



| Triangles.           | Angles<br>observed. | Distances of the stations from the<br>intersected objects. |        |
|----------------------|---------------------|------------------------------------------------------------|--------|
| Lillyhoe - - -       | 0 1 2               | } Silsoe Spire -                                           | Fect.  |
| Lidlington - - -     | 23 57 30            |                                                            | 25599  |
| Silsoe Spire         | 22 4 36             |                                                            | 27658  |
| Lillyhoe - - -       | 11 46 23            | } Flitton Steeple -                                        | 30008  |
| Lidlington - - -     | 17 18 29            |                                                            | 20580  |
| Flitton Steeple      |                     |                                                            |        |
| Lillyhoe - - -       | 57 56 38            | } Shillington Steeple                                      | 16857  |
| Lidlington - - -     | 19 37 7             |                                                            | 42549  |
| Shillington Steeple  |                     |                                                            |        |
| Lillyhoe - - -       | 14 35 24            | } Westoning Steeple -                                      | 32242  |
| Lidlington - - -     | 24 29 56            |                                                            | 19586  |
| Westoning Steeple    |                     |                                                            |        |
| Lillyhoe - - -       | 23 40 47            | } Wrest Garden Obelisk                                     | 23770  |
| Lidlington - - -     | 19 18 12            |                                                            | 28880  |
| Wrest Garden Obelisk |                     |                                                            |        |
| Lillyhoe - - -       | 63 39 11            | } St. Neot's Steeple -                                     | 105026 |
| Lidlington - - -     | 88 31 51            |                                                            | 94147  |
| St. Neot's Steeple   |                     |                                                            |        |

Kinsworth from Lidlington 61255.3 feet.

|                    |          |                        |        |
|--------------------|----------|------------------------|--------|
| Kinsworth - - -    | 17 4 20  | } Harlington Steeple - | 37666  |
| Lidlington - - -   | 23 39 1  |                        | 27565  |
| Harlington Steeple |          |                        |        |
| Kinsworth - - -    | 17 22 11 | } Maulden Steeple -    | 63165  |
| Lidlington - - -   | 87 3 13  |                        | 18882  |
| Maulden Steeple    |          |                        |        |
| Kinsworth - - -    | 3 53 24  | } Millbrook Steeple -  | 60167  |
| Lidlington - - -   | 73 16 9  |                        | 42622  |
| Millbrook Steeple  |          |                        |        |
| Kinsworth - - -    | 36 15 30 | } Streatly Steeple -   | 36167  |
| Lidlington - - -   | 33 41 7  |                        | 38567  |
| Streatly Steeple   |          |                        |        |
| Kinsworth - - -    | 34 29 11 | } Hanslop Spire -      | 111928 |
| Lidlington - - -   | 166 4 4  |                        | 70552  |
| Hanslop Spire      |          |                        |        |



## Kinsworth from Bow Brickhill 57668 feet.

| Triangles.                 | Angles<br>observed. | Distances of the Stations from the<br>intersected Objects. |        |
|----------------------------|---------------------|------------------------------------------------------------|--------|
|                            |                     |                                                            | Fect.  |
| Bow Brickhill - - -        | 131 31 20           | } Souldrope Spire -                                        | 93229  |
| Kinsworth - - -            | 30 17 44            |                                                            | 138367 |
| <i>Souldrope Spire</i>     |                     |                                                            |        |
| Bow Brickhill - - -        | 91 22 55            | } Souldon Windmill -                                       | 31623  |
| Kinsworth - - -            | 28 24 55            |                                                            | 66434  |
| <i>Souldon Windmill</i>    |                     |                                                            |        |
| Bow Brickhill - - -        | 70 9 33             | } Stewkley Windmill -                                      | 32706  |
| Kinsworth - - -            | 33 27 4             |                                                            | 55812  |
| <i>Stewkley Windmill</i>   |                     |                                                            |        |
| Bow Brickhill - - -        | 61 57 57            | } Tharfield Windmill -                                     | 139157 |
| Kinsworth - - -            | 93 36 13            |                                                            | 123073 |
| <i>Tharfield Windmill</i>  |                     |                                                            |        |
| Bow Brickhill - - -        | 4 13 44             | } Tottenhoe Station -                                      | 43177  |
| Kinsworth - - -            | 14 47 27            |                                                            | 13049  |
| <i>Tottenhoe Station</i>   |                     |                                                            |        |
| Bow Brickhill - - -        | 21 55 14            | } Chalgrave Steeple -                                      | 43590  |
| Kinsworth - - -            | 43 21 54            |                                                            | 23699  |
| <i>Chalgrave Steeple</i>   |                     |                                                            |        |
| Bow Brickhill - - -        | 85 34 3             | } Lidlington Windmill -                                    | 28814  |
| Kinsworth - - -            | 27 23 29            |                                                            | 62442  |
| <i>Lidlington Windmill</i> |                     |                                                            |        |
| Bow Brickhill - - -        | 116 46 10           | } Keysoe Spire -                                           | 107275 |
| Kinsworth - - -            | 42 6 4              |                                                            | 142850 |
| <i>Keysoe Spire</i>        |                     |                                                            |        |

## Lillyhoe from Trusler Hill 50673.6 feet.

|                                |           |                             |        |
|--------------------------------|-----------|-----------------------------|--------|
| Lillyhoe - - -                 | 51 56 21  | } Knotting Green Elm Tree { | 118536 |
| Trusler Hill - - -             | 103 29 55 |                             | 95981  |
| <i>Knotting Green Elm Tree</i> |           |                             |        |
| Lillyhoe - - -                 | 36 45 37  | } Sundon Windmill -         | 25692  |
| Trusler Hill - - -             | 27 4 1    |                             | 33790  |
| <i>Sundon Windmill</i>         |           |                             |        |



# Trigonometrical Survey.

623

Bow Brickhill from Trusler Hill 20138.7 feet.

| Triangles.          | Angles<br>observed. | Distances of the stations from the<br>intersected objects. |       |
|---------------------|---------------------|------------------------------------------------------------|-------|
| Bow Brickhill - - - | 25 13 54            | } Crawley Steeple - - {                                    | 15998 |
| Trusler Hill - - -  | 50 16 22            |                                                            | 8867  |
| Crawley Steeple     |                     |                                                            |       |
| Bow Brickhill - - - | 93 18 15            | } Moulshoe Steeple - - {                                   | 25136 |
| Trusler Hill - - -  | 49 17 46            |                                                            | 33101 |
| Moulshoe Steeple    |                     |                                                            |       |
| Bow Brickhill - - - | 13 27 17            | } Woburn Steeple - - {                                     | 12432 |
| Trusler Hill - - -  | 19 46 14            |                                                            | 8552  |
| Woburn Steeple      |                     |                                                            |       |

Bow Brickhill from Lillyhoe 69867 feet.

|                     |          |                           |       |
|---------------------|----------|---------------------------|-------|
| Bow Brickhill - - - | 60 57 17 | } Renhold Steeple - - {   | 84608 |
| Lillyhoe - - -      | 68 43 59 |                           | 79373 |
| Renhold Steeple     |          |                           |       |
| Bow Brickhill - - - | 64 55 32 | } Ravensden Steeple - - { | 85825 |
| Lillyhoe - - -      | 66 41 24 |                           | 84646 |
| Ravensden Steeple   |          |                           |       |

Kinsworth from Lillyhoe 47278.7 feet.

|                  |          |                          |       |
|------------------|----------|--------------------------|-------|
| Kinsworth - - -  | 43 44 48 | } Flitwick Steeple - - { | 49849 |
| Lillyhoe - - -   | 71 53 53 |                          | 36264 |
| Flitwick Steeple |          |                          |       |



## SECTION SECOND.

*Determination of the Latitudes and Longitudes of the Stations on Black Down, in Dorsetshire, Butterscombe, in Devonshire, and St. Agnes Beacon, in Cornwall.*

ART. XVI.—*Calculation of the Distance between Black Down and Dunnose in the Isle of Wight.*

To complete this distance, I shall have recourse to the xxvith and xxviii triangles, published in the Philosophical Transactions of 1795, and LIId and LIVth of the Trans. for 1797, together with the observations made at Black Down, in the latter year. (See also Pl. XXX. Fig. 1.).

The most eligible method of calculating with these data, seems to be that of first finding the *cross-distance* between Black Down and Dean Hill. To do this, we have the angle at Nine Barrow Down, between Black Down and Dean Hill, and the respective distances from the first to the latter stations, together with the newly observed angle between Dunnose and Nine Barrow Down; from which we obtain the angles of a triangle, constituted by Dunnose, Nine Barrow Down, and Black Down.

The distance from Nine Barrow Down to Dean Hill is 166497 feet, and, from the same station to Black Down, the distance is 126782 feet, (see Phil. Trans. for 1795, p. 502, and for 1797, p. 455,) and the angle comprehended by those distances =  $110^{\circ} 30' 13''$ , 25. The difference between the horizontal angle and that formed by the chords is  $3''$ , 25, which, subtracted from  $110^{\circ} 30' 13''$ , 25, leaves  $110^{\circ} 30' 10''$ : computing with this



angle and the sides spoken of, there results the following triangle, viz.

|                  |   |              |
|------------------|---|--------------|
| Nine Barrow Down | - | 110° 30' 10" |
| Black Down       | - | 40 6 54,75   |
| Dean Hill        | - | 29 22 55,75  |

This, using the side Nine Barrow and Dean Hill, (166497 feet,) gives 240236,7 feet, for the distance between Black Down and Dean Hill.

The angle at Dean Hill, between Nine Barrow Down and Dunnose, is  $64^{\circ} 50' 19''$ , (see Phil. Trans. for 1795. p. 501,) and the angle between Black Down and Nine Barrow, as just found, is  $29^{\circ} 22' 55'',75$ , which, increased by the proper correction for the difference between the chord and horizontal angles, becomes  $29^{\circ} 22' 57'',5$ . The sum of these angles,  $94^{\circ} 13' 16'',5$ , is the horizontal angle between Black Down and Dunnose.

The angle at Black Down, between Dunnose and Nine Barrow Down, deduced from observations made in 1797, is found to be  $4^{\circ} 30' 25'',75$ : this, subtracted from the angle between Dean Hill and Dunnose, leaves  $35^{\circ} 36' 29''$ , for the angle at Black Down; which, corrected for the purpose of reduction to their respective chord angles, become  $94^{\circ} 13' 11'',5$ , and  $35^{\circ} 36' 25'',75$ , from whence we get the angle at Dunnose =  $50^{\circ} 10' 22'',75$ . We have, therefore, the following triangle, viz.

|            |   |               |
|------------|---|---------------|
| Dean Hill  | - | 94° 13' 11,5" |
| Black Down | - | 35 36 25,75   |
| Dunnose    | - | 50 10 22,75   |

The distance between Dean Hill and Dunnose is 183496,2 feet, (Phil. Trans. for 1795, p. 501,) and that between Black Down and Dean Hill, according to the foregoing computation, is 240236,7 feet: these, applied to the angles of the above triangle,



give 314309,6, and 314305,4 feet, respectively, for the distance between Black Down and Dunnose: wherefore, the mean 314307,5 feet, = 59,528 miles, may be considered as the true distance between those stations.

*Direction of the Meridian at Black Down.*

On the 18th of April, in the forenoon, the angle between the Pole Star, when at its greatest apparent elongation from the meridian, was observed, and found to be -  $104^{\circ} 19' 19'',25$

And on the 19th, in the afternoon -  $98^{\circ} 42' 47''$

Half their sum is the angle between the meridian and Abbotsbury staff -  $101^{\circ} 31' 3''$

On the 20th of April, in the forenoon, the angle between the Pole Star, when at its greatest apparent elongation from the meridian, was observed, and found to be -  $104^{\circ} 19' 25'',25$

And on the 19th, in the afternoon -  $98^{\circ} 42' 35'',5$

Half their sum is the angle between the meridian and Abbotsbury staff -  $101^{\circ} 31' 0'',5$

Therefore,  $101^{\circ} 31' 2''$  may be taken for the angle between the meridian and Abbotsbury staff.

ART. XVII.—*Latitude and Longitude of Black Down.*

The angle between Dunnose and the Abbotsbury Staff was observed, and found =  $164^{\circ} 26' 35'',25$ ; and the angle between the meridian and the same staff, by double azimuths of the Pole Star,  $101^{\circ} 31' 2''$ . Wherefore their sum, subtracted from  $360^{\circ}$ , leaves  $94^{\circ} 2' 22'',75$ , the angle which Dunnose makes with the meridian.



In Fig. 4. Plate XXX. let  $Z$  be the zenith,  $B$  the station on Black Down, and  $ZBA$  its meridian; also, let  $D$  be Dunnose, and  $ZD$  its meridian; likewise, suppose  $BC$  to be an arc of a great circle, perpendicular to the meridian at  $B$ , and  $DA$  another arc of a great circle, perpendicular to the meridian at  $D$ ,  $BF$  and  $ED$  being the parallels of latitude at Black Down and Dunnose.

In the spherical triangle  $BZD$ , the angles at  $B$  and  $D$  are given, the first being  $94^{\circ} 2' 22''.75$ , and the second  $84^{\circ} 54' 53''$ ; therefore, in the triangle  $ABD$  the angle at  $B$  is  $85^{\circ} 57' 36''.75$ , and, in the triangle  $BDC$ , the angle at  $D = 84^{\circ} 54' 53''$ : hence, the angles of these triangles, when reduced to those formed by the chords, are as follows:

$$\begin{aligned} \text{In the triangle } BDC \quad & \left\{ \begin{array}{l} DDC = 84^{\circ} 54' 52.5'' \\ CDB = 91^{\circ} 2' 44.75'' \\ CBD = 4^{\circ} 2' 22.75'' \end{array} \right. \\ \text{And in the triangle } ABD \quad & \left\{ \begin{array}{l} ABD = 85^{\circ} 57' 36.75'' \\ BAD = 88^{\circ} 57' 16.25'' \\ BDA = 5^{\circ} 5' 7'' \end{array} \right. \end{aligned}$$

Now the distance between Black Down and Dunnose,  $BD$ , has been already found to be 314307.5 feet; therefore, using the above angles with that distance, (after the proper corrections are applied for reducing the horizontal angles to those formed by the chords,) we get,

$$\begin{aligned} \text{In the triangle } BCD \quad & \left\{ \begin{array}{l} BC = 313128 \\ CD = 21146.9 \end{array} \right\} \text{feet.} \\ \text{And in the triangle } ABD \quad & \left\{ \begin{array}{l} AD = 313581.2 \\ AB = 27864.5 \end{array} \right\} \text{feet.} \end{aligned}$$

Again, in the two small triangles formed by the parallels  $BF$  and  $ED$ , the perpendiculars  $BC$  and  $DA$ , and the small arcs  $CF$  and  $AE$ , we have the angles at  $C$  and  $A$  given, the



first being  $91^{\circ} 2' 45'',75$ , and the last  $88^{\circ} 57' 15''$ ; which angles, however, are augmented by the addition of the differences between the horizontal angles and those formed by the chords. We have therefore,

$$\text{In the triangle BCF} \begin{cases} \text{BCF} = 91^{\circ} 2' 45,75'' \\ \text{BFC} = 88^{\circ} 25' 51,5'' \\ \text{FBC} = 0^{\circ} 31' 22,75'' \end{cases}$$

$$\text{And in the triangle AED} \begin{cases} \text{EAD} = 88^{\circ} 57' 17'' \\ \text{AED} = 90^{\circ} 31' 21,5'' \\ \text{ADE} = 0^{\circ} 31' 21,5'' \end{cases}$$

And, using BC and AD, as found above, we get

$$\begin{aligned} \text{CF} &= 2859,1 \\ \text{And EA} &= 2859,8 \end{aligned} \Bigg\} \text{feet.}$$

Therefore  $\text{FD} = \text{DC} + \text{CF} = 22146,9 + 2859,1 = 25006$  feet. And  $\text{BE} = \text{BA} = \text{EA} = 27864,5 - 2859,8 = 25004,7$  feet. The mean,  $25005,3$  feet, may be considered as very nearly the true distance between the parallels of Black Down and Dunnose. This method is the same as that made use of in the *Phil. Trans.* for 1795, p. 521, and affords the means of very accurately determining the distance between the parallels of latitude of the two stations, when the angles were observed with precision, and the direction in which the stations lie, is not much removed from east and west.

This small space,  $25004,7$  feet, corresponds to  $4' 6'',5$ , in which I use 60851 fathoms for the length of a degree of the meridian in  $50^{\circ} 41'$ . See *Phil. Trans.* for 1795, p. 537.

Now the latitude of Dunnose is  $50^{\circ} 37' 7'',3$ , and its longitude  $1^{\circ} 11' 36''$ ; (*Phil. Trans.* for 1795, p. 536;) therefore,  $50^{\circ} 37' 7'',3 + 4' 6'',5 = 50^{\circ} 41' 13'',8$ , is the latitude of Black Down.

This method of finding the latitude seems to be more correct than by spherical computation; yet, by this latter, nearly the



same conclusion is derived; for, the bearing of Black Down west of Dunnose being  $84^{\circ} 54' 52''.5$ , we get the distance of that station from the meridian of the latter = 313072 feet, and from the perpendicular, 27861 feet; which, converted into parts of an arch, according to the lengths of their respective degrees, gives  $50^{\circ} 41' 14''$  for the latitude, and  $1^{\circ} 20' 46''.4$  for the longitude west of Dunnose. According to the troublesome yet ingenious method recommended by M. SEJOUR, in his *Traité Analytique des Mouvements apparens des Corps Célestes*, the latitude of Black Down comes out  $50^{\circ} 41' 13''.9$ , and the longitude  $1^{\circ} 20' 45''.75$ . We may, therefore, admitting the supposition of Dunnose being situated in  $50^{\circ} 37' 7''.3$ , safely take  $50^{\circ} 41' 13''.8$  for the latitude, and  $2^{\circ} 32' 22''.4$  for the longitude, of Black Down; that of Dunnose being  $1^{\circ} 11' 36''$  west of the meridian of Greenwich.

ART. XVIII. *Calculation of the Distance between the Stations on Black Down, in Dorsetshire, and Rippin Tor, in Devonshire.*

For the calculation of this distance, we must have recourse to the XLVIIIth, XLVIIIth, XLIXth, and Lth triangles. (See Philosophical Transactions for 1797, and Plate XXX, Fig. 1 of this Volume.) In the two first, we have the whole angle at Pilsden, between Dumpdon and Black Down =  $152^{\circ} 37' 27''.25$ , which, reduced to the angle formed by the chords, becomes  $152^{\circ} 37' 24''.25$ . The sides forming this angle, are Dumpdon and Pilsden, Pilsden and Black Down: the distance between the two first stations being 78459.3 feet, and between the two last 79110.7 feet. From these data, the distance between Dumpdon and Black Down is found to be 153095.7 feet, the triangle for computation being,



Pilsden - - -  $152^{\circ} 37' 24'',25$

Black Down - -  $13 37 50,5$

Dumpdon - - -  $13 44 45,25$

But this side may be also found, by computing with the whole angle at Charton Common, which angle, when reduced to the plane of the chords, becomes  $141^{\circ} 33' 53'',75$ . The two sides are 581012,5 feet, and 103345 feet; which *data* give the following triangle:

Charton - - -  $141^{\circ} 33' 53'',5$

Dumpdon - -  $24 48 39,25$

Black Down - -  $13 37 27,25$ ; from whence we find the distance from Dumpdon to Black Down = 153094,6 feet. Wherefore, the mean, 153095,2 feet, may be considered to be very nearly the true distance.

In the Lth triangle, (Cawsand Beacon, Dumpdon, and Little Haldon) the angle at Cawsand Beacon is  $43^{\circ} 14' 21'',25$ ; and in the LIst, (Rippin Tor, Cawsand Beacon, and Little Haldon) the angle at the same station is  $25^{\circ} 30' 39'',75$ ; their sum is  $68^{\circ} 45' 1''$ , and, adding  $1''$  for the necessary correction, it becomes  $68^{\circ} 45' 2''$ . Computing with this angle, and the including sides, (64020,5 and 18334 feet,) we obtain the following triangle:

Rippin Tor - - -  $90^{\circ} 34' 35''$

Cawsand Beacon - -  $68 45 2$

Dumpdon - - -  $20 40 23$ , which gives the distance from Dumpdon to Cawsand Beacon = 169014 feet.

In the XLIXth triangle, the observed angle at Dumpdon is found to be  $86^{\circ} 39' 8'',5$ , and, by adding to it the horizontal angle at Dumpdon, between Rippin Tor and Little Haldon, and also that between Black Down and Charton Common, we get  $125^{\circ} 54' 30'',5$ , for the horizontal angle between Rippin



Tor and Cawsand Beacon. To reduce this angle to that formed by the chords, 6" must be subtracted; therefore,  $125^{\circ} 54' 24''.5$  is the angle for computation. The sides Dumpdon and Rippin Tor, Dumpdon and Black Down, (169014 and 153095,2 feet,) with this angle, give the following triangle:

|            |   |   |                                                                                                 |
|------------|---|---|-------------------------------------------------------------------------------------------------|
| Rippin Tor | - | - | $25^{\circ} 36' 4''.5$                                                                          |
| Dumpdon    | - |   | $125^{\circ} 54' 24''.5$                                                                        |
| Black Down | - |   | $28^{\circ} 29' 31''$ , which gives the distance from Rippin Tor to Black Down = 286973,3 feet. |

On referring to the observations made in 1797, on Black Down, it will be seen that the angle between Rippin Tor and the staff erected near Abbotsbury, was  $3^{\circ} 8' 52''.5$ , and the angle between Pilsden and the same staff  $45^{\circ} 16' 13''$ ; their difference,  $42^{\circ} 7' 20''.5$ , is the angle between Rippin Tor and Pilsden. Now, if the angles of the triangles, five in number, used in finding the distance between Rippin Tor and Black Down have been observed correctly, and the calculations properly made, the computed angle at Blackdown, between those stations, should be, of course, the same; but the angle formed by the chords of the arcs between Blackdown and Pilsden and Dumpdon, has been found =  $13^{\circ} 37' 50''.5$ , (which is very nearly the same as the horizontal one,) and the angle between Dumpdon and Rippin Tor =  $28^{\circ} 29' 31''$ , which it is also unnecessary to correct: their sum is  $42^{\circ} 7' 21''.5$ , the very angle observed. It is not, perhaps, proper to dismiss this consideration, without observing that this agreement affords a strong proof of the excellence of our instrument, as the triangles, from their magnitude and nature, are not so disposed as to favour the comparison.



ART. XIX. *Latitude and Longitude of Rippin Tor.*

The angle at Blackdown, between the staff at Abbotsbury and the meridian, has been found  $= 101^{\circ} 31' 1''{,}5$ , nearly, and that between Rippin Tor and the same staff  $= 3^{\circ} 8' 52''{,}5$ ; therefore,  $98^{\circ} 22' 8''$  is the angle which Rippin Tor makes with the meridian, and this, taken from  $180^{\circ}$ , leaves  $81^{\circ} 37' 52''$ , the bearing of Rippin Tor SW from Black Down.

This angle, with the distance found above, gives 28585,3 feet, for the distance of Rippin Tor from the meridian of Black Down, and 56086,0 feet, for that from its perpendicular; therefore, the latitude is  $50^{\circ} 33' 59''{,}1$ , and the longitude west from Black Down,  $1^{\circ} 13' 3''{,}8$ ; consequently, its longitude west of Greenwich is  $3^{\circ} 45' 26''{,}2$ .

*Direction of the Meridian at Butterton Hill.*

On the 6th of May, in the afternoon, the angle between the Pole Star, when at its greatest apparent elongation from the meridian, and the staff on Hemmerdon Ball was observed, and found to be - - - - -  $91^{\circ} 29' 13''{,}75$

And on the 7th, in the afternoon - - - - -  $97 \quad 4 \quad 14$

Half their sum is the angle between the meridian and the staff on Hemmerdon Ball - - -  $94 \quad 16 \quad 44$

Again, on the 7th, in the afternoon, the angle between the Pole Star, when at its greatest apparent elongation from the meridian, and the staff on Hemmerdon Ball was observed, and found to be - - - - -  $91 \quad 29 \quad 12$

Half the sum of this, and the angle observed



in the forenoon of the same day, ( $97^{\circ} 4' 14''$ )  
is - - - - -  $94^{\circ} 16' 43''$

Hence,  $94^{\circ} 16' 44''$  may be considered as the true angle between the meridian and the staff on Hemmerdon Ball.

The angle between the station on Rippin Tor and Hemmerdon Ball, is  $121^{\circ} 17' 7'',75$ ; therefore,  $121^{\circ} 17' 7'',75 - 94^{\circ} 16' 44'' = 27^{\circ} 0' 23'',75$ , is the bearing of Rippin Tor, north-east of Butterton. This angle, with 62951 feet, gives 28585,2 feet, and 56086,6 feet, for the distance of Rippin Tor from the meridian and perpendicular; which, using 61182 and 60847 fathoms, for the lengths of degrees on the meridian and perpendicular, respectively become  $4' 40'',3$ , and  $9' 13''$ . Therefore, in the right angled spherical triangle BPT, (Plate XXX, Fig. 2,) in which B is Butterton, P the pole, T Rippin Tor, and R the point where the parallel to the perpendicular cuts the meridian, we have the co-latitude of T, or Rippin Tor,  $= 39^{\circ} 26' 0'',9$ , and  $RT = 4' 40'',3$ . We have, consequently, cosine  $4' 40'',3$  : radius :: cosine  $39^{\circ} 26' 0'',9$  : cosine  $39^{\circ} 26' 0'',7$ , the co-latitude of the point R. So  $PB = PR + RT = 39^{\circ} 26' 0'',7 + 9' 13'' = 39^{\circ} 35' 13'',7$ ; therefore, the latitude of Butterton is  $50^{\circ} 24' 46'',3$ , and its longitude west from Greenwich,  $3^{\circ} 52' 47'',5$ .

ART. XX. *Calculation of the Distance between Hensbarrow and Butterton.*

The most convenient, as well as the most accurate means of computing this distance, will be by referring to the LVIIIth, LXVIIIth, and LXIVth triangles, in the series of 1796, where the sum of the observed angles at Carraton Hill is  $136^{\circ} 52' 43''$ . The correction for reducing this angle to that formed by the chords, is  $4''$ ; therefore,  $136^{\circ} 52' 39''$  is the proper angle for computation.



The distance from Hensbarrow to Carraton Hill, is 100416 feet, and from Butterton to that station 131576 feet. (See Phil. Trans. for 1797, p. 458, 460.) These data give the following triangle, viz.

|               |     |                         |
|---------------|-----|-------------------------|
| Carraton Hill | - - | 136° 52' 39"            |
| Hensbarrow    | - - | 24 35 57,5              |
| Butterton     | - - | 18 31 23,5, which gives |

21602 feet, for the distance between Hensbarrow and Butterton Hill.

The angle between Carraton Hill and Rippin Tor was observed in 1796, and found =  $101^{\circ} 3' 44'',25$ . (See Phil. Trans. 1797.) The angle between Hensbarrow and Rippin Tor is  $119^{\circ} 35' 3'',25$ ; therefore,  $18^{\circ} 31' 19''$  is the angle between Hensbarrow and Carraton. The difference between the horizontal and chord angle is  $0'',25$  nearly; this, added to  $18^{\circ} 31' 23'',5$ , gives  $18^{\circ} 31' 23'',75$ , which is nearly the same as the observed angle. This agreement proves, that the angles of the triangles connecting Butterton and Hensbarrow have been observed correctly.

ART. XXI. *Latitude and Longitude of Hensbarrow.*

The angle between Hensbarrow and Hemmerdon, (see Observations made at Butterton,) was  $1^{\circ} 52' 4'',5$ ; therefore, as the angle between the latter and the meridian =  $94^{\circ} 16' 44''$ , we get  $92^{\circ} 24' 39'',5$ , for the angle which Hensbarrow makes with the same meridian. The distance from Hensbarrow to Butterton, as found above, is 21602 feet; this, with the angle  $92^{\circ} 24' 39'',5$ , gives the distance of Hensbarrow from the meridian = 215871 feet, and from the perpendicular 9089 feet; these, converted into parts of degrees, become  $35' 17'',1$ , and  $1' 29'',62$ . There-



fore, the latitude of Hensbarrow is  $50^{\circ} 23' 3'',3$ , and its longitude, west of Butterson,  $55' 20'',2$ ; consequently, its longitude, west of Greenwich, is  $3^{\circ} 52' 47'',5 + 55' 20'',2 = 4^{\circ} 48' 7'',7$ .

ART XXII. *Direction of the Meridian at St. Agnes Beacon.*

On the 22d of May, in the forenoon, the angle between the Pole Star, when at its greatest elongation from the meridian, and the staff near Peranzabulo, was observed, and found to be

$38^{\circ} 26' 1'',5$

And on the 22d, in the afternoon

$44^{\circ} 0' 33'',25$

Half their sum is the angle between the meridian and staff

$41^{\circ} 13' 17'',5$

The angle between the staff at Peranzabulo and the station Hensbarrow, was also observed at the same station, and found to be  $31^{\circ} 50' 55'',5$ ; wherefore,  $41^{\circ} 13' 17'',5 + 31^{\circ} 50' 55'',5 = 73^{\circ} 4' 13'',$  is the angle between Hensbarrow and St. Agnes Beacon.

ART. XXIII. *To find the Latitude and Longitude of St. Agnes Beacon.*

In Plate XXX. Fig. 3. Let A be the station at St. Agnes, P the pole, H Hensbarrow, and B the point where the parallel to the meridian of St. Agnes cuts that meridian, BHP being a right angled spherical triangle on the earth's surface.

PH has been already found  $= 39^{\circ} 36' 56'',7$ ; and, as BH, the distance of Hensbarrow from the meridian,  $= 92878$ , and AB, the distance from the perpendicular,  $= 28271$ , we get  $BH = 15' 10'',9$ , and  $AB = 4' 38'',8$ ; which arcs are found by using 61182 and 60845 fathoms, for the length of their respective



degrees. From these *data*, the latitude of the point B is easily derived; for cosine  $15' 10'',9$  : radius :: cosine  $39^\circ 36' 56'',7$  : cosine  $39^\circ 36' 54'',2$ , the co-latitude of B; hence  $39^\circ 36' 54'',2 + 4' 38'',8 = 39^\circ 41' 33'',0$  the co-latitude of A; hence  $50^\circ 18' 27''$  is the latitude of St. Agnes. Its longitude, west from Hensbarrow, is also found by a simple proportion; sine  $39^\circ 36' 54'',2$  : radius :: sine  $15' 10'',9$  : sine  $0^\circ 23' 48''$ ; therefore,  $4^\circ 48' 7'',7 + 0^\circ 23' 48'' = 5^\circ 11' 55'',7$ , is the longitude of St. Agnes, west of Greenwich.

ART. XXIV.—*Remarks.*

I have shewn, with attention to minuteness, the manner in which the latitudes and longitudes of the stations on which directions of meridians have been observed are determined. It now remains to be considered, how far the uncertain state in which we remain, with respect to the figure of the earth, may affect the accuracy of those conclusions.

If the earth were homogeneous, it would necessarily be an ellipsoid; and, were its diameters known, the longitudes and latitudes of places on its surface might be accurately computed, provided their geodetical situations were correctly ascertained, and the latitude of one station in the series of triangles truly determined.

As there is, however, great reason to suppose that the earth is not any regular geometrical figure, from the impossibility of reconciling the results of the various measurements for ascertaining the lengths of degrees of latitude, some uncertainty must remain with respect to our deductions; but there seems to be reasons for supposing the errors, thence resulting, are confined within moderate limits.



In making computations on a given hypothesis of the earth's figure, the truth of the conclusions, as well as the ease with which they are found, materially depends on the distances of the objects from their respective fixed meridians.

If the difference of longitude approaches nearly to, or exceeds  $3^\circ$ , to compute that longitude, and also the latitude, it is necessary the precise figure should be understood; because the analogy does not hold good, in that case, between the equality of the sums of the angles of spherical and spheroidical triangles on the earth's surface. With regard to latitudes, more particularly when the distances are diminished by means of frequent new directions of meridians, a knowledge of the exact length of a degree of a great circle is not necessary; because the determination of those latitudes, by means of spherical computation, being true as to sense, the cosines of those small arcs will remain the same.

As there cannot be a doubt justly entertained of the latitude of Greenwich being very accurately determined, as particularly set forth by the Astronomer Royal in his reply to M. CASSINI, it is reasonable to suppose, that if any errors do exist in the latitudes of those stations, they can only have arisen from the computations being made with erroneous lengths of degrees on the meridian.

In our former Papers on this subject, we have taken it for granted, that the length of a degree of the meridian at the middle point between Greenwich and Paris, ( $50^\circ 10'$ ), is 60842 fathoms, (which supposition may be considered just, provided the latitude of Paris,  $48^\circ 50' 14''$ , be as near the truth as  $51^\circ 28' 40''$  is to that of Greenwich,) and afterwards added 9 fathoms,



making it 60851, in order to get the length of the degree in  $50^{\circ} 41'$ ; (see *Phil. Trans.* 1795, p. 537;) these 9 fathoms, however, were not arbitrarily assumed, but computed. If the latitude of Paris be  $48^{\circ} 50' 15''$ , (*Conn. des Tems*, 1797-98, p. 373,) the length of the degree will be about 7 fathoms greater, which will make the degree in  $50^{\circ} 41'$ , 60849 instead of 60842 fathoms.

The latitude of the station on Beachy Head,  $50^{\circ} 44' 23''.7$ , was found by using 60861 fathoms for the length of a degree on the meridian in  $51^{\circ} 6'$ ; but, if it be true that  $48^{\circ} 50' 15''$  is the latitude of Paris, the latitude of Beachy Head will be about one-third of a second greater. This seems to be the limit of the probable error in the computed latitude of this station; since its proximity to the meridian of Greenwich, obviates any doubt of the conclusions being affected by any uncertainty respecting the length of the degree of the great circle perpendicular to the meridian.

The latitude of Dunnose was determined by computing the distance between the parallels of that station and Beachy Head; (see *Phil. Trans.* for 1795, p. 522;) which method is very exact, and preferable to any other, since the small space between the parallels was determined with great accuracy, leaving not a doubt of a greater error than 3 feet, a quantity corresponding to about  $\frac{1}{3}$  part of a second. And, since the same method has been adopted to find the difference of latitude between Black Down and Dunnose, it is highly probable that the latitude of the former station is not removed more than  $\frac{3}{10}$ ths of a second from the true one, that of Beachy Head being supposed  $= 50^{\circ} 44' 23''.7$ .



It would have been fortunate, had the difference of latitude between Black Down and Butterson, and Butterson and St. Agnes Beacon, been determined in the same manner, since the latitudes of all these important stations would, in that case, have been found with evident accuracy; but, whoever has leisure and inclination to go through these calculations, will find that, by means of the directions of meridians at Butterson and St. Agnes Beacon, the latitudes of those stations may be found to within half a second. By this I mean, that, allowing the latitude of Black Down to be  $50^{\circ} 41' 13''.8$ , the latitude of Butterson,  $50^{\circ} 24' 46''.3$ , will not deviate more than half a second from the truth; and the same may be said with respect to the latitude of St. Agnes, that of Butterson being admitted as correct. Supposing, therefore, the latitude of Greenwich to be  $51^{\circ} 28' 40''$ , we may rely on the assurance of the latitude of St. Agnes Beacon being determined within  $1\frac{1}{2}''$  of the truth.

With respect to the longitudes of these stations, their accuracy entirely depends on the observations made at Dunnose and Beachy Head, for determining the length of a degree of a great circle perpendicular to the meridian. The truth of the deduction drawn from those observations rests on their accuracy; and it can scarcely be deemed presumptuous to assert, that an error of more than  $1''$  cannot have existed in either of the angles. On this account, therefore, I should suppose, that the difference of longitude between those stations, has been found so nearly as to leave no greater error than  $1''$ . The whole of the operation to which I now allude, was performed with great care; the directions of the meridians having been determined by means of double azimuths of the Pole Star, confirmed by computed azimuths. In returning to the consideration of this sub-



ject, I do not perceive any source of error likely to affect the conclusions, unless it be that to which all astronomical observations, made with instruments adjusted by plumb-lines or levels, are liable. In determining differences of longitude through these means, the direction in which any lateral attraction must act, to produce a *maximum* of error, is at right angles to the meridian. If the attraction be *in the plane of it*, it is obvious the double azimuth, although the telescope of the theodolite does not move in a vertical, will nevertheless give, almost exactly, the true direction of the meridian.

The high lands about St. Catherine's Light-House, in the Isle of Wight, are about six miles from Dunnose, and nearly west of it; but it does not appear that the effect of their lateral attraction can have produced any sensible error; since it may be shewn, that the plumb-line of the sector at Schehallien would have deviated only a small part of a second from the true vertical, had the sector itself been placed at that distance from the hill. Beachy Head is situated at the eastern extremity of the South Downs; a *defect* of matter towards the east immediately taking place. This circumstance renders the observations liable to some small errors, on account of the superior lateral attraction in the opposite direction; but, notwithstanding it is very probable that an error induced by either of these attractions, is so very small as to render the subject scarcely worth consideration, yet, as both lie *the same way*, it is satisfactory to consider that they mutually tend to correct the errors which may result from either; we may, therefore, safely conclude, that  $1^{\circ} 11' 36''$  is very nearly the true longitude between the station on Beachy Head and that on Dunnose. Under this persuasion, I consider it probable that the longitude of Black



Down cannot err in excess or defect more than 3"; that of But-  
terton 5"; and that of St. Agnes Beacon 6".

The latitudes and longitudes of these important stations,  
brought under one point of view, will be as follows :

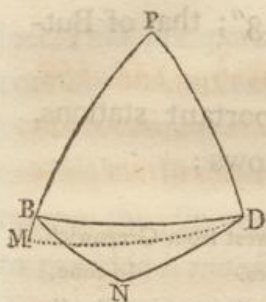
|                  | Latitude.     | Longitude west from Greenwich. |          |
|------------------|---------------|--------------------------------|----------|
|                  |               | In degrees.                    | In time. |
| Black Down -     | 50° 41' 13",8 | 2° 32' 22",4                   | 10' 9",5 |
| Butterton Hill - | 50 24 46,3    | 3 52 47,5                      | 15 31,2  |
| St. Agnes Beacon | 50 18 27      | 5 11 55,7                      | 20 47,7  |

*Note.* It may probably be expected, that I should determine the directions of the meridians at Black Down, Butterton Hill, and St. Agnes Beacon, by calculation, and afterwards compare them with the observed ones. I have desisted from the measure in the body of the work, and reserved the little I have to say for this note.

If the earth were a perfect sphere, or an ellipsoid of known diameters, the direction of the meridian, at any station not very remotely situated from the parallel of another, might be determined, provided the direction of the meridian at that station were observed, and the value of the arc subtended by the space between them pretty accurately ascertained, and also the latitude of the station, at which the angle is given, nearly obtained.

Thus, if it be required to find the angle at Dunnose, between Beachy Head and the meridian, from the observed angle at the latter station, and the arc between them, we shall have 39° 15' 36",3, the co-latitude of Beachy Head, and 55' 28",7 for the oblique arc. These *data* (two sides and an included angle) give 1° 26' 48",4, for the difference of longitude between Beachy Head and Dunnose, and 81° 56' 52",6, for the angle which the meridian at the latter makes with the former station. The difference of longitude found in a rather more correct way, has been heretofore shewn to be 1° 26' 47",93, (see *Philos. Trans.* 1795. p. 523,) and the angle at Dunnose was also shewn to be 81° 56' 53", from observation, which may be considered the same with that found by this mode of computation. In all cases in which the *data* were equally correct, no doubt the direction of meridians might be computed, without fear of the results deviating much from the truth; but, if it be required to find the angle at Black Down, from the observed direction of the meridian at Dunnose, a different method must be used. It is, however, less accurate than the former one, and it has been expressly for this reason, that I have not introduced this subject into the account.





In the adjoining diagram, suppose B, Black Down; D, Dunnose; and, N, Nine Barrow Down: also, let PB, the meridian of Black Down, be prolonged to M, and DM be drawn, PM being = PD. Then we shall have three spherical triangles BPD, BND, and BMD. Now, the angle NBD was found from observations to be  $4^{\circ} 30' 28''$ , and BND  $172^{\circ} 27' 33''.5$ ; these give the angle BDN =  $3^{\circ} 1' 59''.5$ , nearly, because the excess of the three angles above  $180^{\circ}$  is  $1''$ . The observed angle at D, Dunnose, between Nine Barrow Down and the meridian DP, or PDN, was  $87^{\circ} 56' 53''$ ; therefore,  $87^{\circ} 56' 53'' - 3^{\circ} 1' 59''.5 = 84^{\circ} 54' 53''.5$ , is the angle at D, between the meridian and the station on Black Down.

Now, the difference of longitude between B and D, or the angle at P, has been already found =  $1^{\circ} 20' 46''.4$ ; and, since BP is very nearly = PD, and BD is small, we shall have  $\text{rad.} : \text{tang. } \frac{1}{2}P :: \text{cosine DP} : \text{cosine BMD} = 89^{\circ} 28' 47''$ . But the angle PDB has been found =  $84^{\circ} 54' 53''.5$ ; therefore,  $89^{\circ} 28' 47'' - 84^{\circ} 54' 53''.5 = 4^{\circ} 33' 53''.5$ , the angle BDM; hence,  $180^{\circ} 0' 2'' - 94^{\circ} 2' 40''.5 = 85^{\circ} 57' 21''.5$ , or MBD; therefore,  $94^{\circ} 2' 38''.5$ , or DBP, is the angle at Black Down obtained in this way, which differs nearly  $16''$  from the observed one, viz.  $94^{\circ} 2' 22''.75$ . It is probable, some portion of this arises from defects in the observation made at Dunnose, on the lights fired at Nine Barrow Down: only two lights were seen; and, as the observations differed  $5''$  from each other, some degree of doubt exists, as to the accuracy of the angle. The angle at Nine Barrow Down, between Black Down and Dunnose, is not absolutely to be depended on for purposes of this kind, although there can be no doubt of its being sufficiently near the truth, for that to which it has been before applied. In the correction of the angles at that station, in our former accounts, we proceeded on the supposition of their being less satisfactory than the other angles of the triangles to which Nine Barrow Down is a common station. For these reasons, I am of opinion the computed angle cannot be applied as a test to the observed one; and it also appears to me, that greater objections lie against similar comparisons between the computed and observed angles at Buttern and St. Agnes; as those stations could not be seen from each other, nor the latter from Black Down. Although the computed directions of the meridians differ some seconds from the observed ones, I am by no means doubtful of the truth of the latter; as the double azimuths of the Pole Star, found from computation, agree very satisfactorily with those which have been used in obtaining the directions of the several meridians.—In finding the value of the oblique arc, or the line which joins Black Down and Dunnose, as used in the first method of computation, I have had recourse to the following *correct* expression, viz.

$$d = \frac{p \cdot m}{p + m - p \cdot s^2};$$

where  $d$  is the length of the required degree,  $p$  that of the great circle perpendicular to the meridian,  $m$  that of a degree of the meridian itself, and  $s$  the sine of the angle constituted by the oblique arc and the meridian.



ART. XXV. *Bearings of the Stations in the Series of 1795 and 1796, from the Parallels to the Meridians of Black Down, Butterson Hill, and St. Agnes Beacon; likewise their Distances from those Meridians, and from their Perpendiculars.*

*Meridian of Black Down.*

| Bearings from the Parallel to the Meridian. |   |                |             | Distances<br>from merid. | Distances<br>from perp. |
|---------------------------------------------|---|----------------|-------------|--------------------------|-------------------------|
|                                             |   |                |             | Feet.                    | Feet.                   |
| Bull Barrow                                 | - | Black Down     | 42 2 30 NE  | 53643.2                  | 59489.7                 |
| Mintern                                     | - | -              | 10 36 33 NE | 10996.8                  | 58709                   |
| Pilsden                                     | - | -              | 56 14 48 NW | 65775.6                  | 43955.4                 |
| Charton Common                              | - | -              | 83 30 3 NW  | 102681                   | 11697.5                 |
| Dumpton                                     | - | Charton Common | 45 4 0 NW   | 143749                   | 52670.9                 |
| Rippin Tor                                  | - | -              | 81 37 52 SW |                          |                         |

*Meridian of Butterson.*

|                |   |            |             |          |          |
|----------------|---|------------|-------------|----------|----------|
| Rippin Tor     | - | Butterson  | 27 0 23 NE  | 28585.3  | 56086.6  |
| Furiland       | - | -          | 78 37 39 SE | 78966.3  | 15883    |
| Bolt Head      | - | -          | 14 49 48 SE | 18551.3  | 70065.4  |
| Maker Heights  | - | -          | 70 36 9 SW  | 71467.9  | 25164.3  |
| Kit Hill       | - | -          | 67 12 12 NW | 93081.9  | 39121.7  |
| Carraton Hill  | - | -          | 73 53 22 NW | 126408.9 | 36511.3  |
| Cawsand Beacon | - | Rippin Tor | 35 35 29 NW | 86744.4  | 108147.5 |
| Little Haldon  | - | Furiland   | 4 25 2 NE   | 84571.4  | 56676.8  |
| Bindown        | - | Maker      | 70 4 48 NW  | 52926.6  | 19180.1  |
| Hensbarrow     | - | -          | 87 35 18 SW | 92878.0  | 28271.0  |

*Meridian of St. Agnes Beacon.*

|              |   |                  |             |          |         |
|--------------|---|------------------|-------------|----------|---------|
| Hensbarrow   | - | St. Agnes Beacon | 73 4 13 NE  | 92877.4  | 28279.9 |
| Deadman      | - | -                | 72 24 27 SE | 97292.5  | 30849   |
| Karnbonellis | - | -                | 3 27 27 SW  | 2741.7   | 45379.2 |
| Karnminnis   | - | -                | 61 13 58 SW | 74168.1  | 40719   |
| Bodmin       | } | Hensbarrow       | 37 30 45 NE | 121703.2 | 65825.8 |
| Lansallos    |   |                  | 75 29 51 SE | 152945.3 | 12733.5 |
| St. Burian   | - | Karnbonellis     | 67 20 59 SW | 94831.5  | 83807.3 |
| Pertinney    | - | Karnminnis       | 39 25 32 SW | 100465.1 | 72704.4 |
| Sennen       | - | Pertinney        | 40 50 18 SW | 113674.4 | 879868  |



ART. XXVI. *Latitudes and Longitudes of the Stations in the Series of 1795 and 1796.*

*Meridian of Black Down.*

| Names of Stations.                 | Latitude.     | Longitude from Black Down. | Longitude west of Greenwich. |          |
|------------------------------------|---------------|----------------------------|------------------------------|----------|
|                                    |               |                            | In degrees.                  | In time. |
|                                    |               |                            |                              | m. s.    |
| Bull Barrow - - -                  | 50° 50' 59.5  | 0° 13' 53.2 E              | 2° 18' 29.2                  | 9 14.    |
| Mintern - - -                      | 50° 50' 52.8  | 0° 2' 50.8 E               | 2° 29' 31.6                  | 9 58.1   |
| Pilsden - - -                      | 50° 48' 26.9  | 0° 17' 0.7 W               | 2° 49' 23.1                  | 11 17.5  |
| Charton - - -                      | 50° 43' 6.1   | 0° 26' 30.5 W              | 2° 58' 52.9                  | 11 55.5  |
| Dumpdon - - -                      | 50° 49' 47.2  | 0° 37' 12.1 W              | 3° 39' 34.5                  | 14 38.3  |
| Rippin Tor - - -                   | 50° 33' 59.1  | 1° 13' 3.8 W               | 3° 45' 26.2                  | 15 1.7   |
| <i>Meridian of Butterson Hill.</i> |               | From merid. of Butterson.  |                              |          |
| Furland - - -                      | 50° 22' 7.8   | 0° 23' 13.2 E              | 3° 32' 34.3                  | 14 10.3  |
| Little Haldon - - -                | 50° 34' 3.0   | 0° 21' 45.6 E              | 3° 31' 1.9                   | 14 4.1   |
| Cawsand Beacon - - -               | 50° 42' 31.14 | 0° 2' 14.3 W               | 3° 55' 1.8                   | 15 40.1  |
| Bolt Head - - -                    | 50° 13' 15.2  | 0° 4' 44.5 E               | 3° 48' 3.1                   | 15 12.2  |
| Maker - - -                        | 50° 20' 36.56 | 0° 18' 18.2 W              | 4° 11' 5.7                   | 16 44.3  |
| Kit Hill - - -                     | 50° 31' 9.4   | 0° 23' 55.7 W              | 4° 16' 43.2                  | 17 6.9   |
| Carraton Hill - - -                | 50° 30' 41.6  | 0° 32' 29.5 W              | 4° 25' 17.0                  | 17 41.1  |
| Bindown - - -                      | 50° 23' 32.9  | 0° 31' 53.5 W              | 4° 24' 41.0                  | 17 38.7  |
| Hensbarrow - - -                   | 50° 23' 3.3   | 0° 55' 20.2 W              | 4° 48' 7.7                   | 19 12.5  |
| <i>Meridian of St. Agnes.</i>      |               | From merid. of St. Agnes.  |                              |          |
| Lansallos - - -                    | 50° 20' 25.7  | 0° 39' 10.3 E              | 4° 32' 45.7                  | 18 11.0  |
| Bodmin Down - - -                  | 50° 29' 11.6  | 0° 31' 15.9 E              | 4° 40' 39.8                  | 18 42.6  |
| Deadman - - -                      | 50° 13' 20.0  | 0° 24' 51.3 E              | 4° 47' 4.4                   | 19 8.3   |
| Karnbonellis - - -                 | 50° 10' 59.4  | 0° 0' 42.0 W               | 5° 12' 37.7                  | 20 50.5  |
| Karnminnis - - -                   | 50° 11' 43.8  | 0° 18' 56.2 W              | 5° 30' 51.9                  | 22 3.5   |
| St. Burian - - -                   | 50° 4' 37.9   | 0° 24' 9.2 W               | 5° 36' 4.9                   | 22 24.3  |
| Pertinney - - -                    | 50° 6' 27.0   | 0° 25' 36.2 W              | 5° 37' 31.9                  | 22 30.1  |
| Sennen - - -                       | 50° 3' 55.6   | 0° 28' 56.7 W              | 5° 40' 52.4                  | 22 43.5  |



ART. XXVII. *Bearings of the intersected Objects, from the Stations in the Series of 1795 and 1796, from the Parallels to the Meridians of Black Down, Butterson Hill, and St. Agnes Beacon; and likewise their Distances from these Meridians.*

*Meridian of Black Down.*

| Bearings from the Parallels to the Meridian. |            |             | Distances<br>from merid. | Distances<br>from perp. |
|----------------------------------------------|------------|-------------|--------------------------|-------------------------|
| <i>At Bull Barrow.</i>                       |            |             | Feet.                    | Feet.                   |
| Portland Light House                         | -          | 19 47 16 SE | 21581                    | 59985                   |
| Noil Windmill                                | -          | 10 12 56 NE | 72842                    | 166029                  |
| Noil Steeple                                 | -          | 21 53 29 NE | 86610                    | 141534                  |
| Holy Trinity,                                | Shaftsbury | 25 41 52 NE | 81081                    | 116506                  |
| St. Rumbold's Steeple,                       | Ditto      | 28 12 51 NE | 80486                    | 109522                  |
| Maypowder Steeple                            | -          | 85 17 11 NW | 29526                    | 61479                   |
| Stourhead House                              | -          | 0 27 46 NW  | 52881                    | 153806                  |
| Mr. Frarapton's Obelisk                      | -          | 10 3 4 SE   | 63588                    | 3384                    |
| Mere Steeple                                 | -          | 6 40 55 NE  | 63893                    | 146984                  |
| Mrs. Thornhill's Obelisk                     | -          | 22 18 51 NW | 40391                    | 91778                   |
| Odcomb Spire                                 | -          | 70 25 0 NW  | 35474                    | 91194                   |
| Milborne Port                                | -          | 38 21 20 NW | 20110                    | 101865                  |
| <i>At Black Down.</i>                        |            |             |                          |                         |
| Puncknoll Flagstaff                          | -          | 89 9 57 NW  | 25612                    | 373                     |
| Lambert's Castle                             | -          | 65 17 36 NW | 67269                    | 30950                   |
| Lyme Cobb                                    | -          | 82 21 29 NW | 89547                    | 12015                   |
| <i>At Pilsden.</i>                           |            |             |                          |                         |
| Golden Cape                                  | -          | 4 44 3 SW   | 68239                    | 14209                   |
| Glastonbury Tor                              | -          | 14 19 23 NE | 34314                    | 167176                  |
| Bridport Beacon                              | -          | 8 19 55 SW  | 72199                    | 91                      |
| Lord Rolle's Barn, near Sidmouth             | -          | 64 34 38 SW | 101743                   | 26859                   |
| <i>At Durdun.</i>                            |            |             |                          |                         |
| Naval Flagstaff, Whitlands                   | -          | 32 45 10 SE | 116249                   | 9920                    |
| Catherstone Lodge                            | -          | 2 29 45 NE  | 140940                   | 117131                  |
| Lord Lisburne's Obelisk                      | -          | 46 47 34 SW | 225502                   | 24119                   |
| Sir J. de la Pole's Flagstaff                | -          | 52 3 42 SE  | 86622                    | 8137                    |
| Honiton Steeple                              | -          | 12 24 9 SW  | 146681                   | 39339                   |
| St. Mary Ottery Steeple                      | -          | 42 21 56 SW | 179904                   | 13028                   |
| Sir Robert Palk's Tower                      | -          | 58 56 2 SW  | 242012                   | 6526                    |



## Meridian of Butterson.

| Bearings from the Parallels to the Meridian. |   |   |              | Distances<br>from merid. | Distances<br>from perp. |
|----------------------------------------------|---|---|--------------|--------------------------|-------------------------|
| <i>At Little Haldon.</i>                     |   |   |              | Feet.                    | Feet.                   |
| North Bovey                                  | - | - | 71 44 23 N W | 43315                    | 70289                   |
| Eastern Karn                                 | - | - | 56 27 52 N W | 41145                    | 85459                   |
| Western Karn                                 | - | - | 53 12 10 N W | 40730                    | 89472                   |
| West Down Beacon                             | - | - | 63 59 14 N E | 126152                   | 76968                   |
| Woodley's Summer House                       | - | - | 83 39 47 S W | 29448                    | 50555                   |
| Berry Head Flagstaff                         | - | - | 10 22 16 S E | 95740                    | 4350                    |
| Brixen Steeple                               | - | - | 2 29 4 S E   | 87435                    | 9331                    |
| Ipplepen Steeple                             | - | - | 22 15 0 S W  | 68413                    | 17180                   |
| Three Barrow Tor                             | - | - | 68 43 3 S W  | 8667                     | 27109                   |
| Brent Beacon                                 | - | - | 56 11 17 S W | 15460                    | 10390                   |
| <i>At Butterson.</i>                         |   |   |              |                          |                         |
| Chudleigh Steeple                            | - | - | 44 4 44 N E  | 67688                    | 69900                   |
| Froward Flagstaff                            | - | - | 75 0 28 S E  | 84342                    | 22587                   |
| Start Point Flagstaff                        | - | - | 39 22 33 S E | 56544                    | 68897                   |
| Marlborough Steeple                          | - | - | 16 42 32 S E | 18429                    | 61393                   |
| Bolt Head Flagstaff                          | - | - | 14 57 7 S E  | 18739                    | 70173                   |
| Mewstone, highest point                      | - | - | 52 35 23 S W | 49825                    | 38108                   |
| Cupola, Hospital, Plymouth                   | - | - | 76 47 30 S W | 66891                    | 15699                   |
| St. John's Steeple                           | - | - | 79 34 44 S W | 83991                    | 15447                   |
| Saltash Steeple                              | - | - | 89 37 12 S W | 73707                    | 489                     |
| Penlee Beacon                                | - | - | 64 59 49 S W | 69758                    | 32532                   |
| Plymstock Steeple                            | - | - | 73 46 15 S W | 49217                    | 14326                   |
| Statten Barn                                 | - | - | 64 43 53 S W | 53270                    | 25145                   |
| Mount Batton                                 | - | - | 70 50 51 S W | 58651                    | 20370                   |
| Flagstaff, Plymouth Garrison                 | - | - | 72 51 17 S W | 57021                    | 17591                   |
| New Church, Plymouth                         | - | - | 75 25 49 S W | 56521                    | 14691                   |
| Old Church, Plymouth                         | - | - | 75 1 56 S W  | 57505                    | 15374                   |
| West Chimney, Governor's House               | - | - | 75 42 15 S W | 64497                    | 16435                   |
| Flagstaff on Mount Wise                      | - | - | 75 40 55 S W | 65281                    | 16662                   |
| Chapel, Plymouth Dock                        | - | - | 77 33 28 S W | 67040                    | 14792                   |
| Obelisk, Crimhill Passage, Plymouth          | - | - | 74 7 9 S W   | 66728                    | 18984                   |
| Mount Edgumbe House                          | - | - | 72 18 23 S W | 65827                    | 21001                   |
| Flagstaff, Maker Tower                       | - | - | 70 53 41 S W | 68224                    | 23632                   |
| Naval Signal Staff, Maker Tower              | - | - | 70 54 3 S W  | 68232                    | 23626                   |
| Eddystone Light House                        | - | - | 46 1 27 S W  | 87190                    | 84127                   |
| <i>At Butterson.</i>                         |   |   |              |                          |                         |
| Stonehouse Steeple                           | - | - | 65 32 37 S W | 53078                    | 24140                   |
| Puslinch Obelisk                             | - | - | 45 17 46 S W | 27480                    | 27223                   |
| Flagstaff, Rame Head                         | - | - | 65 3 44 S W  | 76935                    | 35774                   |
| <i>At Rippin Tor.</i>                        |   |   |              |                          |                         |
| Great Haldon                                 | - | - | 52 27 0 N E  | 72023                    | 89479                   |



| Bearings from the Parallels to the Meridian. |   |   |              | Distances<br>from merid. | Distances<br>from perp. |
|----------------------------------------------|---|---|--------------|--------------------------|-------------------------|
|                                              |   |   |              | Feet.                    | Feet.                   |
| <i>At Maker.</i>                             |   |   |              |                          |                         |
| Hemmerdon Ball                               | - | - | 62 10 37 N E | 27722                    | 2077                    |
| Brent Tor                                    | - | - | 5 27 45 N E  | 62385                    | 69820                   |
| Blockhouse Flagstaff                         | - | - | 27 51 26 N E | 64005                    | 11043                   |
| Rame Steeple                                 | - | - | 20 20 12 S W | 74388                    | 33043                   |
| Chapel, Dockyard                             | - | - | 23 6 50 N E  | 67042                    | 14795                   |
| Flagstaff, Statten Battery                   | - | - | 88 9 5 S E   | 54278                    | 25719                   |
| Windmill, Plymouth Dock                      | - | - | 29 47 35 N E | 65963                    | 15549                   |
| <i>At Kit Hill.</i>                          |   |   |              |                          |                         |
| St. Stephen's Steeple                        | - | - | 19 29 31 S E | 78182                    | 2979                    |
| St. Ive Steeple                              | - | - | 56 20 4 S W  | 114213                   | 25047                   |
| Callington Steeple                           | - | - | 43 0 14 S W  | 98219                    | 33613                   |
| Linkinghorn Steeple                          | - | - | 69 8 31 N W  | 111417                   | 46108                   |
| St. Dominic Steeple                          | - | - | 27 19 41 N E | 89512                    | 46030                   |
| South Petherwin Steeple                      | - | - | 34 6 18 N W  | 115216                   | 71807                   |
| South Hill                                   | - | - | 74 57 40 N W | 108044                   | 43142                   |
| St. Cleer Steeple                            | - | - | 74 42 9 S W  | 133492                   | 27795                   |
| <i>At Carraton Hill.</i>                     |   |   |              |                          |                         |
| Cheese Rings                                 | - | - | 44 0 29 N W  | 133198                   | 43540                   |
| Liskeard Steeple                             | - | - | 15 19 39 S W | 132155                   | 15546                   |
| Landrake Steeple                             | - | - | 46 1 2 S E   | 92463                    | 3750                    |
| Duloe Steeple                                | - | - | 15 23 3 S W  | 137923                   | 5336                    |
| Menheniot Steeple                            | - | - | 11 59 44 S E | 121941                   | 15479                   |
| Polparrow Flagstaff                          | - | - | 20 8 5 S W   | 138871                   | 2521                    |
| Lord Camelford's Obelisk                     | - | - | 48 33 15 S W | 163992                   | 3324                    |
| Boconnock Steeple                            | - | - | 44 34 58 S W | 158753                   | 3692                    |
| Roach Steeple                                | - | - | 66 30 33 S W | 218318                   | 3434                    |
| Roach Rock                                   | - | - | 65 58 15 S W | 217204                   | 3969                    |

Meridian of St. Agnes.

|                              |   |   |              |        |       |
|------------------------------|---|---|--------------|--------|-------|
| <i>At Lansallos.</i>         |   |   |              |        |       |
| Lanlivery Steeple            | - | - | 56 48 14 N W | 119848 | 34388 |
| Helmen Tor                   | - | - | 53 55 17 N W | 113818 | 41243 |
| Mr. Tremaine's Summer House  | - | - | 67 21 40 S W | 96548  | 10787 |
| Gorran Steeple               | - | - | 58 55 59 S W | 95877  | 21647 |
| Flagstaff, Deadman           | - | - | 51 46 44 S W | 97059  | 31278 |
| Gwineas Rocks                | - | - | 53 9 0 S W   | 106551 | 22037 |
| <i>At Hensbarrow.</i>        |   |   |              |        |       |
| Hendellion Steeple           | - | - | 2 26 59 N W  | 89918  | 97463 |
| Stone, St. Braeg's Down      | - | - | 17 31 12 N W | 81868  | 63145 |
| St. Dennis Steeple           | - | - | 83 6 25 N W  | 77630  | 30114 |
| Lansallos Steeple            | - | - | 73 43 28 S E | 149787 | 11656 |
| Gerrans Steeple              | - | - | 26 33 53 S W | 55357  | 46773 |
| St. Michael Carhayes Steeple | - | - | 9 39 51 S W  | 84768  | 19353 |



| Bearings from the Parallels to the Meridian. |   |    |    | Distances<br>from merid. | Distances<br>from perp. |        |        |
|----------------------------------------------|---|----|----|--------------------------|-------------------------|--------|--------|
|                                              |   | °  | '  | "                        | Feet.                   | Feet.  |        |
| St. Kivern Steeple                           | - | 27 | 6  | 7                        | SW                      | 30611  | 93398  |
| Flagstaff, Blackbead                         | - | 24 | 50 | 36                       | SW                      | 31214  | 104917 |
| Windmill, near Fowey                         | - | 67 | 2  | 44                       | SE                      | 134347 | 10707  |
| Menabilly House                              | - | 60 | 26 | 48                       | SE                      | 123516 | 10899  |
| Old Tower at Polruan                         | - | 64 | 44 | 37                       | SE                      | 35892  | 7978   |
| Flagstaff, St. Anthony's Head (D.)*          | - | 26 | 35 | 45                       | SW                      | 48664  | 60038  |
| <i>At the Deadman.</i>                       |   |    |    |                          |                         |        |        |
| St. Veep's Steeple                           | - | 39 | 4  | 29                       | NE                      | 140146 | 21930  |
| <i>At St. Agnes.</i>                         |   |    |    |                          |                         |        |        |
| St. Columb Minor Steeple                     | - | 44 | 7  | 57                       | NE                      | 40698  | 41950  |
| Peranzabulo                                  | - | 41 | 54 | 34                       | NE                      | 19354  | 21563  |
| St. Eval Steeple                             | - | 37 | 52 | 39                       | NE                      | 50275  | 64632  |
| Cubert Steeple                               | - | 42 | 26 | 53                       | NE                      | 23773  | 25991  |
| Flagstaff, Pendennis Castle                  | - | 34 | 19 | 23                       | SE                      | 39999  | 58586  |
| Windmill, St. Mawe's                         | - | 45 | 52 | 9                        | SE                      | 48079  | 46642  |
| Karnbre Castle                               | - | 11 | 53 | 47                       | SW                      | 6480   | 30760  |
| Illugan Steeple                              | - | 30 | 1  | 2                        | SW                      | 11865  | 20537  |
| St. Paul's Steeple                           | - | 20 | 21 | 16                       | SW                      | 38457  | 103660 |
| Lord Dunstanville's House                    | - | 40 | 33 | 25                       | SW                      | 19726  | 23050  |
| Gwinear Steeple                              | - | 39 | 33 | 34                       | SW                      | 39578  | 47911  |
| Cow and Calf                                 | - | 23 | 7  | 32                       | NE                      | 37174  | 87044  |
| Camborn Steeple                              | - | 30 | 16 | 51                       | SW                      | 19881  | 34048  |
| St. Erme Steeple                             | - | 88 | 42 | 22                       | NE                      | 44657  | 1009   |
| St. Allen Steeple                            | - | 85 | 13 | 35                       | NE                      | 36688  | 3064   |
| Ludguan Steeple                              | - | 47 | 39 | 58                       | SW                      | 64737  | 58976  |
| <i>At Karnbonellis.</i>                      |   |    |    |                          |                         |        |        |
| Lizard Windmill                              | - | 1  | 47 | 24                       | SE                      | 573    | 114785 |
| Grade Steeple                                | - | 6  | 41 | 17                       | SE                      | 5710   | 117451 |
| Ruan Major Steeple                           | - | 3  | 46 | 21                       | SE                      | 1486   | 109496 |
| St. Hilary Steeple                           | - | 66 | 19 | 33                       | SW                      | 49009  | 65664  |
| Mr. Rogers's Tower, near St. Ives            | - | 83 | 43 | 6                        | SW                      | 18396  | 47102  |
| Madern Steeple                               | - | 76 | 53 | 40                       | SW                      | 81542  | 63725  |
| Parklough Flagstaff                          | - | 6  | 55 | 11                       | SW                      | 10735  | 111240 |
| <i>At Karnminnis.</i>                        |   |    |    |                          |                         |        |        |
| St. Buryan Steeple                           | - | 25 | 45 | 25                       | SW                      | 95205  | 84320  |
| <i>At St. Buryan.</i>                        |   |    |    |                          |                         |        |        |
| Chapel Karnbury                              | - | 3  | 25 | 16                       | NW                      | 95472  | 73098  |
| Flagstaff, St. Leven's Point                 | - | 77 | 29 | 40                       | SW                      | 114449 | 88158  |
| Sennen Steeple                               | - | 83 | 44 | 37                       | SW                      | 112202 | 85712  |
| <i>At Pertinney.</i>                         |   |    |    |                          |                         |        |        |
| Stone, LAND'S END                            | - | 48 | 5  | 30                       | SW                      | 116222 | 86847  |

\* The letter D is added (as in the former accounts) to those places respecting which any doubts are entertained.



ART. XXVIII. *Latitudes and Longitudes of such intersected Objects, in the Series of 1795 and 1796, as have been referred to the Meridians of Black Down, Butterson Hill, and St. Agnes.*

| Names of Objects.               | Latitude   | Longitude from<br>Black Down. | Longitude west of Greenwich. |          |
|---------------------------------|------------|-------------------------------|------------------------------|----------|
|                                 |            |                               | In degrees.                  | In time. |
|                                 | ° ' "      | ° ' "                         | ° ' "                        | m. s.    |
| Portland Light House -          | 50 31 22,2 | 0 5 32,9 E                    | 2 26 49,5                    | 9 47,3   |
| Noil Windmill -                 | 51 8 29,3  | 0 18 58,7 E                   | 2 13 23,7                    | 8 53,6   |
| Noil Steeple -                  | 51 4 27,1  | 0 22 31,8 E                   | 2 19 50,6                    | 9 19,3   |
| Holy Trinity, - Shaftsbury      | 51 0 20,7  | 0 21 3,6 E                    | 2 11 18,8                    | 8 45,3   |
| St. Rumbold's Steeple, Ditto    | 50 59 11,8 | 0 20 53,9 E                   | 2 11 28,5                    | 8 45,8   |
| Maypowder Steeple -             | 50 51 19,7 | 0 7 38,6 E                    | 2 24 43,8                    | 9 38,9   |
| Stourhead House -               | 51 6 29,5  | 0 13 46,0 E                   | 2 18 36,4                    | 9 14,4   |
| Mr. Frampton's Obelisk -        | 50 41 46,0 | 0 16 24,5 E                   | 2 15 57,9                    | 9 3,8    |
| Mere Steeple -                  | 51 5 21,7  | 0 16 37,6 E                   | 2 15 44,8                    | 9 2,9    |
| Mrs. Thornhill's Obelisk -      | 50 56 17,5 | 0 10 28,6 E                   | 2 21 53,8                    | 9 27,6   |
| Odcomb Spire -                  | 50 56 12,6 | 0 9 12,1 W                    | 2 41 34,4                    | 10 46,3  |
| Milborne Port -                 | 50 57 58,0 | 0 5 13,1 E                    | 2 27 9,3                     | 9 48,6   |
| Punchnoll Flagstaff -           | 50 41 17,3 | 0 6 36,4 W                    | 2 38 58,8                    | 10 35,9  |
| Lambert's Castle -              | 50 46 17,7 | 0 17 23,1 W                   | 2 49 45,5                    | 11 19    |
| Lyme Cobb -                     | 50 43 10,0 | 0 23 7, W                     | 2 55 29,4                    | 11 41,9  |
| Golden Cape -                   | 50 43 32,5 | 0 17 37,2 W                   | 2 49 59,6                    | 11 20    |
| Glastonbury Tor -               | 51 8 47,7  | 0 8 56,4 W                    | 2 41 18,8                    | 10 45,2  |
| Bridport Beacon -               | 50 41 13,2 | 0 18 37,6 W                   | 2 50 59,9                    | 11 24    |
| Ld. Rolle's Barn, near Sidmouth | 50 45 35,6 | 0 26 17,2 W                   | 2 58 39,6                    | 11 54,6  |
| Naval Flagstaff, Whitlands      | 50 42 47,7 | 0 30 0,4 W                    | 3 2 22,8                     | 12 9,5   |
| Catherstone Lodge -             | 51 0 23,0  | 0 36 36,6 W                   | 3 8 59,0                     | 12 35,9  |
| Lord Lisburne's Obelisk -       | 50 37 1,3  | 0 58 5,6 W                    | 3 30 28,1                    | 14 1,9   |
| Sir J. de la Pole's Flagstaff - | 50 42 31,9 | 0 22 21,4 W                   | 2 54 43,8                    | 11 38,9  |
| Honiton Steeple -               | 50 47 35,5 | 0 37 55,7 W                   | 3 10 18,1                    | 12 41,2  |
| St. Mary Ottery Steeple -       | 50 43 12,9 | 0 46 26,8 W                   | 3 18 49,2                    | 13 15,3  |
| Sir Robert Palk's Tower -       | 50 39 52,5 | 1 2 24,6 W                    | 3 34 47,                     | 14 19,1  |



## Meridian of Butterson Hill.

| Names of Objects.                               | Latitude.  | Longitude from Butterson Hill. | Longitude west of Greenwich. |          |
|-------------------------------------------------|------------|--------------------------------|------------------------------|----------|
|                                                 |            |                                | In degrees.                  | In time. |
|                                                 |            |                                |                              | m. s.    |
| North Bovey Steeple (D.) -                      | 50 36 18.7 | 0 11 9.3 E                     | 3 41 38.2                    | 14 46.5  |
| Eastern Karn -                                  | 50 38 48.4 | 0 10 36.3 E                    | 3 42 11.2                    | 14 48.7  |
| Western Karn -                                  | 50 39 27.9 | 0 10 30.1 E                    | 3 42 17.4                    | 14 49.1  |
| West Down Beacon -                              | 50 37 20.5 | 0 32 30.0 E                    | 3 20 17.5                    | 13 21.1  |
| Woodley's Summer House                          | 50 33 4.5  | 0 7 34.5 E                     | 3 45 13                      | 15 0.9   |
| Flagstaff, Berry Head, Torbay                   | 50 24 0.7  | 0 24 33.1 E                    | 3 28 14.4                    | 13 52.9  |
| Brixen Steeple -                                | 50 23 12   | 0 22 24.8 E                    | 3 30 22.7                    | 14 1.5   |
| Ipplepen Steeple -                              | 50 27 34.2 | 0 17 33.8 E                    | 3 35 13.7                    | 14 20.9  |
| Three Barrow Tor -                              | 50 29 13.5 | 0 2 13.5 E                     | 3 50 34                      | 15 22.3  |
| Brent Beacon, near Ashburton                    | 50 26 28.6 | 0 3 58.1 E                     | 3 48 49.4                    | 15 15.3  |
| Chudleigh Steeple -                             | 50 36 14.1 | 0 17 25.9 E                    | 3 35 21.6                    | 14 21.4  |
| Froward Flagstaff -                             | 50 21 1.4  | 0 21 36.3 E                    | 3 31 11.2                    | 14 4.7   |
| Flagstaff, Start Point -                        | 50 13 25.9 | 0 14 26.7 E                    | 3 38 20.8                    | 14 33.4  |
| Mariborough Steeple -                           | 50 14 40.7 | 0 4 42.5 E                     | 3 48 5.0                     | 15 12.3  |
| Flagstaff, Bolt Head -                          | 50 13 14.1 | 0 4 47.2 E                     | 3 48 0.3                     | 15 12    |
| Mewstone, highest point -                       | 50 18 29.7 | 0 12 45.1 W                    | 4 5 32.6                     | 16 22.1  |
| Cupola of Plymouth Hospital                     | 50 22 10.1 | 0 17 8.5 W                     | 4 9 56.1                     | 16 39.7  |
| St. John's Steeple (D.) -                       | 50 22 11.8 | 0 21 31.4 W                    | 4 14 18.9                    | 16 57.2  |
| Saltash Steeple -                               | 50 24 39.8 | 0 18 54.3 W                    | 4 11 41.8                    | 16 42.8  |
| Penlee Beacon -                                 | 50 19 24   | 0 17 52.6 W                    | 4 10 40.1                    | 16 42.7  |
| Plymstock Steeple -                             | 50 22 24.2 | 0 12 36.8 W                    | 4 5 24.3                     | 16 21.6  |
| Statten Barn -                                  | 50 20 37.4 | 0 13 38.6 W                    | 4 6 26.1                     | 16 25.7  |
| Mount Batten -                                  | 50 21 24.3 | 0 15 1.6 W                     | 4 7 49.1                     | 16 31.2  |
| Flagstaff, Plymouth Garrison                    | 50 21 21.8 | 0 14 36.5 W                    | 4 7 24.0                     | 16 29.6  |
| New Church, Plymouth -                          | 50 22 20.4 | 0 14 29.0 W                    | 4 7 16.5                     | 16 29.1  |
| Old Church, Plymouth -                          | 50 22 13.6 | 0 14 44.1 W                    | 4 7 31.6                     | 16 30.1  |
| Eddystone Light House -                         | 50 10 54.5 | 0 22 15.4 W                    | 4 15 2.9                     | 17 0.3   |
| West Chimney, Governor's House, Plymouth Dock - | 50 22 2.9  | 0 16 31.6 W                    | 4 9 19.1                     | 16 37.2  |
| Flagstaff, Mount Wise -                         | 50 22 0.7  | 0 16 43.7 W                    | 4 9 31.2                     | 16 38.1  |
| Chapel, Plymouth Dock -                         | 50 22 19   | 0 17 10.8 W                    | 4 9 58.3                     | 16 39.9  |
| Obelisk, Crimhill Passage                       | 50 21 37.7 | 0 17 5.8 W                     | 4 9 53.3                     | 16 39.5  |
| Mount Edgecumbe House                           | 50 21 17.9 | 0 16 51.8 W                    | 4 9 39.3                     | 16 38.6  |
| Flagstaff, Maker Tower                          | 50 20 51.8 | 0 17 28.5 W                    | 4 10 16.0                    | 16 41.1  |
| Naval Flagst. near Maker Tow.                   | 50 20 51.9 | 0 17 28.6 W                    | 4 10 16.1                    | 16 41.1  |
| Stonehouse Steeple -                            | 50 20 47.4 | 0 13 35.7 W                    | 4 6 23.2                     | 16 25.5  |
| Puslinch Obelisk -                              | 50 20 17.5 | 0 7 2.6 W                      | 3 59 50.1                    | 15 59.5  |
| Rame Head -                                     | 50 18 51.7 | 0 19 41.5 W                    | 4 12 29.0                    | 16 49.9  |
| Great Haldon -                                  | 50 39 27   | 0 18 34.2 W                    | 3 34 13.3                    | 14 16.9  |
| Hemmerdon Ball -                                | 50 21 21.2 | 0 7 6.5 W                      | 3 59 53.6                    | 15 59.5  |
| Brent Tor -                                     | 50 36 13.4 | 0 16 33.9 W                    | 4 9 21.4                     | 16 37.4  |
| Flagstaff, Blockhouse, Plymouth                 | 50 22 56.4 | 0 16 24.4 W                    | 4 9 11.8                     | 16 36.8  |



| Names of Objects.                 | Latitude.  | Longitude from<br>Butterton Hill. | Longitude west of Greenwich. |          |
|-----------------------------------|------------|-----------------------------------|------------------------------|----------|
|                                   |            |                                   | In degrees.                  | In time. |
|                                   |            |                                   | ° ' "                        | m. s.    |
| <i>Rame Steeple</i> - -           | 50 19 18,7 | 0 37 59,8 W                       | 4 30 47,3                    | 18 3,1   |
| <i>Flagstaff, Statten Battery</i> | 50 20 31,8 | 0 13 54,1 W                       | 4 6 41,6                     | 16 26,8  |
| Windmill, Plymouth Dock           | 50 22 11,6 | 0 16 54,2 W                       | 4 9 41,7                     | 16 38,8  |
| St. Stephen's Steeple -           | 50 24 15,1 | 0 20 3,0 W                        | 4 12 50,5                    | 16 51,3  |
| St. Ive Steeple - -               | 50 28 49   | 0 29 20,2 W                       | 4 22 7,7                     | 17 28,5  |
| Linkinghorn Steeple -             | 50 32 17,3 | 0 28 39,2 W                       | 4 21 26,7                    | 17 25,8  |
| St. Dominic Steeple (n.) -        | 50 32 17,8 | 0 23 1,2 W                        | 4 15 48,7                    | 17 3,2   |
| South Petherwin Steeple -         | 50 36 30,4 | 0 29 40,4 W                       | 4 22 27,5                    | 17 29,8  |
| South Hill Steeple -              | 50 31 48,3 | 0 27 46,9 W                       | 4 20 34,4                    | 17 22,3  |
| St. Cleer Steeple - -             | 50 29 15   | 0 34 33,1 W                       | 4 27 20,6                    | 17 49,4  |
| Callington Steeple -              | 50 30 14,9 | 0 25 14,4 W                       | 4 18 1,9                     | 17 12,1  |
| Cheese Rings - -                  | 50 31 50,5 | 0 34 14,9 W                       | 4 27 2,4                     | 17 48,1  |
| Liskeard Steeple - -              | 50 27 14,4 | 0 33 55,5 W                       | 4 26 43,0                    | 17 46,8  |
| Landrake Steeple -                | 50 25 20,7 | 0 23 43,3 W                       | 4 16 30,8                    | 17 6     |
| Duloe Steeple - -                 | 50 23 48,0 | 0 35 21,9 W                       | 4 28 9,4                     | 17 52,6  |
| Menheniot Steeple -               | 50 27 14,5 | 0 31 18,3 W                       | 4 24 5,8                     | 17 36,4  |
| <i>Polparrow Flagstaff</i> -      | 50 25 5,5  | 0 35 37,4 W                       | 4 28 24,9                    | 17 53,6  |
| Lord Camelford's Obelisk          | 50 25 11,1 | 0 42 4,2 W                        | 4 34 51,7                    | 18 19,4  |
| Boconnock Steeple -               | 50 25 15,3 | 0 40 43,7 W                       | 4 33 31,2                    | 18 14,1  |
| Roach Rock - -                    | 50 23 53,4 | 0 55 41,8 W                       | 4 48 29,4                    | 19 13,9  |
| Roach Steeple - -                 | 50 23 58,7 | 0 55 59,1 W                       | 4 48 46,6                    | 19 15,1  |

## Meridian of St. Agnes.

| Names of Objects.                    | Latitude.  | Longitude from<br>St. Agnes Beacon. | Longitude west of Greenwich. |          |
|--------------------------------------|------------|-------------------------------------|------------------------------|----------|
|                                      |            |                                     | In degrees.                  | In time. |
|                                      |            |                                     | ° ' "                        | m. s.    |
| Lanlivery Steeple -                  | 50 24 1,9  | 0 30 44,0 E                         | 4 41 11,7                    | 18 44,8  |
| Helmen Tor - -                       | 50 25 9,9  | 0 29 11,9 E                         | 4 42 43,8                    | 18 50,9  |
| Mr. Tremaine's Summer House          | 50 16 37,8 | 0 24 41,6 E                         | 4 47 14,1                    | 19 8,9   |
| Gorran Steeple - -                   | 50 14 50,8 | 0 24 30,4 E                         | 4 47 25,3                    | 19 9,6   |
| <i>Flagstaff, Deadman</i> -          | 50 13 15,8 | 0 24 47,7 E                         | 4 47 8,0                     | 19 8,5   |
| <i>Gwineas Rocks</i> - -             | 50 14 46,3 | 0 27 14,1 E                         | 4 44 41,6                    | 18 58,8  |
| Hendellion Steeple -                 | 50 34 25,6 | 0 23 8,5 E                          | 4 48 47,2                    | 19 15,1  |
| Stone, St. Braeg's Down -            | 50 28 47,6 | 0 21 1,7 E                          | 4 50 54,0                    | 19 23,6  |
| St. Dennis Steeple -                 | 50 23 22,1 | 0 19 54,1 E                         | 4 52 1,6                     | 19 28,1  |
| St. Michael Carhayes Steeple         | 50 15 14,0 | 0 21 40,2 E                         | 4 50 15,5                    | 19 21    |
| St. Kivern Steeple -                 | 50 3 5,6   | 0 7 47,5 E                          | 5 4 8,2                      | 20 16,5  |
| <i>Flagstaff, Blackhead</i> -        | 50 1 12,1  | 0 7 56,4 E                          | 5 3 59,3                     | 20 15,9  |
| Windmill, near Fowey -               | 50 20 7,2  | 0 34 24,2 E                         | 4 37 31,5                    | 18 30,1  |
| Menabilly House -                    | 50 20 9,9  | 0 31 37,8 E                         | 4 40 17,9                    | 18 41,1  |
| Old Tower at Polruan -               | 50 19 40,2 | 0 34 47,7 E                         | 4 37 8,0                     | 18 28,5  |
| <i>Flagstaff, St. Anthony's Head</i> | 50 8 34,2  | 0 12 24,7 E                         | 4 59 31,0                    | 19 58,1  |
| St. Veep's Steeple -                 | 50 21 57,5 | 0 35 54,7 E                         | 4 36 1,0                     | 18 24,1  |
| St. Columb Minor Steeple             | 50 25 20,1 | 0 10 26,4 E                         | 5 1 29,3                     | 20 5,9   |
| <i>Peranzabulo</i> - -               | 50 21 59,4 | 0 4 57,6 E                          | 5 6 58,2                     | 20 27,9  |



| Names of Objects.                   | Latitude.  | Longitude from<br>St. Agnes Beacon. | Longitude west of Greenwich. |          |
|-------------------------------------|------------|-------------------------------------|------------------------------|----------|
|                                     |            |                                     | In degrees.                  | In time. |
|                                     |            |                                     | m. s.                        |          |
| St. Eval Steeple -                  | 50 29 3,5  | 0 12 54,9 E                         | 4 59 0,8                     | 19 56    |
| Cubert Steeple -                    | 50 22 43,0 | 0 6 5,6 E                           | 5 5 50,1                     | 20 23,3  |
| <i>Flagstaff, Pendennis Castle</i>  | 50 8 48,7  | 0 10 12,1 E                         | 5 1 43,6                     | 20 6,9   |
| Windmill, St. Mawes -               | 50 10 46,3 | 0 12 16,3 E                         | 4 59 39,4                    | 19 58,6  |
| Karnbre Castle -                    | 50 13 23,6 | 0 1 39,3 W                          | 5 13 35,0                    | 20 54,3  |
| Illugan Steeple -                   | 50 15 4,4  | 0 3 1,9 W                           | 5 14 57,6                    | 20 59,8  |
| St. Paul's Steeple -                | 50 1 24,3  | 0 9 47,0 W                          | 5 21 42,7                    | 21 26,8  |
| Lord Dunstanville's House           | 50 14 39,4 | 0 5 2,5 W                           | 5 16 58,2                    | 21 7,8   |
| Lansallos Steeple -                 | 50 20 15,3 | 0 38 16,2 E                         | 4 33 39,5                    | 18 14,6  |
| Gerrans Steeple -                   | 50 10 44,8 | 0 14 7,7 E                          | 4 57 48,0                    | 19 51,2  |
| Gwinear Steeple -                   | 50 10 34,1 | 0 10 6,0 W                          | 5 22 1,7                     | 21 28,1  |
| <i>Cow and Calf</i> -               | 50 32 44,8 | 0 9 33,7 E                          | 5 2 22,0                     | 20 9,5   |
| Camborn Steeple -                   | 50 12 51,0 | 0 5 4,7 W                           | 5 17 0,4                     | 21 8     |
| St. Erme Steeple -                  | 50 18 36,3 | 0 11 25,7 E                         | 5 0 30,0                     | 20 2     |
| St. Allen Steeple -                 | 50 18 56,8 | 0 9 23,6 E                          | 5 2 32,1                     | 20 10,1  |
| Ludguan Steeple -                   | 50 8 44,1  | 0 16 30,7 W                         | 5 28 26,4                    | 21 53,8  |
| <i>Windmill, Lizard</i> -           | 49 59 35,1 | 0 0 8,7 E                           | 5 12 4,4                     | 20 48,3  |
| Grade Steeple -                     | 49 59 8,8  | 0 1 27,1 E                          | 5 10 28,6                    | 20 41,9  |
| Ruan Major Steeple -                | 50 0 27,2  | 0 0 22,6 E                          | 5 11 29,1                    | 20 45,9  |
| St. Hilary Steeple -                | 50 7 38,7  | 0 12 29,7 W                         | 5 24 25,4                    | 21 37,7  |
| Mr. Rogers's Tower -                | 50 10 42,4 | 0 4 41,7 W                          | 5 16 37,4                    | 21 6,5   |
| Modern Steeple -                    | 50 7 56,6  | 0 20 47,5 W                         | 5 32 43,2                    | 22 10,9  |
| <i>Park Lough Flagstaff</i>         | 50 0 9,9   | 0 2 43,8 W                          | 5 14 39,5                    | 20 58,6  |
| <i>Lizard Flagstaff</i> -           | 49 57 55,8 | 0 0 38,1 E                          | 5 11 17,7                    | 20 45,2  |
| St. Buryan Steeple -                | 50 4 32,8  | 0 24 14,8 W                         | 5 36 10,5                    | 22 24,7  |
| Karnbury Chapel -                   | 50 6 23,5  | 0 24 19,8 W                         | 5 36 15,5                    | 22 25    |
| <i>St. Leven's Point, Flagstaff</i> | 50 3 53,8  | 0 29 8,5 W                          | 5 41 4,2                     | 22 44,3  |
| Sennen Steeple -                    | 50 4 18,0  | 0 28 36,6 W                         | 5 40 29,9                    | 22 41,9  |
| Stone, LAND'S END -                 | 50 4 6,6   | 0 29 35,8 W                         | 5 41 31,5                    | 22 46,1  |

Notwithstanding almost the whole of the above latitudes and longitudes belong to objects near the sea coast, yet I have distinguished those which are actually upon it, from those more remotely situated, by *Italics*.



ART. XXIX. *Bearings of the Stations in the Series of 1797 and 1798, from the Parallels to the Meridians of Black Down, But-  
terton Hill, and St. Agnes Beacon; and likewise their Distances  
from those Meridians*

*Meridian of Black Down.*

| Names of the Stations. |               | Bearings.   | Distances<br>from merid. | Distances<br>from perp. |
|------------------------|---------------|-------------|--------------------------|-------------------------|
|                        |               |             | Feet.                    | Feet                    |
| Pilsden -              | Moor Lynch -  | 2 33 59 NW  | 71070                    | 162067                  |
| Ash Beacon -           |               | 59 52 59 NW |                          |                         |
| Mintern -              | Ash Beacon -  | 5 17 18 NW  | 5544                     | 117624                  |
| Moor Lynch -           |               | 59 53 1 SE  |                          |                         |
| Bull Barrow -          | Long Knoll -  | 1 2 34 NE   | 55557                    | 164653                  |
| Ash Beacon -           |               | 46 45 33 NE |                          |                         |
| Pilsden -              | Dundon -      | 12 40 33 NE | 42964                    | 145377                  |
| Moor Lynch -           |               | 59 17 35 SE |                          |                         |
| Moor Lynch -           | Mendip -      | 66 3 36 NE  | 1021                     | 194072                  |
| Ash Beacon -           |               | 3 23 8 NW   |                          |                         |
| Long Knoll -           | Beacon Hill - | 82 28 4 NE  | 189665                   | 182386                  |
| Wingreen -             |               | 50 16 22 NW |                          |                         |
| Long Knoll -           | Westbury -    | 39 44 34 NE | 92715                    | 209344                  |
| Mendip -               |               | 80 32 31 NE |                          |                         |
| Westbury -             | Farley Down   | 35 44 37 NW | 57752                    | 257920                  |
| Dundry -               |               | 88 51 23 SE |                          |                         |
| Mendip -               | Dundry -      | 18 59 1 NW  | 21488                    | 259503                  |
| Farley Down -          |               | 88 51 22 NW |                          |                         |
| Mendip -               | Lansdown -    | 22 4 57 NE  | 32440                    | 271514                  |
| Dundry -               |               | 77 26 41 NE |                          |                         |

*Meridian of Butterson Hill.*

|                 |                 |             |        |       |
|-----------------|-----------------|-------------|--------|-------|
| Carraton Hill - | St. Stephen's - | 15 15 47 NE | 112457 | 87635 |
| Kit Hill -      |                 | 21 46 9 NW  |        |       |
| Carraton Hill - | Black Down -    | 64 12 55 NE | 51797  | 72555 |
| St. Stephen's - |                 | 76 2 26 SE  |        |       |

*Meridian of St. Agnes Beacon.*

|                  |               |             |        |        |
|------------------|---------------|-------------|--------|--------|
| St. Agnes Beacon | Trevose Head  | 25 54 12 NE | 42858  | 88250  |
| Hensbarrow -     |               | 39 49 34 NW |        |        |
| Trevose Head -   | Cadon Barrow  | 63 18 48 NE | 119364 | 126702 |
| Bodmin Down -    |               | 2 11 52 NW  |        |        |
| Bodmin Down -    | Brown Willy - | 28 46 20 NE | 142745 | 104145 |
| Cadon Barrow -   |               | 46 1 42 SE  |        |        |



ART. XXX. Bearings of the Stations in the Series of 1799, from the Parallels to the Meridians of Dunnose and Greenwich; and likewise their Distances from those Meridians.

*Meridian of Dunnose.*

| Names of the Stations. |                  | Bearings.   | Distances from merid. | Distances from perp. |
|------------------------|------------------|-------------|-----------------------|----------------------|
|                        |                  |             | Feet.                 | Feet.                |
| Highclere              | Bagshot Heath    | 81 40 58 NE | 108275                | 274173               |
|                        | Nuffield         | 35 30 40 NE | 36747                 | 351480               |
|                        | White Horse Hill | 27 47 37 NW | 83796                 | 349533               |
|                        | Stow on the Wold | 14 29 27 NW | 114915                | 469942               |
| White Horse Hill       | Brill            | 50 16 17 NE | 28955                 | 443235               |
|                        | Shotover Hill    | 53 30 7 NE  | 3063                  | 413801               |
|                        | Scutchamfly      | 84 25 51 SE | 32776                 | 344558               |
|                        | Whiteham Hill    | 36 30 13 NE | 31054                 | 420801               |
| Stow on the Wold       | Broadway         | 33 3 55 NW  | 143396                | 513693               |
|                        | Epwell           | 39 34 55 NE | 64617                 | 530781               |
| Shotover Hill          | Cunner Hill      | 76 58 3 SW  | 25416                 | 407209               |
| Epwell                 | Corley Hill      | 6 39 56 NW  | 81312                 | 673637               |
|                        | Arbury Hill      | 48 5 23 NE  | 2776                  | 586288               |
| Brill                  | Crouch Hill      | 39 20 49 NW | 36102                 | 522584               |
|                        | Quainton         | 61 40 13 NE | 64963                 | 462648               |

*Meridian of Greenwich.*

|               |               |             |        |        |
|---------------|---------------|-------------|--------|--------|
| Nuffield      | Wendover      | 44 48 19 NE | 174338 | 100986 |
| Brill         |               | 65 49 3 SE  |        |        |
| Brill         |               | 56 46 9 NE  |        |        |
| Arbury Hill   | Bow Brickhill | 54 50 52 SE | 151413 | 190493 |
| Brill         |               | 85 8 30 NE  |        |        |
| Bow Brickhill | Kinsworth     | 31 55 51 SE | 120910 | 141562 |
| Bow Brickhill |               | 74 6 27 SE  |        |        |
| Kinsworth     | Lillyhoe      | 50 54 40 NE | 84215  | 171367 |
| Bow Brickhill |               | 67 24 37 NE |        |        |
| Lillyhoe      | Lidlington    | 50 6 55 NW  | 121834 | 202802 |
| Bow Brickhill |               | 89 1 15 SE  |        |        |
| Lillyhoe      | Trusler Hill  | 68 14 71 NW | 131278 | 190151 |
|               |               |             |        |        |



ART. XXXI. *Latitudes and Longitudes of the Stations in the Series of 1797 and 1798, referred to the Meridians of Black Down, Butterson Hill, and St. Agnes Beacon.*

*Meridian of Black Down.*

| Names of the Stations. | Latitude.     | Longitude from Black Down. | Longitude west of Greenwich. |          |
|------------------------|---------------|----------------------------|------------------------------|----------|
|                        |               |                            | In degrees.                  | In time. |
|                        |               |                            |                              | m. s.    |
| Moor Lynch - - -       | 51° 7' 50,2"  | 0° 18' 30,6" W             | 2° 50' 53"                   | 11 23,5  |
| Ash Beacon - - -       | 51° 0' 33,5"  | 0° 1' 26,4" E              | 2° 30' 56"                   | 10 3,7   |
| Long Knoll - - -       | 51° 8' 16,2"  | 0° 14' 28,3" E             | 2° 17' 54,1"                 | 9 11,6   |
| Dundon - - -           | 51° 5' 6,5"   | 0° 11' 10,7" W             | 2° 43' 33,1"                 | 10 54,2  |
| Mendip - - -           | 51° 13' 7,2"  | 0° 0' 15,9" E              | 2° 32' 6,5"                  | 10 8,4   |
| Beacon Hill - - -      | 51° 11' 1,6"  | 0° 49' 20,6" E             | 1° 43' 1,8"                  | 6 52,1   |
| Westbury - - -         | 51° 15' 35,3" | 0° 24' 13" E               | 2° 8' 9,4"                   | 8 32,6   |
| Farley Down - - -      | 51° 23' 35,7" | 0° 15' 7,6" E              | 2° 17' 14,8"                 | 9 8,9    |
| Dundry - - -           | 51° 23' 52,2" | 0° 5' 37,7" W              | 2° 38' 0,1"                  | 10 32,0  |
| Lansdown - - -         | 51° 27' 50,4" | 0° 8' 30,6" E              | 2° 23' 51,8"                 | 9 35,4   |

*Meridian of Butterson Hill.*

| Names of the Stations. | Latitude.     | Longitude from Butterson Hill. | Longitude west of Greenwich. |          |
|------------------------|---------------|--------------------------------|------------------------------|----------|
|                        |               |                                | In degrees.                  | In time. |
|                        |               |                                |                              | m. s.    |
| St. Stephen's - - -    | 50° 39' 6,7"  | 0° 28' 59,6" W                 | 4° 21' 47,1"                 | 17 27,1  |
| Black Down - - -       | 50° 36' 40,9" | 0° 13' 20,5" W                 | 4° 6' 8,0"                   | 16 24,5  |

*Meridian of St. Agnes Beacon.*

| Names of the Stations. | Latitude.     | Longitude from St. Agnes Beacon. | Longitude west of Greenwich. |          |
|------------------------|---------------|----------------------------------|------------------------------|----------|
|                        |               |                                  | In degrees.                  | In time. |
|                        |               |                                  |                              | m. s.    |
| Trevoze Head - - -     | 50° 32' 56,5" | 0° 11' 1,5" E                    | 5° 0' 54,2"                  | 20 3,6   |
| Cadon Barrow - - -     | 50° 39' 12,1" | 0° 30' 46,5" E                   | 4° 41' 9,2"                  | 18 44,6  |
| Brown Willy - - -      | 50° 35' 27,9" | 0° 36' 45,3" E                   | 4° 35' 10,4"                 | 18 20,6  |



ART. XXXII. *Latitudes and Longitudes of the Stations in the Series of 1799, referred to the Meridians of Dunnose and Greenwich.*

*Meridian of Dunnose.*

| Names of the Stations. | Latitude.  | Longitude from Dunnose. | Longitude west of Greenwich. |          |
|------------------------|------------|-------------------------|------------------------------|----------|
|                        |            |                         | In degrees.                  | In time. |
|                        | ° ' "      | ° ' "                   | ° ' "                        | m. s.    |
| Nuffield - - -         | 51 34 52,2 | 0 9 39,9 E              | 1 1 56,1                     | 4 7,7    |
| White Horse Hill - -   | 51 34 31,6 | 0 22 1,7 W              | 1 33 37,7                    | 6 14,5   |
| Stow on the Wold - -   | 51 54 16,3 | 0 30 26,7 W             | 1 42 2,4                     | 6 48,1   |
| Broadway - - -         | 52 1 25,6  | 0 38 5,3 W              | 1 49 41,3                    | 7 18,7   |
| Brill - - -            | 51 49 56,6 | 0 7 39,4 E              | 1 3 56,6                     | 4 15,7   |
| Scutchamfly - - -      | 51 33 44,1 | 0 8 37 W                | 1 20 13,0                    | 5 20,8   |
| Shotover Hill - - -    | 51 45 6,7  | 0 0 48,5 E              | 1 10 47,5                    | 4 43,1   |
| Whiteham Hill - - -    | 51 46 15,4 | 0 8 12,1 W              | 1 19 48,1                    | 5 19,2   |
| Cumner Hill - - -      | 51 44 1,5  | 0 6 42,4 W              | 1 18 18,4                    | 5 13,2   |
| Epwell - - -           | 52 4 19,8  | 0 17 10,8 W             | 1 28 46,8                    | 5 55,1   |
| Corley Hill - - -      | 51 50 28,3 | 0 9 39,9 W              | 1 21 15,9                    | 5 25,0   |
| Arbury Hill - - -      | 52 13 26,6 | 0 0 44,4 W              | 1 12 20,4                    | 4 49,3   |
| Crouch Hill - - -      | 52 2 58,7  | 0 9 35,6 W              | 1 21 11,6                    | 5 24,7   |
| Quainton - - -         | 51 53 7,2  | 0 17 12,1 E             | 0 54 23,9                    | 3 37,6   |

*Meridian of Greenwich.*

| Names of the Stations. | Latitude.  | Longitude west of Greenwich. |          |
|------------------------|------------|------------------------------|----------|
|                        |            | In degrees.                  | In time. |
|                        | ° ' "      | ° ' "                        | m. s.    |
| Wendover - - -         | 51 45 6,4  | 0 46 1,4                     | 3 4,1    |
| Bow Brickhill - - -    | 51 59 50,5 | 0 40 1,2                     | 2 44,1   |
| Kinsworth - - -        | 51 51 50,8 | 0 31 59,9                    | 2 7,9    |
| Lillyhoe - - -         | 51 56 46,5 | 0 22 19,5                    | 1 29,3   |
| Lidlington - - -       | 52 1 54,0  | 0 32 21,7                    | 2 9,4    |
| Trusler Hill - - -     | 51 59 48,0 | 0 34 50,5                    | 2 19,3   |



ART. XXXIII. *Bearings of intersected Objects, from the Stations in the Series of 1797 and 1798, from the Parallels to the Meridians of Black Down, Butterson Hill, and St. Agnes Beacon; and likewise their Distances from those Meridians.*

*Meridian of Black Down.*

| Bearings from the Parallels to the Meridian. |   |   |              | Distances<br>from merid. | Distances<br>from perp. |
|----------------------------------------------|---|---|--------------|--------------------------|-------------------------|
|                                              |   |   |              | Feet.                    | Feet.                   |
| <i>At Moor Lynch.</i>                        |   |   |              |                          |                         |
| Walton Windmill                              | - | - | 75 12 31 S E | 51340                    | 156858                  |
| Westonzoyland Steeple                        | - | - | 63 42 36 S W | 46928                    | 154235                  |
| Middlezoy Steeple                            | - | - | 31 48 21 S W | 79339                    | 148733                  |
| Chedzoy Steeple                              | - | - | 85 18 45 N W | 90459                    | 163658                  |
| Higham Windmill                              | - | - | 29 57 17 S E | 58858                    | 140880                  |
| Higham Steeple                               | - | - | 22 51 39 S E | 62691                    | 142196                  |
| Bridgewater Spire                            | - | - | 88 39 25 S W | 104717                   | 161280                  |
| Somerton Steeple                             | - | - | 47 4 54 S E  | 41197                    | 134292                  |
| Burton Pynsent Obelisk                       | - | - | 10 35 4 S W  | 78428                    | 122688                  |
| <i>At Dundry.</i>                            |   |   |              |                          |                         |
| Puckle Steeple                               | - | - | 55 19 25 N E | 26010                    | 292363                  |
| Westleigh Steeple                            | - | - | 46 49 23 N E | 23610                    | 301818                  |
| Bristol Cathedral                            | - | - | 26 7 30 N E  | 11836                    | 279184                  |
| Redcliff Steeple                             | - | - | 33 8 32 N E  | 9407                     | 278007                  |
| Long Aston                                   | - | - | 0 51 38 N W  | 21696                    | 273385                  |
| Clifden Windmill                             | - | - | 9 52 50 N E  | 19281                    | 272172                  |
| Blaze Castle                                 | - | - | 1 49 16 N E  | 20268                    | 297874                  |
| Penpole Park Gazebo                          | - | - | 11 43 37 N W | 28680                    | 294155                  |
| Duke of Beaufort's House, Stoke              | - | - | 32 31 51 N E | 651                      | 294212                  |
| Durham Steeple                               | - | - | 63 28 33 N E | 38049                    | 289219                  |
| Knowle Steeple                               | - | - | 13 41 30 N E | 8112                     | 314410                  |
| Mangotsfield Steeple                         | - | - | 47 44 31 N E | 13923                    | 291677                  |
| Winterbown Steeple                           | - | - | 31 14 10 N E | 7056                     | 306569                  |
| Harfield Steeple                             | - | - | 20 11 9 N E  | 93478                    | 292526                  |
| Leigh on Mendip                              | - | - | 33 59 55 S E | 21483                    | 195794                  |
| Dundry Steeple                               | - | - | 71 23 20 S W | 22831                    | 259052                  |
| <i>At Long Knoll.</i>                        |   |   |              |                          |                         |
| Doulting Spire                               | - | - | 68 59 51 N W | 9544                     | 182322                  |
| Frome Steeple                                | - | - | 5 20 25 N W  | 52415                    | 198272                  |
| <i>At Farley Down.</i>                       |   |   |              |                          |                         |
| Devizes Steeple                              | - | - | 79 51 30 S E | 129342                   | 245113                  |
| Cold Aston Steeple                           | - | - | 33 43 21 N W | 44362                    | 277983                  |



## Meridian of Butterson Hill.

| Bearings from the Parallels to the Meridian. |             | Distances<br>from merid. | Distances<br>from perp. |
|----------------------------------------------|-------------|--------------------------|-------------------------|
| <i>At Furland.</i>                           |             | Feet.                    | Feet.                   |
| Hope's Nose - - -                            | 23 7 55 NE  | 93759                    | 18745                   |
| <i>At St. Stephen's.</i>                     |             |                          |                         |
| Werrington Steeple - - -                     | 29 37 23 NE | 109839                   | 92242                   |
| Boyton Steeple - - -                         | 0 55 35 NW  | 112767                   | 106733                  |
| St. Stephen's Steeple - - -                  | 45 55 4 SE  | 110738                   | 85968                   |
| North Petherwin Steeple - - -                | 49 15 49 NW | 125044                   | 98473                   |
| <i>At Carraton Hill.</i>                     |             |                          |                         |
| Stokeclimsland Steeple - - -                 | 65 56 2 NE  | 96381                    | 49922                   |
| Launceston Steeple - - -                     | 21 26 54 NE | 108267                   | 82689                   |
| Launceston Chapel - - -                      | 21 14 13 NE | 108513                   | 82561                   |

## Meridian of St. Agnes Beacon.

|                            |             |       |       |
|----------------------------|-------------|-------|-------|
| <i>At Bodmin.</i>          |             |       |       |
| St. Minvern Steeple - - -  | 58 18 36 NW | 79549 | 91845 |
| St. Minvern Windmill - - - | 61 51 46 NW | 99966 | 82260 |
| <i>At Trevoze Head.</i>    |             |       |       |
| St. Isey Steeple - - -     | 61 2 12 SE  | 68456 | 74082 |
| St. Merian Steeple - - -   | 57 59 32 SE | 52096 | 82476 |

ART. XXXIV. Bearings of intersected Objects, from the Stations in the Series of 1799, from the Parallels to the Meridians of Dunnose and Greenwich; and likewise their Distances from those Meridians.

## Meridian of Dunnose.

|                                  |             |        |        |
|----------------------------------|-------------|--------|--------|
| <i>At Epwell.</i>                |             |        |        |
| Warwick Steeple - - -            | 16 25 48 NW | 87242  | 607508 |
| St. Martin's, Coventry - - -     | 2 3 42 NW   | 69028  | 653327 |
| Soleyhul Spire - - -             | 31 8 35 NW  | 128826 | 654971 |
| <i>At Arbury Hill.</i>           |             |        |        |
| Dunchurch Windmill - - -         | 23 55 48 NW | 20724  | 626734 |
| Breadon Hill, Summer House - - - | 7 37 31 NW  | 26706  | 765038 |



| Bearings from the Parallels to the Meridian. |   |             | Distances<br>from merid. | Distances<br>from perp. |
|----------------------------------------------|---|-------------|--------------------------|-------------------------|
|                                              |   |             | Feet.                    | Feet.                   |
| Markfield Windmill                           | - | 5 20 7 NW   | 18608                    | 755819                  |
| Newnham Windmill                             | - | 59 36 2 NE  | 2261                     | 589244                  |
| <i>At Corley Hill.</i>                       |   |             |                          |                         |
| Gazebo, Breaddon Hill                        | - | 35 45 58 SW | 188086                   | 525408                  |
| <i>At Crouch Hill.</i>                       |   |             |                          |                         |
| Deddington Steeple                           | - | 18 6 0 SE   | 28646                    | 499771                  |
| Bloxham Spire                                | - | 16 35 11 SW | 39519                    | 511110                  |
| Aynoe Steeple                                | - | 49 26 2 SE  | 11944                    | 501902                  |
| Adderbury Spire                              | - | 37 26 59 SE | 26213                    | 509671                  |
| Farthingo Steeple                            | - | 56 26 49 SE | 6431                     | 502904                  |
| <i>At Arbury Hill.</i>                       |   |             |                          |                         |
| Round House, Edge Hills                      | - | 56 15 5 SW  | 57501                    | 549724                  |
| Windmill, near the Round House               | - | 55 39 29 SW | 58398                    | 548286                  |
| <i>At Brill.</i>                             |   |             |                          |                         |
| Wingrove Steeple                             | - | 81 17 5 NE  | 103826                   | 454713                  |
| Hardwick Steeple                             | - | 78 6 1 NE   | 83299                    | 454687                  |
| Luggersal Steeple                            | - | 44 56 1 NE  | 35106                    | 419401                  |
| Granborough Steeple                          | - | 53 9 30 NE  | 70782                    | 474574                  |
| Bicester Steeple                             | - | 43 27 16 NW | 6854                     | 466560                  |
| Marq. Buckingham's House, Wooton             | - | 79 17 25 NE | 43490                    | 445984                  |
| Islip Steeple                                | - | 84 26 3 SW  | 8944                     | 439540                  |
| Woodstock Steeple                            | - | 85 25 45 NW | 35563                    | 448393                  |
| Kidlington Spire                             | - | 88 29 39 SW | 18401                    | 441989                  |
| Witchwood Beacon                             | - | 89 11 34 SW | 76971                    | 444726                  |
| <i>At Whitehorse Hill.</i>                   |   |             |                          |                         |
| Abingdon Spire                               | - | 62 38 18 NE | 19054                    | 383037                  |
| Wallingford Steeple                          | - | 84 54 39 NE | 17497                    | 358560                  |
| Great Coxwell Windmill                       | - | 25 45 11 NW | 96959                    | 376819                  |
| Drayton Steeple                              | - | 67 28 0 NE  | 24691                    | 374055                  |
| Highworth Steeple                            | - | 57 49 58 NW | 116343                   | 370003                  |
| Witney Spire                                 | - | 14 14 57 NE | 64787                    | 424386                  |
| Bampton Steeple                              | - | 4 36 29 NE  | 79056                    | 408334                  |
| Radley Steeple                               | - | 61 25 12 NE | 12123                    | 388573                  |
| Buckland Steeple                             | - | 20 8 12 NE  | 69616                    | 388204                  |
| <i>At Stow.</i>                              |   |             |                          |                         |
| Stow on the Wold Steeple                     | - | 20 55 25 NW | 118442                   | 479166                  |
| <i>At Broadway.</i>                          |   |             |                          |                         |
| Sarsden Chapel                               | - | 52 29 8 SE  | 86195                    | 469777                  |
| Bourton Chapel                               | - | 54 36 35 SE | 125636                   | 501076                  |
| Walford Spire                                | - | 82 38 42 SE | 93704                    | 507924                  |



## Meridian of Greenwich.

| Bearings from the Parallels to the Meridian. |   |             | Distances<br>from merid. | Distances<br>from perp. |
|----------------------------------------------|---|-------------|--------------------------|-------------------------|
| <i>At Wendover.</i>                          |   |             | Feet.                    | Feet.                   |
| Pitchcot Windmill                            | - | 19 11 59 NW | 191077                   | 149055                  |
| Ivinghoe Spire                               | - | 45 44 37 NE | 143127                   | 131397                  |
| Quainton Steeple                             | - | 34 47 15 NW | 205750                   | 146203                  |
| Leighton Buzzard Spire                       | - | 21 41 12 NE | 150616                   | 160663                  |
| <i>At Quainton.</i>                          |   |             |                          |                         |
| Southern Obelisk, Stow Park                  | - | 22 1 36 NW  | 227554                   | 204673                  |
| Northern Obelisk, ditto                      | - | 21 50 48 NW | 228505                   | 207532                  |
| <i>At Kinsworth.</i>                         |   |             |                          |                         |
| Aylesbury Spire                              | - | 77 56 58 SW | 190234                   | 126763                  |
| Maulden Steeple                              | - | 16 30 28 NE | 102962                   | 202124                  |
| Harlington Steeple                           | - | 16 12 37 NE | 110395                   | 177730                  |
| Millbrook Steeple                            | - | 3 1 41 NE   | 117732                   | 201645                  |
| Stretley Steeple                             | - | 35 23 47 NE | 99961                    | 171044                  |
| Sauldon Windmill                             | - | 60 20 46 NW | 178643                   | 174431                  |
| <i>At Bow Brickhill.</i>                     |   |             |                          |                         |
| Hanslope Spire                               | - | 38 58 48 NW | 185668                   | 232843                  |
| North Crawley Steeple                        | - | 9 41 15 NE  | 145529                   | 224961                  |
| Pavenham Spire                               | - | 22 15 49 NE | 122215                   | 261812                  |
| St. Paul's Spire, Bedford                    | - | 43 9 11 NE  | 104408                   | 240631                  |
| Sharnbrook Spire                             | - | 19 21 54 NE | 123533                   | 269816                  |
| Woburn Market-House                          | - | 73 52 37 SE | 139255                   | 186978                  |
| Ridgemont Station                            | - | 72 28 11 NE | 130927                   | 196964                  |
| Wootton Spire                                | - | 41 33 7 NE  | 120265                   | 225635                  |
| Cranfield Spire                              | - | 30 44 22 NE | 136284                   | 215933                  |
| Husborne Crawley Steeple                     | - | 65 44 51 NE | 136827                   | 197064                  |
| Woburn Steeple                               | - | 75 33 58 SE | 139373                   | 187394                  |
| Souldrop Spire                               | - | 16 32 49 NE | 124861                   | 279861                  |
| Windmill near Tharfield                      | - | 86 6 12 NE  | 12577                    | 199950                  |
| Tottenhoe Station                            | - | 27 42 7 SE  | 130412                   | 150494                  |
| Chalgrave Steeple                            | - | 53 51 5 SE  | 116215                   | 164780                  |
| Keysoe Spire                                 | - | 31 17 59 NE | 95682                    | 282155                  |
| Moulshoe Steeple                             | - | 2 19 30 NW  | 152432                   | 215608                  |
| Renhold Spire                                | - | 44 56 16 NE | 91651                    | 250385                  |
| Lidlington Windmill                          | - | 62 30 6 NE  | 125855                   | 203797                  |
| <i>At Lillyhoe.</i>                          |   |             |                          |                         |
| Knotting Green Elm Tree                      | - | 16 17 56 NW | 117482                   | 285139                  |
| Ravensden Steeple                            | - | 7 25 2 NW   | 95142                    | 255304                  |
| Bow Brickhill Steeple                        | - | 73 20 18 NW | 151490                   | 191501                  |



| Bearings from the Parallels to the Meridian. |   |              | Distances<br>from merid. | Distances<br>from perp. |
|----------------------------------------------|---|--------------|--------------------------|-------------------------|
|                                              |   |              | Feet.                    | Feet.                   |
| Colmworth Spire                              | - | 0 12 52 N W  | 84580                    | 268984                  |
| Sundon Windmill                              | - | 75 0 6 S W   | 109032                   | 164718                  |
| Silsoe Steeple                               | - | 26 9 25 N W  | 95501                    | 194345                  |
| Flitton Steeple                              | - | 38 20 32 N W | 102831                   | 194903                  |
| Shillington Steeple                          | - | 7 49 43 N E  | 81919                    | 188066                  |
| Westoning Steeple                            | - | 64 42 19 N W | 113366                   | 185143                  |
| Wrest-Garden Obelisk                         | - | 26 26 8 N W  | 94797                    | 192652                  |
| Flitwick Steeple                             | - | 57 11 27 N W | 114694                   | 191016                  |
| Amphill Steeple                              | - | 39 6 3 N W   | 109957                   | 203041                  |
| St. Neot's Steeple                           | - | 13 32 16 N E | 59630                    | 273475                  |
| Pollux Hill Steeple                          | - | 47 5 30 N W  | 102236                   | 188118                  |

ART. XXXV. *Latitudes and Longitudes of such Places, in the Series of 1797 and 1798, as have been referred to the Meridians of Black Down, Butterson Hill, and St. Agnes Beacon.*

*Meridian of Black Down.*

| Names of the Objects.           | Latitude.  | Longitude from<br>Black Down. | Longitude west of Greenwich. |          |
|---------------------------------|------------|-------------------------------|------------------------------|----------|
|                                 |            |                               | In degrees.                  | In time. |
| Walton Windmill                 | 51 6 59.5  | 0 13 22.1 W                   | 2 45 44.5                    | 11 2.9   |
| Westonzoyland Steeple           | 51 6 33.8  | 0 12 12.9 W                   | 2 44 35.3                    | 10 58.3  |
| Middlezoy Steeple               | 51 5 38.3  | 0 20 38.8 W                   | 2 53 1.2                     | 11 32.1  |
| Chedzoy Steeple                 | 51 8 5.1   | 0 23 33.7 W                   | 2 55 56.1                    | 11 43.7  |
| Higham Windmill                 | 51 4 21.8  | 0 15 18.6 W                   | 2 47 41.0                    | 11 10.7  |
| Higham Steeple                  | 51 4 34.6  | 0 16 18.5 W                   | 2 48 40.9                    | 11 14.7  |
| Bridgewater Spire               | 51 7 40.7  | 0 27 16.3 W                   | 2 59 38.7                    | 11 58.6  |
| Somerton Steeple                | 51 3 17.3  | 0 10 42.7 W                   | 2 43 5.1                     | 10 52.3  |
| Burton Pynsent Obelisk          | 51 1 21.6  | 0 20 22.7 W                   | 2 52 45.1                    | 11 31    |
| Westleigh Steeple               | 51 30 49.4 | 0 6 12.0 E                    | 2 26 10.4                    | 9 44.7   |
| Bristol Cathedral               | 51 27 6.3  | 0 3 6.2 W                     | 2 35 28.6                    | 10 21.9  |
| Redcliff Steeple                | 51 26 54.8 | 0 2 28.0 W                    | 2 34 50.4                    | 10 19.3  |
| Long Aston                      | 51 26 9.1  | 0 5 41.3 W                    | 2 38 3.7                     | 10 32.2  |
| Clifden Windmill                | 51 25 57.2 | 0 5 3.3 W                     | 2 37 25.7                    | 10 29.7  |
| Blaze Castle                    | 51 30 10.4 | 0 5 19.3 W                    | 2 37 41.7                    | 10 30.8  |
| Penpole Gazebo                  | 51 29 33.7 | 0 7 31.7 W                    | 2 39 54.1                    | 10 39.6  |
| Duke of Beaufort's House, Stoke | 51 29 34.5 | 0 0 10.2 E                    | 2 32 12.2                    | 10 8.8   |
| Durham Steeple                  | 51 28 44.8 | 0 9 59.0 E                    | 2 22 23.4                    | 9 29.5   |
| Knowle Steeple                  | 51 32 53.7 | 0 2 7.9 W                     | 2 34 30.3                    | 10 18    |
| Mangotsfield Steeple            | 51 29 9.5  | 0 3 39.2 E                    | 2 28 43.2                    | 9 54.8   |
| Winterbown Steeple              | 51 31 36.4 | 0 1 51.2 E                    | 2 30 31.2                    | 10 2.1   |
| Harfield Steeple                | 51 29 15.3 | 0 24 32.2 W                   | 2 56 54.6                    | 11 47.6  |
| Leigh Steeple on Mendip         | 51 13 24.  | 0 5 36.3 E                    | 2 26 46.1                    | 9 47.1   |
| Dundry Steeple                  | 51 23 47.7 | 0 5 58.8 W                    | 2 38 21.2                    | 10 33.4  |



| Names of the Objects. | Latitude.  | Longitude from<br>Black Down. | Longitude west of Greenwich. |                 |
|-----------------------|------------|-------------------------------|------------------------------|-----------------|
|                       |            |                               | In degrees.                  | In time.        |
| Doultling Spire - -   | 51 11 11,4 | 0 2 29,3 E                    | 0 29 53,1                    | m. s.<br>9 59,5 |
| Devizes Steeple - -   | 51 21 25,5 | 0 33 51,2 E                   | 2 58 31,2                    | 11 54,1         |
| Frome Steeple - -     | 51 13 47,9 | 0 13 40,8 E                   | 2 18 41,6                    | 9 14,7          |
| Cold Aston - -        | 51 26 53,9 | 0 11 38,0 E                   | 2 20 44,4                    | 9 24,9          |
| Puckle Steeple - -    | 51 29 16,2 | 0 6 49,6 E                    | 2 25 32,8                    | 9 42,2          |

*Meridian of Butterson Hill.*

| Names of Objects.        | Latitude.  | Longitude from<br>Butterson Hill. | Longitude west of Greenwich. |                  |
|--------------------------|------------|-----------------------------------|------------------------------|------------------|
|                          |            |                                   | In degrees.                  | In time.         |
| Hope's Nose, Torbay -    | 50 27 48,5 | 0 26 4,4 E                        | 0 26 43,1                    | m. s.<br>13 46,9 |
| Werrington Steeple -     | 50 39 52,2 | 0 28 19,4 W                       | 4 21 6,9                     | 17 24,4          |
| Boyton Steeple - -       | 50 42 14,9 | 0 29 6,1 W                        | 4 21 53,6                    | 17 27,5          |
| North Petherwin - -      | 50 40 52,5 | 0 32 15,3 W                       | 4 25 2,8                     | 17 40,2          |
| St. Stephen's Steeple -  | 50 38 50,3 | 0 28 32,6 W                       | 4 21 20,1                    | 17 25,3          |
| Stokeclimsland Steeple - | 50 32 55,8 | 0 24 47,5 W                       | 4 17 35,0                    | 17 10,3          |
| Launceston Steeple -     | 50 38 18,1 | 0 27 54,1 W                       | 4 20 41,6                    | 17 22,7          |
| Launceston Castle -      | 50 38 16,8 | 0 27 57,9 W                       | 4 20 45,4                    | 17 23            |

*Meridian of St. Agnes Beacon.*

| Names of Objects.      | Latitude.  | Longitude from<br>St. Agnes Beacon. | Longitude west of Greenwich. |                  |
|------------------------|------------|-------------------------------------|------------------------------|------------------|
|                        |            |                                     | In degrees.                  | In time.         |
| St. Minvern Steeple -  | 50 33 30,6 | 0 20 28,1 E                         | 0 51 27,6                    | m. s.<br>19 25,8 |
| St. Minvern Windmill - | 50 31 55,5 | 0 23 23,5 E                         | 4 48 32,2                    | 19 14,1          |
| St. Isey Steeple - -   | 50 30 36,0 | 0 17 36,6 E                         | 4 54 20,1                    | 19 37,3          |
| St. Merian Steeple -   | 50 31 59,3 | 0 13 23,8 E                         | 4 58 31,9                    | 19 54,1          |

ART. XXXVI. *Latitudes and Longitudes of such Places, in the Series of 1799, as have been referred to the Meridians of Dunnose and Greenwich.*

*Meridian of Dunnose.*

| Names of Objects.            | Latitude.  | Longitude from<br>Dunnose. | Longitude west of Greenwich. |                 |
|------------------------------|------------|----------------------------|------------------------------|-----------------|
|                              |            |                            | In degrees.                  | In time.        |
| Warwick Steeple -            | 52 16 53,0 | 0 23 18,3 W                | 0 34 54,3                    | m. s.<br>6 19,6 |
| St. Martin's Spire, Coventry | 52 24 25,4 | 0 18 29,5 W                | 1 30 5,5                     | 6 0,3           |
| Soleyhull Spire - -          | 52 2 30,4  | 0 34 13,8 W                | 1 45 49,3                    | 9 3,3           |
| Dunchurch Windmill -         | 52 20 4,6  | 0 5 32,5 W                 | 1 17 8,5                     | 5 8,6           |



| Names of Objects.        | Latitude.  | Longitude<br>from Dunnose. | Longitude west of Greenwich. |          |
|--------------------------|------------|----------------------------|------------------------------|----------|
|                          |            |                            | In degrees.                  | In time. |
|                          | ° ' "      | ° ' "                      | ° ' "                        | m. s.    |
| Gazebo, Bardon Hill *    | 52 42 47.6 | 0 7 12.2 W                 | 1 18 48.2                    | 5 15.2   |
| Markfield Windmill -     | 52 41 16.8 | 0 5 1.0 W                  | 1 16 37.0                    | 5 6.5    |
| Breadon Hill Building †  | 52 3 16.7  | 0 49 59.7 W                | 2 1 35.7                     | 8 6.4    |
| Newnham Windmill -       | 52 13 55.7 | 0 0 36.2 E                 | 1 10 59.8                    | 4 43.9   |
| Deddington Steeple -     | 51 59 13.9 | 0 7 36.1 W                 | 1 19 12.1                    | 5 16.8   |
| Bloxham Spire -          | 52 1 5.6   | 0 10 29.7 W                | 1 22 5.7                     | 5 28.4   |
| Aynoe Steeple -          | 51 59 35.2 | 0 3 10.2 W                 | 1 14 46.2                    | 4 59.1   |
| Adderbury Spire -        | 52 0 51.6  | 0 6 3.7 W                  | 1 17 39.7                    | 5 10.6   |
| Farthingo Steeple -      | 51 59 45.1 | 0 1 42.4 W                 | 1 13 18.4                    | 4 53.2   |
| Round House, Edge Hills  | 52 7 25.6  | 0 15 18.4 W                | 1 26 54.4                    | 5 47.6   |
| Round House Windmill -   | 52 7 11.4  | 0 15 32.6 W                | 1 27 8.6                     | 5 48.6   |
| Wingrove Steeple -       | 51 51 46.8 | 0 27 28.7 E                | 0 44 7.3                     | 2 56.5   |
| Hardwick Steeple -       | 51 51 47.8 | 0 22 2.6 E                 | 0 49 33.4                    | 3 18.2   |
| Luggersal Steeple, Bucks | 51 50 57.3 | 0 9 17.2 E                 | 1 2 18.8                     | 4 9.2    |
| Granborough Steeple -    | 51 55 4.3  | 0 18 45.2 E                | 0 52 50.8                    | 3 31.4   |
| Bicester Steeple -       | 51 53 46.8 | 0 1 48.9 E                 | 1 9 47.1                     | 4 39.1   |
| Abingdon Spire -         | 51 40 3.8  | 0 5 1.2 W                  | 1 16 37.2                    | 5 6.5    |
| Wallingford Steeple -    | 51 36 2.4  | 0 4 36.2 E                 | 1 6 59.8                     | 4 27.9   |
| Great Coxwell Windmill   | 51 38 59.8 | 0 25 32.4 W                | 1 37 8.4                     | 6 28.5   |
| Drayton Steeple -        | 51 38 35   | 0 6 30.1 W                 | 1 18 6.1                     | 5 12.4   |
| Highworth Steeple -      | 51 37 51.4 | 0 30 38.1 W                | 1 42 14.1                    | 6 48.9   |
| Witney Spire -           | 51 46 49.9 | 0 17 6.9 W                 | 1 28 42.9                    | 5 54.8   |
| Bampton Steeple -        | 51 44 11.2 | 0 20 51.9 W                | 1 32 27.9                    | 6 9.8    |
| Radley Steeple -         | 51 40 58.3 | 0 31 57.4 W                | 1 43 33.4                    | 6 54.2   |
| Buckland Steeple -       | 51 40 53.3 | 0 18 21.1 W                | 1 29 57.1                    | 5 59.8   |
| Witchwood Beacon -       | 51 50 9.8  | 0 20 21.6 W                | 1 31 57.6                    | 6 7.8    |
| Stow on the Wold -       | 51 55 46.9 | 0 31 23.6 W                | 1 42 59.6                    | 6 51.9   |
| Sarsden Chapel -         | 51 54 16.4 | 0 22 49.9 W                | 1 34 25.9                    | 6 17.7   |
| Bourton Chapel -         | 51 59 22.5 | 0 33 20.7 W                | 1 44 56.7                    | 6 59.8   |
| Walford Spire -          | 52 0 31.6  | 0 26 12.5 W                | 1 37 48.5                    | 6 31.2   |
| Islip Steeple -          | 51 49 20.7 | 0 2 21.9 W                 | 1 13 57.9                    | 4 55.8   |
| Woodstock Steeple -      | 51 50 47.4 | 0 9 24.5 W                 | 1 21 0                       | 5 24     |
| Kidlington Spire -       | 51 49 44.6 | 0 4 51.9 W                 | 1 16 27.9                    | 5 5.8    |

## Meridian of Greenwich.

| Names of Objects.           | Latitude.  | Longitude west of Greenwich. |          |
|-----------------------------|------------|------------------------------|----------|
|                             |            | In degrees.                  | In time. |
|                             | ° ' "      | ° ' "                        | m. s.    |
| Pitchcot Windmill -         | 51 52 58.5 | 0 50 35.5                    | 3 22.3   |
| Ivinghoe Spire -            | 51 50 9.1  | 0 37 51.3                    | 2 31.4   |
| Quainton Steeple -          | 51 52 28.7 | 0 54 28.0                    | 3 37.8   |
| Southern Obelisk, Stow Park | 52 2 2.2   | 1 0 27.1                     | 4 1.8    |
| Northern Obelisk, ditto -   | 50 2 30.2  | 1 0 42.9                     | 4 2.8    |

\* In page 658, this is, by mistake, called Breadon Hill Summer House.

† In page 659, this building is called Gazebo.



| Names of Objects.         | Latitude.                              | Longitude west of Greenwich,           |          |
|---------------------------|----------------------------------------|----------------------------------------|----------|
|                           |                                        | In degrees.                            | In time. |
|                           | <sup>o</sup> <sup>'</sup> <sup>"</sup> | <sup>o</sup> <sup>'</sup> <sup>"</sup> | m. s.    |
| Leighton Buzzard Spire    | 51 54 56,5                             | 0 39 54,4                              | 2 39,6   |
| Aylesbury Spire           | 51 49 18,9                             | 0 50 18                                | 3 21,2   |
| Hanslope Spire            | 52 6 45,2                              | 0 49 17,8                              | 3 17,2   |
| North Crawley Spire       | 52 5 31,1                              | 0 38 38,4                              | 2 34,5   |
| Pavenham Spire            | 52 11 36,3                             | 0 32 27,0                              | 2 9,8    |
| St. Paul's Spire, Bedford | 52 8 8,8                               | 0 27 43,3                              | 1 50,9   |
| Sharnbrook Spire          | 52 12 55,1                             | 0 32 48,0                              | 2 11,2   |
| Woburn Market-House       | 51 59 17,4                             | 0 36 58,5                              | 2 27,9   |
| Woburn Steeple            | 51 59 21,8                             | 0 37 0,3                               | 2 28     |
| Ridgmont Station          | 52 0 56,4                              | 0 34 45,7                              | 2 19     |
| Wootton Steeple           | 52 5 39,2                              | 0 31 55,7                              | 2 7,7    |
| Cranfield Spire           | 52 4 3,1                               | 0 36 11,1                              | 2 24,7   |
| Husborne Crawley Steeple  | 52 0 57,0                              | 0 36 19,8                              | 2 25,3   |
| Souldrop Steeple          | 52 14 38,6                             | 0 33 9,1                               | 2 12,6   |
| Windmill near Tharfield   | 52 1 30,9                              | 0 3 20,4                               | 0 13,3   |
| Tottenham Station         | 51 53 18,9                             | 0 34 37,5                              | 2 18,5   |
| Chalgrave Steeple         | 51 55 40,2                             | 0 30 51,4                              | 2 3,4    |
| Keysoe Spire              | 52 14 58,5                             | 0 25 24,3                              | 1 41,6   |
| Moulshoe Steeple          | 52 2 59,0                              | 0 40 39,6                              | 2 42,6   |
| Renhold Spire             | 52 9 41,5                              | 0 24 20,1                              | 1 37,3   |
| Lidlington Windmill       | 52 2 4,2                               | 0 33 25,0                              | 2 13,7   |
| Maulden Steeple           | 52 1 52,2                              | 0 27 20,2                              | 1 49,3   |
| Harlington Steeple        | 51 57 48,4                             | 0 29 18,6                              | 1 57,2   |
| Millbrook Steeple         | 52 1 43,6                              | 0 31 15,5                              | 2 5      |
| Stretley Steeple          | 51 56 42,8                             | 0 26 12,4                              | 1 44,8   |
| Sauldon Windmill          | 51 57 9,7                              | 0 47 26,9                              | 3 9,8    |
| Knotting-Green Elm Tree   | 52 15 26,6                             | 0 31 11,5                              | 2 4,7    |
| Ravensden Steeple         | 52 10 33,9                             | 0 25 15,7                              | 1 41     |
| Bow Brickhill Steeple     | 52 0 1,1                               | 0 40 13,4                              | 2 40,9   |
| Colmworth Spire           | 52 12 49,3                             | 0 22 27,0                              | 1 28,5   |
| Sundon Windmill           | 51 57 52,2                             | 0 28 57,0                              | 1 55,8   |
| Silsoe Steeple            | 52 0 33,0                              | 0 25 21,4                              | 1 41,4   |
| Flitton Steeple           | 52 0 42,1                              | 0 27 14,4                              | 1 48,9   |
| Shillington Steeple       | 51 59 31,7                             | 0 21 45,0                              | 1 27     |
| Westoning Steeple         | 51 59 2,7                              | 0 30 5,9                               | 2 0,4    |
| Wrest-Garden Obelisk      | 52 0 16,2                              | 0 25 10,7                              | 1 40,7   |
| Flitwick Steeple          | 51 59 58,6                             | 0 30 27,1                              | 2 1,8    |
| Amphill Steeple           | 52 1 57,8                              | 0 29 11,7                              | 1 56,7   |
| St. Neot's Steeple        | 52 13 34,7                             | 0 15 49,9                              | 1 3,3    |
| Pollux Hill Steeple       | 51 59 31,2                             | 0 27 8,7                               | 1 48,6   |



ART. XXXVII. *Latitudes and Longitudes of some remarkable Places, not contained in the preceding Tables.*

*St. Nicholas's or Drake's Island, in Plymouth Sound.*

The bearing of Kit Hill, from the meridian of Butterson, is  $67^{\circ} 12' 12''$ , and the angle between it and the flagstaff on Drake's Island,  $41^{\circ} 40' 8''$ ; therefore, the bearing of the latter from the meridian is  $71^{\circ} 7' 40''$ ; consequently, its distance from the meridian is 60531 feet, and from the perpendicular 20692 feet, which respectively subtend  $9' 53'' 6$ , and  $3' 24'' 5$ . These, with the latitude and longitude of Butterson,  $50^{\circ} 24' 46'' 3$  and  $3^{\circ} 52' 47'' 5$ , give  $50^{\circ} 21' 21'' 1$  for the latitude, and  $4^{\circ} 8' 17'' 9$  for the longitude, of the flagstaff on Drake's Island.

The latitude and longitude of this spot was determined by Mr. BAYLEY, in the year 1792. The observations for the former were as follows :

|                       |                                                        |
|-----------------------|--------------------------------------------------------|
| $50^{\circ} 21' 20''$ | ☉'s LL.                                                |
| $50^{\circ} 21' 30,5$ | ditto.                                                 |
| $50^{\circ} 21' 31$   | ditto.                                                 |
| $50^{\circ} 21' 29$   | α Aquilæ.                                              |
| $50^{\circ} 21' 26,5$ | α Ophiuchi.                                            |
| $50^{\circ} 21' 55$   | ☉'s LL. The mean of these is $50^{\circ} 21' 28'' 5$ . |

The place chosen by Mr. BAYLEY, as I have been lately informed, was a few feet northward of the staff; therefore,  $7'' 4$  may be taken for the true difference between our determinations.

The longitude of Mr. BAYLEY's station, found by the moon's transit, was  $4^{\circ} 18' 52''$ ; but the longitude deduced from the recent operations, is  $4^{\circ} 8' 17'' 9$ ; there is, therefore, a difference of  $10' 34'' 1$  between the two determinations.



*St. Andrew's or the Old Church, at Plymouth.*

The angle at Butterson, between the Old Church tower and Kit Hill, is  $37^{\circ} 45' 5'', 2$ ; its bearing, therefore, south-west from the meridian, is  $75^{\circ} 1' 56''$ ; consequently, its distance from the meridian is 57505 feet, and from the perpendicular 15374 feet. These respectively subtend  $9' 24''$ , and  $2' 32'', 1$ : hence, its latitude becomes  $50^{\circ} 22' 13'', 6$ , and longitude  $4^{\circ} 7' 31'', 6 = 16^m 30^s, 1$  in time, west of Greenwich.

As it is of very great importance that the truths of the conclusions given in this Work should receive support, wherever I can find it, I think it right to mention the result of his Excellency the Count de BRUHL's endeavours to ascertain the longitude of Plymouth, by means of chronometers. The following is a copy of his communication, made in the year 1795.

*Journey from Plymouth to London.**Green Timekeeper.*

|                         |   |                                                    |               |
|-------------------------|---|----------------------------------------------------|---------------|
| June 8th,               | { | Mr. MUDGE's clock* at Plymouth, fast for mean time | $0^m 32', 15$ |
| 1783.                   | { | Timekeeper faster than Mr. MUDGE's clock           | - 0 25, 6     |
|                         | { | Timekeeper slower than London clock                | - 14 29, 4    |
| 14th.                   | { | London clock slow for mean time                    | - 0 36, 5     |
| Difference of longitude |   |                                                    | - 16 3, 65    |

*Blue Timekeeper.*

|                         |   |                                                   |               |
|-------------------------|---|---------------------------------------------------|---------------|
| June 8th,               | { | Mr. MUDGE's clock at Plymouth, fast for mean time | $0^m 32', 15$ |
|                         | { | Timekeeper faster than Mr. MUDGE's clock          | - 0 37, 4     |
|                         | { | Timekeeper slower than London clock               | - 14 17, 2    |
| 14th.                   | { | London clock slow for mean time                   | - 0 36, 5     |
| Difference of longitude |   |                                                   | - 16 3, 25    |
| Mean difference         |   |                                                   | - 16 3, 55    |

The longitude of St. Paul's, west of Greenwich, is  $23', 1$  in

\* It is, perhaps, right to observe, that Mr. T. MUDGE's transit, at Plymouth, was made by the late Mr. BIRD, and properly set up between stone pillars. The clock, the entire work of his own hands, was a most excellent one.



time; and Mr. DUTTON's house in Fleet-street is about  $2^s$  west of St. Paul's; \* wherefore, its longitude west of Greenwich is  $25^s$ : consequently,  $16^m 3^s,55 + 25^s = 16^m 28^s,55$ , is the difference of longitude between Greenwich and Plymouth, as shewn by the timekeepers.

Now the meridian of Mr. MUDGE's transit-room, at Plymouth, passed only 35 feet to the eastward of the centre of St. Andrew's Tower, his northern meridian mark being on the church itself; therefore, the longitude of the church and transit-room may be considered the same. From the survey, we find it to be  $16^m 30^s,1$ ; and, from Count BRUHL's determination, making a just allowance for the difference of longitude between the late Mr. DUTTON's house and Greenwich,  $16^m 28^s,5$ .

It is left for the public, and this learned Society in particular, to determine how far the near agreement of these several methods, tends to corroborate the assertion I have advanced, of the dependence which may be placed on the deductions drawn from the observations made at Beachy Head and Dunnose. If there had been only one watch employed on the occasion, the result would not have been so satisfactory as the circumstance of two being used seems to make it. As the occasion calls for the remark, before I dismiss this article, I must observe, that the highest advantages would accrue to geography, were the ideas of the Astronomer Royal carried into execution, (and which I shall endeavour to do at some future period,) respecting the discovery of the difference of longitude between Greenwich and some very remote point on the western side of the island, (St. David's Head for instance,) by means of timekeepers,

\* According to HORWOOD's Map of London, the distance from the centre of St. Paul's to Bolt Court, at the corner of which Mr. DUTTON's house is situated, is 31 chains.



carried backwards and forwards in the mail coaches. If this excellent scheme were executed, and the watches employed equal to the best now made, it is probable that the true difference of longitude would shortly be determined. The geodetical situation of St. David's Head will, ere long, be ascertained from a prosecution of the survey: a knowledge, therefore, of its true longitude would be attended with eminent advantages.

*Lizard Light-Houses.*

The light-houses on this head-land were observed from Pertinney and Karnbonellis. At the latter, Pertinney bears  $74^{\circ} 22' 41''$  south-west, from the parallel to the meridian of St. Agnes; and, as the angle between the western light-house and Pertinney is  $78^{\circ} 40' 5''$ , it follows, that the bearing of the light-house from the said parallel is  $4^{\circ} 17' 24''$  south-east. Computing with this angle and the distance from Karnbonellis to the light-house, we get 3344 feet, and 126499 feet, for the distances of that object from the meridian and perpendicular of St. Agnes: therefore, admitting the length of the degree in the meridian, in the middle point between St. Agnes and the light-house, to be 60850 fathoms, and 61182 for the length of a degree of a great circle perpendicular to it, we get  $20' 47''.4$ , and  $32''.8$ , for the small arcs which those spaces respectively subtend. These *data*, with the latitude and longitude of St. Agnes,  $50^{\circ} 18' 27''$ , and  $5^{\circ} 11' 55''.7$ , give the latitude of the light-house =  $49^{\circ} 57' 44''$ , and longitude west of Greenwich  $5^{\circ} 11' 4''.8$ , in time,  $20^m 44^s.3$ .

This light-house was also observed from the station on Karnminnis. The triangle resulting from that observation, together with the angle at Karnbonellis, is



Karnminnis - -  $44^{\circ} 9' 46''$   
 Karnbonellis - -  $98 \ 1 \ 30$

Western Light-house  $37 \ 48 \ 44$ ; which gives  $81342$  feet, for the distance between the station Karnbonellis and the Light-house. This distance is said, in the Philosophical Transactions for 1797, p. 501, to be  $81348$  feet, which differs only 6 feet from the above determination; but it is probable the distance first given is most correct, as the two light-houses appearing nearly in the same line at Karnminnis, was the means of preventing us from clearly distinguishing the apex of either, and it was principally on this account that we preferred the observation made at Pertinney. The agreement however proves, that no inconsistency can be found to obtain with respect to the data before given, for settling the situation of this important headland.

In the Philosophical Transactions for 1797, page 502, it is mentioned, that the distance from the spot where the late Mr. BRADLEY made his observations, to the place where his meridian mark was fixed, was 800 feet. But there appears to be some inconsistency in this particular; as Mr. BRADLEY's own words, in an extract of a letter now before me, are, *it was just 480 feet*. Adding to this,  $24$  feet, the distance between the place of the meridian mark and the line joining the centre of the light-houses, we get the distance of the point O, or the place of the Observatory, (see Phil. Trans. 1797, p. 502,) from the line joining the light-houses W, E, =  $504$  feet; a space corresponding to  $5''$  of latitude, nearly; therefore, from the trigonometrical operations, we get,

$49^{\circ} 57' 44''$  for the latitude } of Mr. BRADLEY's station.  
 and  $5 \ 11 \ 4,8$  for the longitude }



Mr. BRADLEY's observations for finding the latitude, were made with a quadrant of one foot radius, the workmanship of Mr. BIRD; they were as follows.

Nine meridional altitudes of the sun's limb, the extreme results of which were  $49^{\circ} 57' 27''.5$  and  $49^{\circ} 57' 44''$ , gave for the latitude of the Observatory - - -  $49^{\circ} 57' 35''$

Six meridional observations of the Pole Star below the Pole, the extreme results of which were  $49^{\circ} 57' 35''$  and  $49^{\circ} 57' 20''.4$ , gave for the latitude - - -  $49^{\circ} 57' 23''.2$

Thirteen observations of Arcturus,  $\alpha$  Coronæ Borealis, and  $\alpha$  Serpentis, the extreme results of which were  $49^{\circ} 57' 54''.7$  and  $49^{\circ} 57' 2''.7$ , gave for the latitude - - -  $49^{\circ} 57' 29''$

Fifteen observations of  $\alpha$ ,  $\beta$ ,  $\gamma$  Draconis, the extreme results of which were  $49^{\circ} 57' 22''.2$  and  $49^{\circ} 57' 2''.7$ , gave for the latitude - - -  $49^{\circ} 57' 33''$

The mean of which is -  $49^{\circ} 57' 30''$

According to the trigonometrical operations, the latitude is  $49^{\circ} 57' 44''$ ; there is, therefore, a difference of  $14''$  between the results; a quantity so large as justly to excite surprise, if it were not generally understood, that much dependance cannot be placed on observations made with an astronomical quadrant precisely similar to that made use of by Mr. BRADLEY. The *extreme* results in the above, differ so widely as to authorise the truth of the supposition on this occasion.

The longitude of the Lizard was determined by the transit of Venus, Sun's eclipse, transit of the Moon, and two emersions



of Jupiter's first satellite, as particularly set forth in the Preface to the Nautical Ephemeris of 1791. The conclusions were as follows.

|                                                        |                    |   |   |   |                                    |
|--------------------------------------------------------|--------------------|---|---|---|------------------------------------|
| Four transits of the Moon, calculated by Mr. WALES,    |                    |   |   |   |                                    |
| gave for the longitude                                 | -                  | - | - | - | 20 <sup>m</sup> 30 <sup>s</sup> ,6 |
| Two emersions of Jupiter's first satellite, calculated |                    |   |   |   |                                    |
| by ditto                                               | -                  | - | - | - | 21 14 ,5                           |
| Transit of Venus, calculated by                        | { Doctor MASKELYNE |   |   |   |                                    |
|                                                        | { Mr. WITCHELL     |   |   |   |                                    |
|                                                        | { Mr. WALES        |   |   |   |                                    |
| Sun's eclipse, calculated by                           | { Mr. WITCHELL     |   |   |   |                                    |
|                                                        | { Mr. SEJOUR       |   |   |   |                                    |
|                                                        | { Mr. EULER        |   |   |   |                                    |
|                                                        | { Mr. LEXEL        |   |   |   |                                    |
| Mean of the whole                                      |                    |   |   |   | - 20 52 ,12                        |

From the trigonometrical operations, we find the longitude in time to be 20<sup>m</sup> 44<sup>s</sup> ,3; there is, therefore, a difference of 7<sup>s</sup> ,82 between these different determinations: this is, probably, as near as we could have expected to find it; yet it can scarcely be supposed, that of this difference, more than 2<sup>s</sup> can be laid to the account of the survey.

In the Philosophical Transactions for 1797, p. 502, it is observed, that angles were taken at the Lizard Light-house and Naval Signal-Staff, to determine the situation of the *Point* itself. This Point, marked P in the diagram, makes an angle of 2° 23' 16" S W, with the parallel to the meridian of St. Agnes at the station on Karnbonellis, and is therefore 636,6 feet from that meridian, and 126394 feet from the perpendicular; therefore 49° 57' 40" ,6 is the latitude } of the Lizard Point.  
and 5 11 46 the longitude }



*Scilly Islands.*

To determine the distances of the objects in these islands, from the stations near the Land's End, with sufficient accuracy, proper corrections were made for reducing the horizontal angles to those formed by the chords. On the present occasion, it will be right to use the horizontal, and not the chord angles; the distances from the meridians, and from their perpendiculars, being computed on the supposition of the earth's surface being a plane, which, within the limits of our fixed meridians, may be considered as true.

The angles for finding the distances of these objects are given in the Philosophical Transactions for 1797, p. 503; from whence, and the *data* contained in this Work, we get the bearing of

|                               |   |            |                 |
|-------------------------------|---|------------|-----------------|
| the Day-mark in the Island of | { | St. Buryan | 75° 44' 52" S W |
| St. Martin's from             | - | Pertinney  | 71 14 22 S W    |
|                               |   | Sennen     | - 75 30 9 S W   |

which, combined with the distances of the stations from the meridian of St. Agnes, give

|        |   |                                                                        |
|--------|---|------------------------------------------------------------------------|
| 246801 | } | feet, for the distance of the Day-mark from the meridian of St. Agnes; |
| 246804 |   |                                                                        |
| 246821 |   |                                                                        |

|            |   |                                                      |
|------------|---|------------------------------------------------------|
| and 122409 | } | feet, for the distance of it from the perpendicular. |
| 122410     |   |                                                      |
| 122414     |   |                                                      |

The mean of the first is 246809 feet, and the mean of the last 122411 feet; but the latter becomes 122419, because a line drawn from the Day-mark, perpendicular to the meridian of St. Agnes, cuts that meridian eight feet *below* the parallel.

Again, we get the bearing of

|                           |       |                        |   |            |   |                 |
|---------------------------|-------|------------------------|---|------------|---|-----------------|
| the Windmill              | - - - | } in the Island of St. | { | Pertinney  | - | 65° 32' 30" S W |
| the Flagstaff of the Fort |       |                        |   | Mary, from | { | Pertinney       |



from whence, after a similar correction with that just made, we find the distance of

the Windmill 256304 } feet from the { 143597 } feet from the perpendicular of  
the Flagstaff 260152 } meridian, and { 140876 } St. Agnes.

From the same page, and the *data* furnished in this work, we also find the bearing of

St. Agnes Light- { Sennen - 68° 6' 54" S W  
House from { St. Buryan 69 5 56 S W; which gives

265865 } feet, for the distance from the meridian, and  
265879 }

149121 } feet, for the distance from the perpendicular of St. Agnes.  
149128 }

The mean of the first is 265872 feet, and the mean of the last, when corrected, 149133 feet.

With the above data, and also the latitude and longitude of St. Agnes, we get

|                                       |   |                          |             |                                           |          |              |                                    |
|---------------------------------------|---|--------------------------|-------------|-------------------------------------------|----------|--------------|------------------------------------|
| the latitude of                       | { | Day-mark in St. Martin's | -           | 49° 58' 2",9                              | In Time. |              |                                    |
|                                       |   | Windmill, St. Mary's     | -           | 49 54 32,7                                |          |              |                                    |
|                                       |   | Flagstaff, ditto         | -           | 49 54 59,1                                |          |              |                                    |
|                                       |   | St. Agnes Light-House*   | -           | 49 53 36,8                                |          |              |                                    |
| and longitude west<br>from St. Agnes. | { | Day-mark                 | 1° 2' 43",1 | from the meri-<br>dian of Green-<br>wich. | {        | 6° 14' 38",8 | 24 <sup>m</sup> 58 <sup>s</sup> ,6 |
|                                       |   | Windmill                 | 1 5 3,2     |                                           |          | 6 16 58,7    | 25 7,9                             |
|                                       |   | Flagstaff                | 1 6 2,7     |                                           |          | 6 17 57,4    | 25 11,9                            |
|                                       |   | Light House              | 1 7 27,7    |                                           |          | 6 19 23,4    | 25 21,5                            |
|                                       |   |                          |             |                                           |          |              |                                    |

\* In the *Requisite Tables*, published by order of the Board of Longitude, the latitude of the Scilly Lights is said to be 49° 56' 0", and longitude 6° 46' 0". The latitude, according to the survey, is 49° 53' 36",8, and longitude 6° 19' 23",4. An error of 2' 23" in the latitude, may not perhaps be considered extraordinary; but how, in a maritime country, like our own, where chronometers are in such constant use, so great an error as 26' 37" (1<sup>m</sup> 46<sup>s</sup> 1/2 in time) in the longitude, should have remained undetected, excepting by one person, is surprising. J. HUDDART, Esq. visited the Scilly Isles, having with him a watch made by ARNOLD, and obtained his time at that spot in the island of St. Mary where the body of Sir CLOUDSLEY SHOVEL is said to have been thrown ashore, by means of equal altitudes of the Sun's limb; he then found, comparing his time with that shewn by the watch, that 0<sup>h</sup> 25<sup>m</sup> 18<sup>s</sup> was the difference between the meridians of Greenwich and this spot in St. Mary's. Now St. Agnes Light-house is about 2' of a degree west of the place to which Mr. HUDDART alludes; therefore, 25' 18" + 8" = 25' 26" is the longitude of St. Agnes, through these means; which differs only 4<sup>s</sup>,5 in time from that found by the survey.



*The Observatory of his Grace the Duke of MARLBOROUGH, at  
Blenheim.*

The staff erected over the quadrant, was observed from White Horse Hill and Whiteham Hill. At the former station, the latter makes an angle of  $36^{\circ} 30' 13''.5$ , with the parallel to the meridian of *Dunnose*. The staff, therefore, bears from the parallel  $25^{\circ} 59' 29''.75$  N E. ; consequently, its distance from the meridian of *Dunnose* is 36540 feet, and from the perpendicular 446458 feet. These respectively subtend  $5' 58''.3$ , and  $1^{\circ} 13' 21''.4$ ; therefore, the latitude of the Observatory is  $51^{\circ} 50' 28''.3$ , and its longitude  $9' 39''.9$  from *Dunnose*: but  $1^{\circ} 11' 36''$  is the longitude of that station; therefore,  $1^{\circ} 21' 15''.9$ , or  $5' 25''.2$  in time, is the longitude of the Observatory west from Greenwich.

As the meridian of *Dunnose* passes at no great distance from that of *Blenheim*, I have deduced the latitude and longitude from the former, to avoid the errors which creep in, when computations are carried on from remote meridians. It may be worth while, however, to show that the extent of those errors would not be great, were the meridian of *Dunnose* neglected, and the Observatory at *Blenheim* referred to the meridian of Greenwich.

The distance of White Horse Hill from the meridian of Greenwich is found to be 356050 feet, and from its perpendicular 39425 feet; the bearing of Nuffield, from the parallel at that station, being  $89^{\circ} 59' 27''$  S E. *Blenheim* will, therefore, be found to bear  $26^{\circ} 55' 25''$  N E from the parallel at White Horse Hill; consequently, its distance from the meridian of Greenwich is 307224 feet, and from its perpendicular 135569 feet. These give the arcs  $50' 12''.4$ , and  $22' 16''.1$ ; from whence we get  $51^{\circ} 50' 28''.1$  for the latitude, and  $1^{\circ} 21' 16''$  for the longitude,



of the Observatory west of Greenwich. Either of these determinations may be taken for the true result, but I shall prefer the first.

Being favoured by his Grace with the latitude and longitude derived from astronomical observations, we have the following comparisons:

| Latitude |          |               | Longitude west<br>from Greenwich. | Degrees.    | Time.                |
|----------|----------|---------------|-----------------------------------|-------------|----------------------|
|          |          |               |                                   |             |                      |
| {        | observed | 51° 50' 24",9 | {                                 | 1° 21' 6",0 | 5 <sup>m</sup> 24",4 |
|          | computed | 51 50 28,1    |                                   | 1 21 15,9   | 5 25,1               |

#### *Observatory at Oxford.*

The angle at the station on Shotover, between the Atlas on the top of the Observatory and the parallel to the meridian of Dunnose, is 79° 50' 51",75 N W: therefore, its distance from the meridian is 14719 feet, and from the perpendicular 416985 feet. The figure representing Atlas is  $33\frac{3}{4}$  feet *due east* of the Quadrant Room; consequently, no correction will be required in the computed latitude. The space 14719 feet subtends an arc = 2' 24",3, and 416985 feet an arc of 1° 8' 30",8. These *data*, with the latitude and longitude of Dunnose, give 51° 45' 38" for the latitude, and 1° 15' 29",2 for the longitude, of the Observatory. As in the former case, with respect to Blenheim, so in the present instance, it is immaterial whether the calculations be carried on from the meridian of Greenwich or that of Dunnose, as differences of only 0",1 in both the latitude and longitude are found in the results.

The latitude and longitude of this Observatory are given in the *Requisite Tables*; the first is 51° 45' 38", and the last 1° 15' 30", or 5<sup>m</sup> 2<sup>s</sup> in time. Doctor HORNSBY, however, has furnished me with what he conceives to be more accurate



determinations; from which, and the above, we have the following comparisons:

| Latitude | { | observed | 51° 45' 39",5 | Longitude west  | { | Degrees.     | Time.               |
|----------|---|----------|---------------|-----------------|---|--------------|---------------------|
|          |   |          |               |                 |   | 1° 15' 22",5 | 5 <sup>m</sup> 1",5 |
|          |   | computed | 51 45 38,0    | from Greenwich. |   | 1 15 29,2    | 5 1,9               |

I conclude this article with expressing an opinion, that the coincidence between the computed and, no doubt, accurately observed longitude of this Observatory, affords strong reason for supposing, that the operations at Beachy Head and Dunnose, in 1794, for finding the length of a degree of a great circle perpendicular to the meridian on the earth's surface, were made with the required accuracy.

### SECTION THIRD.

*Trigonometrical Surveys of the Northern and Western Parts of Kent, the County of Essex, and Parts of the adjoining Counties, Suffolk and Hertford, executed in the Years 1798 and 1799. (See Plate XXXII.)*

It will be convenient to treat of the operations carried on in the north of Kent and Essex, before we speak of those executed in the western parts of the former county.

In a former article I have observed, that from the old station at Wrotham, (General Roy's,) the view towards the north is obstructed, and also that it became necessary to select a new one: this station was found to be 205,5 feet from the other; the distance was accurately measured, and afterwards the angle taken at the *old* station, between the staff on Severndroog Tower,



Shooters Hill, and the one newly chosen; this angle subtended  $94^{\circ} 19' 0''.5$ .

The distance from Severndroog Tower to the old station at Wrotham, is 79960 feet. But, it must be observed, this distance is not precisely the same as that given by General Roy, because an allowance is made for the error in the reduction of the bases, in the surveys of 1787 and 1788.

With the distances 79960 feet and 205.5 feet, and the included angle,  $94^{\circ} 19' 0''.5$ , we find the distance of the Flag-staff on Severndroog Tower, from the new station = 79944 feet; with this distance, a part of the following triangles have their sides computed.

ART. XXXVIII. *Principal Triangles.*

| Names of stations.     | Observed angles.                        | Distances of the stations. |                |
|------------------------|-----------------------------------------|----------------------------|----------------|
| Wrotham - - -          | $62^{\circ} 54' 38''$                   | } Gravesend -              | Feet.<br>45578 |
| Gravesend - - -        | $82^{\circ} 39' 21''$                   |                            | 71762          |
| Severndroog Tower      |                                         |                            |                |
| Gravesend - - -        | $95^{\circ} 53' 59''$                   | } Langdon Hill -           | 44886          |
| Langdon Hill - - -     | $53^{\circ} 47' 25''$                   |                            | 88470          |
| Severndroog Tower      |                                         |                            |                |
| Gravesend - - -        | $34^{\circ} 31' 53''$                   | } Hadleigh Steeple -       | 64076          |
| Hadleigh Steeple - - - | $43^{\circ} 11' 51''$                   |                            | 37171          |
| Langdon Hill - - -     |                                         |                            |                |
| Gravesend - - -        | $30^{\circ} 24' 19'' - 21''$            | } Halstow Steeple -        | 44839          |
| Hadleigh - - -         | $41^{\circ} 46' 32'' - 33''$            |                            | 34064          |
| Halstow - - -          | $107^{\circ} 49' 5'' - 6''$             |                            |                |
|                        | $179^{\circ} 59' 57''$                  |                            |                |
| Gravesend - - -        | $31^{\circ} 38' 21''$                   | } Gadshill -               | 22277          |
| Halstow - - -          | $24^{\circ} 18' 21''$                   |                            | 28390          |
| Gadshill               |                                         |                            |                |
| Halstow - - -          | $59^{\circ} 18' 6'' - 5''$              | } Sheppey -                | 49409          |
| Hadleigh Steeple - - - | $49^{\circ} 13' 33\frac{1}{2}'' - 32''$ |                            | 64387          |
| Sheppey Isle - - -     | $31^{\circ} 28' 24'' - 23''$            |                            |                |
|                        | $180^{\circ} 0' 3''.5$                  |                            |                |



The distances of Gadshill from Halstow, and from Halstow to the Isle of Sheppey, in the following triangle, viz.

Halstow 128 34 28

Sheppey 18 18 3

*Gadshill* give the distances between Gadshill and the station in the Isle of Sheppey 70687 and 70685 feet: the mean, 70686 feet, may be taken for the true distance.

| Names of stations. |   | Observed angles. | Distances. |         |
|--------------------|---|------------------|------------|---------|
| Hadleigh           | - | 38 43 29         | } Southend | { 27596 |
| Southend           | - | 119 20 5         |            |         |
| Sheppey            | - |                  |            |         |

To find the distance between Langdon Hill and the spindle of the weather-cock on Rayleigh Steeple, we have the following quadrilateral.

Langdon Hill 122° 2' 46"

Gravesend - 64 56 14

Halstow - 111 20 14

Rayleigh - 61 40 46

360 0 0, which gives the distance from the centre of Rayleigh Steeple to the staff on Langdon Hill = 44131 feet; but the point on the top of Rayleigh Tower, over which the instrument was placed, was just 7 feet farther from Langdon Hill than the spindle; therefore, 44131 + 7 = 44138 feet, is the distance between Langdon Hill and the station on the steeple.—The angles in the following triangles,

Hadleigh - 134° 11' 55"

Sheppey - 16 26 30

*Langdon Hill*

Langdon Hill 49 8 5

Sheppey - 27 4 46

*Rayleigh*

give the distance of

the *Spindle* on Rayleigh Tower from { Langdon Hill = 44131 } Feet.  
 { Hadleigh = 15554 }

From the preceding quadrilateral, the distance between the spindle on Rayleigh Tower and the station on Langdon Hill, was found = 44131 feet, which is the same as the other determination.



| Names of stations.                          |   |   | Observed angles. | Distances.             |        |
|---------------------------------------------|---|---|------------------|------------------------|--------|
|                                             |   |   |                  |                        | Feet.  |
| Halstow - - -                               | - | - | 95 46 57         | } Spindle - - -        | 49413  |
| Sheppey - - -                               | - | - | 42 6 39          |                        | 73313  |
| <i>Rayleigh Tower Spindle</i>               |   |   |                  |                        |        |
| Halstow - - -                               | - | - | 35 1 8           | } Prittlewell - - -    | 46820  |
| Hadleigh - - -                              | - | - | 99 3 3           |                        | 27206  |
| <i>Prittlewell Steeple</i>                  |   |   |                  |                        |        |
| Halstow - - -                               | - | - | 64 16 58         | } Prittlewell - - -    | 46823  |
| Sheppey - - -                               | - | - | 55 24 34         |                        | 51243  |
| <i>Prittlewell</i>                          |   |   |                  |                        |        |
| Halstow - - -                               | - | - | 73 45 42         | } Canewden - - -       | 71211  |
| Sheppey - - -                               | - | - | 66 39 49         |                        | 74461  |
| <i>Canewden Steeple</i>                     |   |   |                  |                        |        |
| Rayleigh - - -                              | - | - | 53 5 0           | } Canewden - - -       | 31438  |
| Prittlewell - - -                           | - | - | 73 41 30         |                        | 26189  |
| <i>Canewden</i>                             |   |   |                  |                        |        |
| Hadleigh - - -                              | - | - | 52 52 24         | } Flagstaff - - -      | 51846  |
| Halstow - - -                               | - | - | 86 10 13         |                        | 34060  |
| <i>Flagstaff of the Garrison, Sheerness</i> |   |   |                  |                        |        |
| Severndroog Tower - - -                     | - | - | 17 48 23         | } Purfleet Cliff - - - | 40423  |
| Gravesend - - -                             | - | - | 20 22 40         |                        | 35498  |
| Purfleet Cliff - - -                        | - | - | 141 48 57        |                        |        |
|                                             |   |   | 180 0 0          |                        |        |
| Rayleigh - - -                              | - | - | 97 7 27          | } Danbury - - -        | 47514  |
| Langdon Hill - - -                          | - | - | 43 18 2          |                        | 68746  |
| <i>Danbury Spire</i>                        |   |   |                  |                        |        |
| Severndroog Tower - - -                     | - | - | 26 24 33         | } Frierning - - -      | 103659 |
| Langdon Hill - - -                          | - | - | 95 25 0          |                        | 46312  |
| Frierning Steeple - - -                     | - | - | 58 10 27         |                        |        |
| Langdon Hill - - -                          | - | - | 88 14 19         | } Frierning - - -      | 46314  |
| Frierning - - -                             | - | - | 44 13 19         |                        | 63270  |
| <i>Rayleigh</i>                             |   |   |                  |                        |        |



Mean distance from Langdon Hill to Frierning Steeple 46313 feet.

| Names of Stations.                | Observed angles. | Distances.             |                |
|-----------------------------------|------------------|------------------------|----------------|
| Frierning - - - -                 | 92° 15' 6"       | } Danbury - - - {      | Feet.<br>49020 |
| Langdon Hill - - -                | 45 26 17         |                        | 68748          |
| Danbury Steeple                   |                  |                        |                |
| Langdon Hill - - -                | 24 27 23         | } Signal Staff - - {   | 83902          |
| Rayleigh - - - -                  | 132 52 23        |                        | 47408          |
| Signal Staff, Shoebury-ness       |                  |                        |                |
| Triptree, old station - - -       | 47 8 50          | } Rayleigh Tower - - { | 74052          |
| Rayleigh - - - -                  | 73 45 24         |                        | 82860          |
| Frierning                         |                  |                        |                |
| Triptree, old station, from       |                  | Frierning              |                |
| Triptree - - - -                  | 31 59 21         |                        |                |
| Danbury - - - -                   | 124 20 48        |                        |                |
| Rayleigh                          |                  |                        |                |
| Danbury Spire from Triptree Heath |                  |                        | 36000          |
| Triptree, old station - - -       | 100 28 19        |                        |                |
| Tillingham Steeple - - -          | 30 14 40         |                        |                |
| Danbury Spire                     |                  |                        |                |
| Tillingham from                   |                  | Triptree - - - -       | 54172          |
|                                   |                  | Danbury - - - -        | 70281          |
| Tillingham - - - -                | 84 52 34         | } Peldon - - - {       | 42469          |
| Peldon - - - -                    | 62 39 36         |                        | 78803          |
| Danbury - - - -                   |                  |                        |                |
| Tillingham - - - -                | 48 58 50         | } Flagstaff - - - {    | 57433          |
| Peldon - - - -                    | 83 42 46         |                        | 43595          |
| Flagstaff on St. Osyth Priory     |                  |                        |                |
| Peldon - - - -                    | 20 49 10         | } Thorp - - - {        | 64802          |
| Thorp - - - -                     | 32 47 18         |                        | 28612          |
| Flagstaff, St. Osyth Priory       |                  |                        |                |
| Peldon - - - -                    | 74 46 5          | } Stoke - - - {        | 63931*         |
| Thorp - - - -                     | 52 6 31          |                        | 78171          |
| Stoke Steeple                     |                  |                        |                |
| Peldon - - - -                    | 71 48 20         | } Great Tey - - - {    | 43475          |
| Great Tey - - - -                 | 75 51 12         |                        | 77204          |
| Danbury - - - -                   |                  |                        |                |



| Names of the Stations. | Observed angles. | Distances.               |
|------------------------|------------------|--------------------------|
| Peldon - - - -         | 46° 14' 2"       | } Stoke - - - {          |
| Great Tey - - - -      | 90° 56' 9"       |                          |
| Stoke                  |                  |                          |
|                        |                  | Fect.<br>63941*<br>46182 |

From a former triangle, the distance between Peldon and Stoke Steeple was found to be 63931 feet; wherefore, 63936 feet, the mean, may be taken for the true distance.

|                                           |              |                      |       |
|-------------------------------------------|--------------|----------------------|-------|
| Thorp - - - -                             | 98° 52' 20"  | } Little Bentley - { | 20481 |
| Little Bentley - - - -                    | 53° 2' 30"   |                      | 42981 |
| Dover Court - - - -                       |              |                      |       |
| Thorp - - - -                             | 41° 12' 53"  | } Little Bentley - { | 20481 |
| Little Bentley - - - -                    | 123° 30' 18" |                      | 51205 |
| Peldon - - - -                            |              |                      |       |
| Tillingham - - - -                        | 96° 57' 20"  | } West Mersea - {    | 28924 |
| Danbury Spire - - - -                     | 61° 46' 57"  |                      | 79173 |
| West Mersea                               |              |                      |       |
| Rayleigh - - - -                          | 54° 27' 44"  | } West Mersea - {    | 96701 |
| West Mersea - - - -                       | 29° 13' 0"   |                      | 79170 |
| Danbury - - - -                           |              |                      |       |
| Great Tey - - - -                         | 52° 11' 44"  |                      |       |
| Stoke - - - -                             | 45° 12' 57"  |                      |       |
| Staircase, St. Mary's Steeple, Colchester |              |                      |       |

St. Mary's Steeple from Stoke - - - - 36796

|                                |             |                      |       |
|--------------------------------|-------------|----------------------|-------|
| Little Bromley - - - -         | 54° 11' 22" | } Little Bromley - { | 44356 |
| Stoke - - - -                  | 47° 58' 26" |                      | 33706 |
| St. Mary's, Colchester - - - - |             |                      |       |
| Dover Court - - - -            | 18° 58' 19" | } Tattingstone - {   | 38946 |
| Stoke - - - -                  | 14° 53' 50" |                      | 49250 |
| Tattingstone                   |             |                      |       |
| Thorp - - - -                  | 37° 52' 49" | } Tattingstone - {   | 50690 |
| Stoke - - - -                  | 39° 12' 4"  |                      | 49245 |
| Tattingstone                   |             |                      |       |
| Dover Court - - - -            | 50° 26' 54" | } Falkenham - {      | 31651 |
| Rushmere - - - -               | 38° 25' 20" |                      | 39270 |
| Falkenham Steeple              |             |                      |       |

The distance from Dover Court Steeple to Stoke Steeple is 84425 feet, and from Rushmere Steeple to Stoke Steeple 75955 feet; the included angle at Dover Court Steeple is 62° 38' 20". These give the distance of Dover Court Steeple from Rushmere, 50921 feet.



| Names of Stations.         | Observed angles. | Distances.             |                         |
|----------------------------|------------------|------------------------|-------------------------|
| Dover Court - - -          | 43 40 51         | } Tattingstone -       | Fect.<br>38946<br>35232 |
| Rushmere - - -             | 49 46 9          |                        |                         |
| Tattingstone               |                  |                        |                         |
| Dover Court - - -          | 25 55 13         | } Woodbridge -         | 59894<br>26346*         |
| Rushmere - - -             | 96 25 30         |                        |                         |
| Woodbridge Steeple - -     | 57 39 17         |                        |                         |
|                            | 180 0 0          |                        |                         |
| Falkenham - - -            | 41 25 50         | } Woodbridge -         | 33761<br>26342*         |
| Rushmere - - -             | 58 0 10          |                        |                         |
| Woodbridge                 |                  |                        |                         |
| Falkenham - - -            | 48 42 0          | } Butley - - -         | 45013<br>34058          |
| Woodbridge - - -           | 83 10 0          |                        |                         |
| Butley Steeple             |                  |                        |                         |
| Falkenham - - -            | 21 58 1          | } Orford Light House - | 60589<br>25207          |
| Butley - - -               | 116 14 59        |                        |                         |
| Orford Light House         |                  |                        |                         |
| Rushmere - - -             | 62 45 1-0        | } Otley - - -          | 29238<br>29044          |
| Woodbridge - - -           | 63 30 1-0        |                        |                         |
| Otley Steeple - - -        | 53 45 0          |                        |                         |
|                            | 180 0 2          |                        |                         |
| Rushmere - - -             | 40 25 30         | } Henley - - -         | 21211<br>18988          |
| Otley - - -                | 46 25 0          |                        |                         |
| Henley Steeple - - -       | 93 9 30          |                        |                         |
|                            | 180 0 0          |                        |                         |
| Dover Court - - -          | 12 43 40         | } Obelisk - - -        | 26766<br>25503          |
| Rushmere - - -             | 13 22 10         |                        |                         |
| Obelisk, Woolverstone Park |                  |                        |                         |
| Rushmere - - -             | 61 35 58         | } Copdock - - -        | 28984<br>28057          |
| Copdock Steeple - - -      | 53 5 10          |                        |                         |
| Obelisk                    |                  |                        |                         |
| Rushmere - - -             | 85 25 0          | } Henley - - -         | 21209<br>34520          |
| Copdock - - -              | 37 46 0          |                        |                         |
| Henley - - -               | 56 49 0          |                        |                         |
|                            | 180 0 0          |                        |                         |



| Names of Stations.        | Observed angles. | Distances.         |                |
|---------------------------|------------------|--------------------|----------------|
| Henley - - -              | 58° 32' 42" - 40 | } Naughton - - }   | Fect.<br>45518 |
| Copdock - - -             | 74 30 11 - 10    |                    | 40294          |
| Naughton Steeple - -      | 46 57 11 - 10    |                    |                |
| Naughton - - -            | 74 24 2          | } Lavenham - }     | 35867          |
| Stoke - - -               | 45 58 58         |                    | 48039          |
| Lavenham Steeple - -      | 59 37 0          |                    |                |
| Lavenham - - -            | 67 48 30         | } Bulmer - }       | 36837          |
| Stoke - - -               | 44 59 10         |                    | 48248          |
| Bulmer Steeple - -        | 67 12 20         |                    |                |
| Lavenham - - -            | 47 34 25         | } Glemsford - }    | 25746          |
| Bulmer - - -              | 44 18 40         |                    | 27086          |
| Glemsford Steeple - -     |                  |                    |                |
| Lavenham - - -            | 18 22 0          | } Topplesfield - } | 67962          |
| Bulmer - - -              | 142 15 20        |                    | 34983          |
| Topplesfield - - -        |                  |                    |                |
| Lavenham - - -            | 51 36 40         | } Twinstead - }    | 43349          |
| Stoke - - -               | 58 8 10          |                    | 40006*         |
| Twinstead Steeple - -     |                  |                    |                |
| Stoke - - -               | 50 4 48          | } Twinstead - }    | 40006*         |
| Great Tey - - -           | 56 15 56         |                    | 36895          |
| Twinstead - - -           |                  |                    |                |
| Frierning - - -           | 156 42 10        | } Southweald - }   | 30138          |
| Danbury - - -             | 8 50 0           |                    | 77622          |
| Southweald Steeple - -    |                  |                    |                |
| Danbury - - -             | 151 18 36        | } Gallywood - }    | 26097          |
| Triptree, old Station - - | 12 0 34          |                    | 60211          |
| Gallywood Common - -      |                  |                    |                |
| Triptree, old Station - - | 37 41 44         | } Pleshley - }     | 63213          |
| Gallywood - - -           | 75 13 56         |                    | 39973          |
| Pleshley Steeple - -      |                  |                    |                |
| Danbury - - -             | 55 31 11         | } Pleshley - }     | 48455          |
| Gallywood - - -           | 91 54 46         |                    | 39964          |
| Pleshley - - -            |                  |                    |                |
| Gallywood - - -           | 15 45 30         | } High Easter - }  | 47767          |
| Pleshley - - -            | 114 49 0         |                    | 14293          |
| High Easter Steeple - -   |                  |                    |                |



| Names of stations.         | Observed angles.                                          | Distances.                                                                            |
|----------------------------|-----------------------------------------------------------|---------------------------------------------------------------------------------------|
| Danbury - - -              | $\begin{matrix} 0 & ' & '' \\ 12 & 4 & 30 \end{matrix}$   | } Hatfield Broad Oak - { $\begin{matrix} \text{Fect.} \\ 85096 \\ 39058 \end{matrix}$ |
| Pleshley - - -             | $\begin{matrix} 152 & 53 & 10 \end{matrix}$               |                                                                                       |
| Hatfield Broad Oak Steeple |                                                           |                                                                                       |
| Danbury - - -              | $\begin{matrix} 25 & 45 & 6 \\ 29 & 43 & 54 \end{matrix}$ | } Thaxted - - - { $\begin{matrix} 101330 \\ 53429 \end{matrix}$                       |
| High Easter - - -          |                                                           |                                                                                       |
| Thaxted Spire              |                                                           |                                                                                       |
| Hatfield Broad Oak - -     | $\begin{matrix} 54 & 20 & 51 \\ 39 & 25 & 0 \end{matrix}$ | } Beauchamp Roding - { $\begin{matrix} 24853 \\ 31806 \end{matrix}$                   |
| Pleshley - - -             |                                                           |                                                                                       |
| Beauchamp Roding Spire     |                                                           |                                                                                       |

The angle observed from the station on Danbury Steeple, between Hatfield Broad Oak and Thaxted, was  $30^{\circ} 33' 40''$ ; this, with the including sides, 85094 and 101330 feet, gives the following triangle:

Danbury -  $30^{\circ} 33' 40''$

Hatfield Broad Oak 92 24 0

Thaxted - 57 2 20, which gives the distance between Thaxted and Hatfield Broad Oak = 51566 feet.

|               |                                                            |                                                               |
|---------------|------------------------------------------------------------|---------------------------------------------------------------|
| Danbury - - - | $\begin{matrix} 27 & 24 & 19 \\ 118 & 2 & 28 \end{matrix}$ | } Stoke - - - { $\begin{matrix} 122630 \\ 63951 \end{matrix}$ |
| Peldon - - -  |                                                            |                                                               |
| Stoke         |                                                            |                                                               |

Again, the angle observed at Danbury, between Thaxted and Stoke was  $66^{\circ} 43' 8''$ ; this, with the sides which form it, Danbury and Thaxted, Danbury and Stoke, gives the following triangle:

Danbury -  $66^{\circ} 43' 8''$

Stoke - - - 48 25 16

Thaxted - 64 51 36, from which we find 124430 feet, for the distance from Thaxted to Stoke.

The angle at Lavenham Steeple, between Stoke and Thaxted, was likewise observed, and found to be  $89^{\circ} 10' 30''$ , which, with the distances of these latter stations from Lavenham, 48039 and 124430 feet, gives

Lavenham -  $89^{\circ} 10' 30''$

Stoke - - - 68 7 0

Thaxted - 22 42 30, from which we find 115480 feet to be the distance from Thaxted Spire to Lavenham Steeple.



The angle at Danbury, between Southweald and Hatfield Broad Oak, was found to be  $54^{\circ} 44' 30''$ . The distances from Danbury to Southweald and Hatfield Broad Oak have been already found, the former being 77622 feet, and the latter 85096 feet; from these we get the triangle,

Danbury -  $54^{\circ} 44' 30''$   
 Southweald -  $67^{\circ} 42' 5''$   
 Hatfield Broad Oak  $57^{\circ} 33' 25''$ , which gives 75104 feet, for the distance between Hatfield Broad Oak and Southweald Steeples.

In order to connect the preceding triangles with those carried on for the survey of the south-western part of Essex, and of Hertfordshire, stations were selected on Hampstead Heath, and on Highbeech in Epping Forest, to which the great theodolite was taken, as related in the article detailing the particulars of the operations in 1799. The triangles making this connection are the following. The first, namely,

Severndroog Tower  $28^{\circ} 58' 10''$   
 Southweald -  $94^{\circ} 49' 5''$   
 Langdon Hill -  $56^{\circ} 12' 45''$ , is had from the included angle

at Severndroog Tower,  $28^{\circ} 58' 10''$ , and the sides Severndroog Tower and Southweald, Severndroog Tower and Langdon Hill: the first is 73787 feet, and the second 88470 feet. From these *data*, we obtain the distance between the station on Langdon Hill and that on Southweald Steeple = 43001 feet.

| Names of Stations. |   | Observed angles.       | Distances.  |                          |
|--------------------|---|------------------------|-------------|--------------------------|
| Severndroog Tower  | - | $24^{\circ} 24' 35''$  | } Brentwood | Feet.<br>78553*<br>36616 |
| Langdon Hill       | - | $62^{\circ} 26' 39''$  |             |                          |
| Brentwood Steeple  | - |                        |             |                          |
| Severndroog Tower  | - | $4^{\circ} 33' 29''$   | } Brentwood | 78553*<br>7706           |
| Southweald         | - | $125^{\circ} 53' 12''$ |             |                          |
| Brentwood          | - |                        |             |                          |

Foot of the cross on the dome of St. Paul's from the station on Severndroog Tower 39962\*.  
 Phil. Trans. for 1787. p. 250.

|                   |   |                       |              |                 |
|-------------------|---|-----------------------|--------------|-----------------|
| Severndroog Tower | - | $33^{\circ} 53' 4''$  | } Highbeech  | 71534<br>61919  |
| St. Paul's        | - | $51^{\circ} 24' 12''$ |              |                 |
| Highbeech         | - |                       |              |                 |
| Severndroog Tower | - | $44^{\circ} 34' 28''$ | } Southweald | 73795*<br>55156 |
| Highbeech         | - | $69^{\circ} 53' 13''$ |              |                 |
| Southweald        | - |                       |              |                 |



From the last triangle, we find the distance from Severndroog Tower to the station on Southweald Steeple to be 73795 feet; this, it will be perceived, is deduced from the distance between the cross on the dome of St. Paul's and Severndroog Tower; but 73791 feet has been found by the triangle, which is derived from the distance between the latter station and Wrotham. A difference of 4 feet on such a distance, all things considered, is not a large quantity.

| Names of Stations.  | Observed Angles. | Distances.          |                   |
|---------------------|------------------|---------------------|-------------------|
| Severndroog Tower - | 49° 8' 1"        | } Brentwood -       | { Feet.<br>78558* |
| Highbeech -         | 71 16 44         |                     |                   |
| Brentwood Spire     |                  |                     |                   |
| Severndroog Tower - | 51 24 12         | } Hampstead Heath - | { 64855           |
| Highbeech -         | 58 29 19         |                     |                   |
| Hampstead Heath     |                  |                     |                   |
| Highbeech -         | 24 36 5          | } St. Paul's -      | { 61919           |
| Hampstead -         | 83 1 11          |                     |                   |
| St. Paul's          |                  |                     |                   |

As it became necessary to ascertain the situation of a high building near Berkhamstead, which, for distinction sake, I shall style the Gazebo, the instrument was removed from the station on Highbeech, to another farther west of it, as some trees obstructed the view of this object from the former. To get the distance from St. Paul's to this new station, the distance between it and the old one was measured, and found = 460 feet: the angles in the following triangle were also observed.

Highbeech, old station 66° 32' 47"

Highbeech, new station 113 3 46

St. Paul's

which gives the distance from

St. Paul's to the new station 61738 feet.

|                          |           |                     |         |
|--------------------------|-----------|---------------------|---------|
| Highbeech, new station - | 105 21 44 | } Gazebo -          | { 49631 |
| Berkhamstead Gazebo -    | 41 55 23  |                     |         |
| St. Paul's -             |           |                     |         |
| Southweald -             | 16 46 15  | } Epping Windmill - | { 46717 |
| Highbeech, old station - | 52 16 51  |                     |         |
| Stand of Epping Windmill |           |                     |         |
| Severndroog Tower -      | 10 8 44   | } Epping Windmill - | { 81891 |
| Highbeech -              | 122 10 45 |                     |         |
| Stand of Epping Windmill |           |                     |         |



| Names of Stations.       | Observed angles. | Distances.          |                |
|--------------------------|------------------|---------------------|----------------|
| Highbeech, old station - | 99 19 16         | } Epping Windmill - | Fect.<br>17049 |
| Berkhamstead Gazebo -    | 17 41 25         |                     | 55567          |
| Stand of Epping Windmill |                  |                     |                |

At the new station on Highbeech, the angle between the staff on the Gazebo at Berkhamstead and the old station was observed, and found to be  $141^{\circ} 45' 50''$ . This angle, with the measured distance between the stations, and also the distance from the Gazebo to the new station, which are respectively 460 and 49628 feet, gives 49987 feet, for the distance between the new station on Highbeech and Berkhamstead Gazebo.

|                              |           |                        |        |
|------------------------------|-----------|------------------------|--------|
| Hatfield Broad Oak Steeple - | 59 1 0    | } Hatfield Broad Oak - | 87140  |
| Berkhamstead Gazebo -        | 43 12 50  |                        | 50219  |
| Epping Windmill -            |           |                        |        |
| Berkhamstead Gazebo -        | 24 9 55   | } Naseing -            | 39173  |
| Hatfield Broad Oak -         | 17 19 38  |                        | 53844  |
| Naseing Steeple              |           |                        |        |
| Hatfield Broad Oak -         | 107 39 57 | } Henham on the Mount  | 39265  |
| Berkhamstead Gazebo -        | 20 41 30  |                        | 105890 |
| Henham on the Mount Steeple  |           |                        |        |
| Hatfield Broad Oak -         | 71 28 54  | } Thorley -            | 24275  |
| Henham on the Mount -        | 36 6 30   |                        | 39058  |
| Thorley Steeple              |           |                        |        |
| Henham on the Mount -        | 35 25 0   | } Atterbury -          | 37882  |
| Thorley Steeple -            | 69 33 0   |                        | 23430  |
| Atterbury Steeple            |           |                        |        |
| Henham on the Mount -        | 87 20 0   | } Rickling -           | 17816  |
| Thorley -                    | 24 57 50  |                        | 42169  |
| Rickling Steeple             |           |                        |        |
| Henham on the Mount -        | 20 54 0   | } Elmdon -             | 45275  |
| Rickling -                   | 146 35 0  |                        | 29327  |
| Elmdon Steeple               |           |                        |        |



The angle between Albury and Elmdon Steeples was observed, at Henham on the Mount, and found to be  $72^{\circ} 47' 38''$ . The distances from the former stations to the latter are 37882 and 45275 feet, which give the following triangle:

Henham -  $72^{\circ} 47' 38''$

Albury -  $60^{\circ} 28' 27''$

Elmdon -  $46^{\circ} 43' 35''$ , from whence we get the distance

between Albury and Elmdon = 49701 feet.

| Names of Stations.     |   | Observed angles.       | Distances.         |                  |
|------------------------|---|------------------------|--------------------|------------------|
| Henham on the Mount    | - | $106^{\circ} 30' 50''$ | } Thaxted -        | { Feet.<br>22988 |
| Elmdon                 | - | $23^{\circ} 2' 40''$   |                    |                  |
| Thaxted Steeple        |   |                        |                    | 56302            |
| Elmdon                 | - | $71^{\circ} 54' 10''$  | } Balsham -        | { 55262          |
| Thaxted                | - | $53^{\circ} 18' 44''$  |                    |                  |
| Balsham Steeple        |   |                        |                    | 65504            |
| Elmdon                 | - | $23^{\circ} 38' 46''$  | } Babraham Mount - | { 43559          |
| Balsham                | - | $48^{\circ} 40' 38''$  |                    |                  |
| Babraham Mount Station |   |                        |                    | 23251            |
| Elmdon                 | - | $29^{\circ} 46' 30''$  | } Triplow -        | { 24806          |
| Babraham Mount         | - | $32^{\circ} 56' 30''$  |                    |                  |
| Triplow Steeple        |   |                        |                    | 29185            |

The angle at Henham on the Mount, between Hatfield Broad Oak and Thaxted Steeples, is  $109^{\circ} 10' 44''$ ; and the distances of the latter stations from the former one are 39266 and 22988 feet; from these data we have the triangle,

Henham -  $109^{\circ} 10' 44''$

Thaxted -  $45^{\circ} 56' 29''$

Hatfield Broad Oak -  $24^{\circ} 52' 47''$ , which gives 51608 feet for

the distance of Thaxted from Hatfield Broad Oak.

|                     |   |                       |                 |          |
|---------------------|---|-----------------------|-----------------|----------|
| Hatfield Broad Oak  | - | $51^{\circ} 9' 50''$  | } High Easter - | { 24858  |
| Beauchamp Roding    | - | $64^{\circ} 26' 10''$ |                 |          |
| High Easter Steeple |   |                       |                 | 21460    |
| Severndroog Tower   | - | $21^{\circ} 6' 9''$   | } Hornchurch -  | { 50989  |
| Langdon Hill        | - | $24^{\circ} 10' 20''$ |                 |          |
| Hornchurch Steeple  |   |                       |                 | 44832*   |
| Langdon Hill        | - | $77^{\circ} 57' 33''$ | } Hornchurch -  | { 44837* |
| Gravesend           | - | $50^{\circ} 59' 0''$  |                 |          |
| Hornchurch Steeple  |   |                       |                 | 56438    |



| Names of Stations.           | Observed angles.                                                                                                                              | Distances.         |                         |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------------|
| Gravesend - - - -            | $\begin{smallmatrix} 0 \\ 24 \end{smallmatrix} \begin{smallmatrix} 32 \\ 26 \end{smallmatrix} \begin{smallmatrix} 30 \\ 22 \end{smallmatrix}$ | } Purfleet Cliff - | Feet.<br>35517<br>28282 |
| Hornchurch - - - -           |                                                                                                                                               |                    |                         |
| Purfleet Cliff Station       |                                                                                                                                               |                    |                         |
| Severndroog Tower - - -      | $\begin{smallmatrix} 39 \\ 27 \end{smallmatrix} \begin{smallmatrix} 44 \\ 16 \end{smallmatrix} \begin{smallmatrix} 2 \\ 44 \end{smallmatrix}$ | } Barking - - -    | 25383<br>35404          |
| Hornchurch - - - -           |                                                                                                                                               |                    |                         |
| Staircase of Barking Steeple |                                                                                                                                               |                    |                         |
| Severndroog Tower - - -      | $\begin{smallmatrix} 39 \\ 44 \end{smallmatrix} \begin{smallmatrix} 41 \\ 15 \end{smallmatrix} \begin{smallmatrix} 6 \\ 27 \end{smallmatrix}$ | } Westham - - -    | 28046<br>25662          |
| St. Paul's - - - -           |                                                                                                                                               |                    |                         |
| Westham Steeple              |                                                                                                                                               |                    |                         |

## ART. XXXIX. Secondary Triangles.

St. Paul's from Severndroog Tower 39962 feet.

|                                          |                                                                                                                                               |                        |                 |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------|
| Severndroog Tower - - -                  | $\begin{smallmatrix} 13 \\ 22 \end{smallmatrix} \begin{smallmatrix} 1 \\ 36 \end{smallmatrix} \begin{smallmatrix} 7 \\ 13 \end{smallmatrix}$  | } Limehouse - - -      | 26371<br>15456  |
| St. Paul's - - - -                       |                                                                                                                                               |                        |                 |
| Limehouse Steeple                        |                                                                                                                                               |                        |                 |
| Severndroog Tower - - -                  | $\begin{smallmatrix} 9 \\ 32 \end{smallmatrix} \begin{smallmatrix} 15 \\ 36 \end{smallmatrix} \begin{smallmatrix} 30 \\ 38 \end{smallmatrix}$ | } Chigwell - - -       | 57757<br>17242  |
| Highbeech - - - -                        |                                                                                                                                               |                        |                 |
| Chigwell Steeple                         |                                                                                                                                               |                        |                 |
| Severndroog Tower - - -                  | $\begin{smallmatrix} 11 \\ 74 \end{smallmatrix} \begin{smallmatrix} 57 \\ 34 \end{smallmatrix} \begin{smallmatrix} 6 \\ 30 \end{smallmatrix}$ | } Billericay - - -     | 100110<br>21506 |
| Frierning - - - -                        |                                                                                                                                               |                        |                 |
| Billericay Chapel                        |                                                                                                                                               |                        |                 |
| Westham Steeple - - -                    | $\begin{smallmatrix} 45 \\ 68 \end{smallmatrix} \begin{smallmatrix} 58 \\ 35 \end{smallmatrix} \begin{smallmatrix} 0 \\ 0 \end{smallmatrix}$  | } Station - - -        | 15640<br>12077  |
| Staircase of Barking Steeple -           |                                                                                                                                               |                        |                 |
| Station on Bank of the Thames            |                                                                                                                                               |                        |                 |
| Station on Bank of the Thames            | $\begin{smallmatrix} 41 \\ 56 \end{smallmatrix} \begin{smallmatrix} 21 \\ 15 \end{smallmatrix} \begin{smallmatrix} 0 \\ 0 \end{smallmatrix}$  | } Perry's Mast House - | 13120<br>10424  |
| Westham Steeple - - -                    |                                                                                                                                               |                        |                 |
| Perry's Mast House                       |                                                                                                                                               |                        |                 |
| Hornchurch - - - -                       | $\begin{smallmatrix} 14 \\ 68 \end{smallmatrix} \begin{smallmatrix} 31 \\ 52 \end{smallmatrix} \begin{smallmatrix} 20 \\ 0 \end{smallmatrix}$ | } Chimney - - -        | 33236<br>9005   |
| Staircase of Barking Steeple             |                                                                                                                                               |                        |                 |
| Chimney of Public House at Barking Creek |                                                                                                                                               |                        |                 |
| Purfleet Cliff - - - -                   | $\begin{smallmatrix} 54 \\ 46 \end{smallmatrix} \begin{smallmatrix} 57 \\ 40 \end{smallmatrix} \begin{smallmatrix} 0 \\ 0 \end{smallmatrix}$  | } Guzzard - - -        | 21002<br>23638  |
| Hornchurch - - - -                       |                                                                                                                                               |                        |                 |
| Guzzard Station                          |                                                                                                                                               |                        |                 |



| Names of Stations.              | Observed angles. | Distances.              |                |
|---------------------------------|------------------|-------------------------|----------------|
| Purfleet Cliff - - - -          | 34 11 30         | } Rainham - - - {       | Fect.<br>16387 |
| Hornchurch - - - -              | 32 1 0           |                         | 17370          |
| Rainham Steeple                 |                  |                         |                |
| Purfleet Cliff - - - -          | 81 9 0           | } Belvidere - - - {     | 16212          |
| Hornchurch - - - -              | 31 50 50         |                         | 30369          |
| Lord Eardley's, Belvidere       |                  |                         |                |
| Purfleet Cliff - - - -          | 42 18 30         | } Cold Harbour - - - {  | 10971          |
| Rainham - - - -                 | 41 45 0          |                         | 11090          |
| Station at Cold Harbour         |                  |                         |                |
| Guzzard - - - -                 | 56 8 20          | } Aveley Mill - - - {   | 21436          |
| Hornchurch - - - -              | 56 43 20         |                         | 21302          |
| Aveley Mill                     |                  |                         |                |
| Purfleet Cliff - - - -          | 34 2 40          | } Valence Tree - - - {  | 36305          |
| Hornchurch - - - -              | 95 3 40          |                         | 20404          |
| Valence Tree                    |                  |                         |                |
| Gravesend - - - -               | 79 39 30         | } Chadwell - - - {      | 17008          |
| Severndroog Tower - - -         | 13 41 10         |                         | 70717          |
| Chadwell Steeple                |                  |                         |                |
| Gravesend - - - -               | 35 39 0          | } Greys - - - - {       | 18479          |
| Chadwell Steeple - - - -        | 79 31 20         |                         | 10953          |
| Greys Steeple                   |                  |                         |                |
| Gravesend - - - -               | 37 46 0          | } Flagstaff - - - {     | 22880          |
| Chadwell Steeple - - - -        | 94 24 0          |                         | 14054          |
| Flagstaff on Mr. Button's House |                  |                         |                |
| Gravesend - - - -               | 51 43 0          | } West Thurrock - - - { | 22457          |
| Chadwell Steeple - - - -        | 80 2 30          |                         | 17897          |
| West Thurrock Steeple           |                  |                         |                |
| Gravesend - - - -               | 49 8 30          | } Horndon - - - - {     | 33382          |
| Hornchurch - - - -              | 36 7 5           |                         | 42833          |
| Horndon Spire                   |                  |                         |                |
| Gravesend - - - -               | 18 52 0          | } West Tilbury - - - {  | 5617           |
| Chadwell - - - -                | 59 26 30         |                         | 14956          |
| West Tilbury Steeple            |                  |                         |                |
| Gravesend - - - -               | 69 31 27         | } Northfleet - - - {    | 8755           |
| Chadwell - - - -                | 30 27 42         |                         | 16179          |
| Northfleet Steeple              |                  |                         |                |



| Names of Stations.              |   |   | Observed angles. | Distances.           |                          |
|---------------------------------|---|---|------------------|----------------------|--------------------------|
| Gravesend - - -                 | - | - | 57 16 0          | } East Tilbury - - - | { Feet<br>16328<br>15987 |
| Chadwell - - -                  | - | - | 59 13 30         |                      |                          |
| <i>East Tilbury Flagstaff</i>   |   |   |                  |                      |                          |
| Chadwell - - -                  | - | - | 51 23 0          | } Station - - -      | { 25526<br>20031         |
| Mr. Button's Flagstaff -        | - | - | 95 22 30         |                      |                          |
| <i>Station near Ockendon</i>    |   |   |                  |                      |                          |
| Mr. Button's Flagstaff -        | - | - | 54 20 30         | } Orset - - -        | { 17360<br>17240         |
| Station near Ockendon -         | - | - | 54 54 30         |                      |                          |
| <i>Orset Steeple</i>            |   |   |                  |                      |                          |
| Gravesend - - -                 | - | - | 45 9 13          | } Fobbing - - -      | { 41433<br>33270         |
| Halstow - - -                   | - | - | 62 0 10          |                      |                          |
| <i>Fobbing Steeple</i>          |   |   |                  |                      |                          |
| Hadleigh Station -              | - | - | 65 31 12         | } Fobbing - - -      | { 26221<br>33279         |
| Halstow -                       | - | - | 45 48 50         |                      |                          |
| <i>Fobbing Steeple</i>          |   |   |                  |                      |                          |
| Halstow - - -                   | - | - | 101 39 27        | } Thundersley - - -  | { 41342                  |
| Gravesend - - -                 | - | - | 37 16 40         |                      |                          |
| <i>Thundersley Steeple</i>      |   |   |                  |                      |                          |
| Halstow - - -                   | - | - | 7 53 10          | } Hadleigh - - -     | { 5713<br>37028          |
| Hadleigh - - -                  | - | - | 117 13 23        |                      |                          |
| <i>Hadleigh Spire</i>           |   |   |                  |                      |                          |
| Hadleigh - - -                  | - | - | 89 20 40         | } Leigh - - -        | { 15735<br>37357         |
| Halstow - - -                   | - | - | 24 54 27         |                      |                          |
| <i>Leigh Steeple Staircase</i>  |   |   |                  |                      |                          |
| Halstow - - -                   | - | - | 74 23 21         | } Leigh - - -        | { 37359<br>53325         |
| Sheppey Station -               | - | - | 42 26 8          |                      |                          |
| <i>Leigh Steeple Staircase</i>  |   |   |                  |                      |                          |
| Halstow - - -                   | - | - | 13 17 45         | } Sheerness - - -    | { 41434<br>13063         |
| Sheppey - - -                   | - | - | 46 5 47          |                      |                          |
| <i>Sheerness Fort Flagstaff</i> |   |   |                  |                      |                          |
| Hadleigh - - -                  | - | - | 38 43 29         | } South Church - - - | { 71211<br>74461         |
| Sheppey - - -                   | - | - | 21 56 26         |                      |                          |
| <i>South Church Steeple</i>     |   |   |                  |                      |                          |
| Hadleigh - - -                  | - | - | 11 6 2           | } Pritlewell - - -   | { 27208<br>5314          |
| Sheppey Station -               | - | - | 80 16 46         |                      |                          |
| <i>Pritlewell Steeple</i>       |   |   |                  |                      |                          |



| Names of Stations.                                                         | Observed angles.             | Distances.           |                           |
|----------------------------------------------------------------------------|------------------------------|----------------------|---------------------------|
| Canewden Steeple -<br>Prittlewell -<br><i>Little Waking Steeple</i>        | ° ' "<br>45 50 0<br>60 46 30 | } Little Waking -    | { Feet.<br>23850<br>19603 |
| Canewden -<br>Prittlewell -<br><i>Bank Flagstaff</i>                       | 64 27 0<br>67 46 30          | } Bank - - -         | { 32739<br>31908          |
| Prittlewell -<br>Station on Bank -<br><i>Shoebury-ness</i>                 | 33 10 0<br>39 20 30          | } Shoebury-ness -    | { 21208<br>18302          |
| Canewden -<br>Bank Flagstaff -<br><i>Foul-ness Chapel</i>                  | 32 51 30<br>81 20 0          | } Foul-ness - - -    | { 35481<br>19473          |
| Rayleigh -<br>Peldon -<br><i>Foul-ness Signal Staff</i>                    | 47 28 6<br>43 45 33          | } Signal Staff - - - | { 71622<br>76311          |
| Tillingham Steeple -<br>Peldon -<br><i>Signal Staff, Tillingham Grange</i> | 139 21 10<br>9 44 29         | } Signal Staff -     | { 13990<br>53860          |
| Tillingham -<br>Peldon -<br><i>Signal Staff, Bradwell Point</i>            | 43 27 58<br>24 10 18         | } Signal Staff -     | { 18802<br>31591          |
| Tillingham -<br>Peldon -<br><i>Brightlingsea Steeple</i>                   | 31 2 40<br>100 56 20         | } Brightlingsea -    | { 56094<br>29463          |
| Tillingham -<br>West Mersey Steeple -<br><i>Tolesbury Steeple</i>          | 39 48 40<br>57 33 13         | } Tolesbury -        | { 24611<br>18673          |
| Tillingham -<br>Triptree, old Station -<br><i>Althorn Church</i>           | 63 55 6<br>35 34 3           | } Althorn - - -      | { 31946<br>49330          |
| Tillingham -<br>Althorn -<br><i>Burnham Steeple</i>                        | 26 32 10<br>55 49 0          | } Burnham - - -      | { 26664<br>14400          |
| Tillingham -<br>Peldon -<br><i>Tolesbunt Major Steeple</i>                 | 47 33 35<br>56 33 25         | } Toleshunt -        | { 36541<br>32317          |



| Names of stations.                 | Observed angles. | Distances.               |                |
|------------------------------------|------------------|--------------------------|----------------|
| Prittlewell Steeple - - -          | 33 10 0          | } Signal Staff - - -     | Fect.<br>21208 |
| Bank Flagstaff - - -               | 39 20 30         |                          | 18302          |
| <i>Signal Staff, Shoebury-ness</i> |                  |                          |                |
| Triptree, new Station - - -        | 38 5 18          | } Maldon - - -           | 19425          |
| Danbury - - -                      | 30 11 27         |                          | 23829          |
| <i>Maldon Spire</i>                |                  |                          |                |
| Triptree, new Station - - -        | 36 48 30         | } Purleigh - - -         | 36118          |
| Danbury - - -                      | 72 9 0           |                          | 22734          |
| <i>Purleigh Steeple</i>            |                  |                          |                |
| Danbury - - -                      | 17 47 32         | } Steple - - -           | 49647          |
| Purleigh Steeple - - -             | 148 16 30        |                          | 28850          |
| <i>Steple Steeple</i>              |                  |                          |                |
| Danbury - - -                      | 26 17 40         | } Hockley - - -          | 41401          |
| Canewden - - -                     | 51 8 0           |                          | 23555          |
| <i>Hockley Steeple</i>             |                  |                          |                |
| Danbury - - -                      | 27 21 50         | } Hockley - - -          | 41400          |
| Rettenden - - -                    | 109 22 0         |                          | 20170          |
| <i>Hockley Steeple</i>             |                  |                          |                |
| Danbury - - -                      | 53 39 40         | } Rettenden - - -        | 30079          |
| Canewden - - -                     | 35 25 0          |                          | 41810          |
| <i>Rettenden Steeple</i>           |                  |                          |                |
| Rettenden - - -                    | 34 41 0          | } Stow, St. Mary's - - - | 23571          |
| Canewden - - -                     | 30 53 0          |                          | 6131           |
| <i>Stow, St. Mary's Steeple</i>    |                  |                          |                |
| Rayleigh - - -                     | 71 51 18         | } Rettenden - - -        | 20760          |
| Langdon Station - - -              | 27 38 45         |                          | 42526          |
| <i>Rettenden Steeple</i>           |                  |                          |                |
| Rayleigh - - -                     | 51 8 10          | } Runwell - - -          | 21207          |
| Langdon - - -                      | 28 10 20         |                          | 34975          |
| <i>Runwell Steeple</i>             |                  |                          |                |
| Danbury - - -                      | 48 57 22         | } Burghstead - - -       | 53254          |
| Rayleigh - - -                     | 72 39 17         |                          | 42079          |
| <i>Great Burghstead Steeple</i>    |                  |                          |                |
| Danbury - - -                      | 59 11 7          | } Hanningfield - - -     | 17666          |
| Gallywood Station - - -            | 41 40 10         |                          | 22822          |
| <i>East Hanningfield Steeple</i>   |                  |                          |                |



| Names of stations.                   | Observed angles.                                                      | Distances.             |                |
|--------------------------------------|-----------------------------------------------------------------------|------------------------|----------------|
| Frierning Steeple - - -              | $\begin{smallmatrix} 0 & ' & '' \\ 36 & 7 & 48 \end{smallmatrix}$     | } Stock - - -          | Fect.<br>16826 |
| Danbury - - -                        | $\begin{smallmatrix} 15 & 38 & 36 \end{smallmatrix}$                  |                        | 36793          |
| <i>Stock Steeple</i>                 |                                                                       |                        |                |
| Triptree, old Station -              | $\begin{smallmatrix} 18 & 38 & 11 \\ 83 & 33 & 14 \end{smallmatrix}$  | } Southminster - - -   | 55075          |
| Tillingham Steeple -                 |                                                                       |                        | 17711          |
| <i>Southminster Steeple</i>          |                                                                       |                        |                |
| Peldon Steeple - - -                 | $\begin{smallmatrix} 97 & 35 & 31 \\ 23 & 54 & 4 \end{smallmatrix}$   | } Layer Marney - - -   | 20180          |
| Tillingham - - -                     |                                                                       |                        | 49369          |
| <i>Layer Marney Steeple</i>          |                                                                       |                        |                |
| Peldon - - - -                       | $\begin{smallmatrix} 80 & 20 & 6 \\ 61 & 39 & 24 \end{smallmatrix}$   | } Signal Staff - - -   | 60701          |
| Tillingham - - -                     |                                                                       |                        | 67990          |
| <i>Signal Staff, St. Osyth Point</i> |                                                                       |                        |                |
| Thorp Steeple - - -                  | $\begin{smallmatrix} 143 & 7 & 36 \\ 18 & 54 & 29 \end{smallmatrix}$  | } Signal Staff - - -   | 21517          |
| Little Bentley - - -                 |                                                                       |                        | 39844          |
| <i>Great Clackton Signal Staff</i>   |                                                                       |                        |                |
| Thorp - - - -                        | $\begin{smallmatrix} 71 & 35 & 55 \\ 16 & 58 & 13 \end{smallmatrix}$  | } Great Clackton - - - | 18920          |
| Peldon - - - -                       |                                                                       |                        | 61508          |
| <i>Great Clackton Steeple</i>        |                                                                       |                        |                |
| Dover Court Steeple -                | $\begin{smallmatrix} 24 & 36 & 48 \\ 92 & 26 & 41 \end{smallmatrix}$  | } Finton - - - -       | 38998          |
| Thorp - - - -                        |                                                                       |                        | 16257          |
| <i>Finton Steeple</i>                |                                                                       |                        |                |
| Dover Court - - -                    | $\begin{smallmatrix} 39 & 16 & 34 \\ 70 & 11 & 16 \end{smallmatrix}$  | } Signal Staff - - -   | 34686          |
| Thorp - - - -                        |                                                                       |                        | 23340          |
| <i>Finton Signal Staff</i>           |                                                                       |                        |                |
| Dover Court - - -                    | $\begin{smallmatrix} 53 & 15 & 26 \\ 47 & 52 & 22 \end{smallmatrix}$  | } Walton - - - -       | 26275          |
| Thorp - - - -                        |                                                                       |                        | 28389          |
| <i>Walton Tower or Sea-mark</i>      |                                                                       |                        |                |
| Dover Court - - -                    | $\begin{smallmatrix} 133 & 57 & 30 \\ 13 & 29 & 57 \end{smallmatrix}$ | } Cupola - - - -       | 15085          |
| Thorp - - - -                        |                                                                       |                        | 46517          |
| <i>Cupola, Landguard Fort</i>        |                                                                       |                        |                |
| Thorp - - - -                        | $\begin{smallmatrix} 46 & 16 & 17 \\ 47 & 1 & 34 \end{smallmatrix}$   | } Ardleigh - - - -     | 47494          |
| Peldon - - - -                       |                                                                       |                        | 46901          |
| <i>Ardleigh Steeple</i>              |                                                                       |                        |                |
| Peldon - - - -                       | $\begin{smallmatrix} 106 & 10 & 16 \\ 32 & 32 & 14 \end{smallmatrix}$ | } Frating - - - -      | 35433          |
| Great Tey Steeple -                  |                                                                       |                        | 63274          |
| <i>Frating Steeple</i>               |                                                                       |                        |                |



| Names of Stations.        | Observed angles. | Distances.              |                |
|---------------------------|------------------|-------------------------|----------------|
| Thorp - - -               | 30 17 55         | } Thorrington - - {     | Feet.<br>23890 |
| Little Bentley Steeple -  | 90 41 23         |                         | 12053          |
| Thorrington Steeple       |                  |                         |                |
| Dover Court - - -         | 22 10 12         | } Kirby - - - {         | 30343          |
| Thorp - - -               | 59 48 37         |                         | 13247          |
| Kirby Steeple             |                  |                         |                |
| Dover Court - - -         | 33 8 12          | } Little Oakley - - {   | 12216          |
| Kirby Steeple - - -       | 18 22 0          |                         | 21193          |
| Little Oakley Steeple     |                  |                         |                |
| Tillingham - - -          | 38 45 0          | } Toleshunt Major - - { | 36541          |
| Laver de la Hay Steeple - | 45 28 0          |                         | 32082          |
| Toleshunt Major Steeple   |                  |                         |                |
| Dover Court - - -         | 16 48 13         | } Brantham - - - {      | 42590          |
| Tattingstone Steeple - -  | 98 26 0          |                         | 12447          |
| Brantham Steeple          |                  |                         |                |
| Dover Court - - -         | 30 52 58         | } Harkstead - - - {     | 19946          |
| Rushmere Steeple - - -    | 16 51 2          |                         | 35319          |
| Harkstead Steeple         |                  |                         |                |
| Dover Court - - -         | 33 17 30         | } Arwarton - - - {      | 13053          |
| Tattingstone - - -        | 14 20 0          |                         | 28941          |
| Arwarton Steeple          |                  |                         |                |
| Tattingstone - - -        | 66 10 0          | } Bradfield - - - {     | 20998          |
| Arwarton Steeple - - -    | 43 12 0          |                         | 28059          |
| Bradfield Steeple         |                  |                         |                |
| Dover Court - - -         | 72 48 50         | } Harwich - - - {       | 8881           |
| Rushmere - - -            | 9 58 0           |                         | 49036          |
| Harwich Spire             |                  |                         |                |
| Dover Court - - -         | 56 48 20         | } Hollesley - - - {     | 57475          |
| Rushmere - - -            | 67 58 30         |                         | 51881          |
| Hollesley Steeple         |                  |                         |                |
| Dover Court - - -         | 47 7 40          | } Shottisham - - - {    | 52205          |
| Rushmere - - -            | 68 4 20          |                         | 41224          |
| Shottisham Steeple        |                  |                         |                |
| Dover Court - - -         | 65 59 15         | } Bawdsey - - - {       | 46177          |
| Rushmere - - -            | 52 42 10         |                         | 53024          |
| Bawdsey Steeple           |                  |                         |                |



| Names of Stations.            | Observed angles.                                                     | Distances.            |                                                                        |
|-------------------------------|----------------------------------------------------------------------|-----------------------|------------------------------------------------------------------------|
| Dover Court - - -             | $\begin{smallmatrix} 52 & 48 & 11 \\ 28 & 31 & 0 \end{smallmatrix}$  | } Felixstow - - -     | $\begin{smallmatrix} \text{Fect.} \\ 28926 \\ 48262 \end{smallmatrix}$ |
| Woodbridge Steeple - -        |                                                                      |                       |                                                                        |
| <i>Felixstow Signal Staff</i> |                                                                      |                       |                                                                        |
| Dover Court - - -             | $\begin{smallmatrix} 45 & 12 & 55 \\ 44 & 53 & 0 \end{smallmatrix}$  | } Bawdsey - - -       | $\begin{smallmatrix} 42265 \\ 42510 \end{smallmatrix}$                 |
| Woodbridge - - -              |                                                                      |                       |                                                                        |
| <i>Bawdsey Signal Staff</i>   |                                                                      |                       |                                                                        |
| Rushmere - - -                | $\begin{smallmatrix} 45 & 41 & 10 \\ 103 & 52 & 0 \end{smallmatrix}$ | } Orford - - -        | $\begin{smallmatrix} 75267 \\ 55472 \end{smallmatrix}$                 |
| Falkenham Steeple - -         |                                                                      |                       |                                                                        |
| <i>Orford Steeple</i>         |                                                                      |                       |                                                                        |
| Woodbridge - - -              | $\begin{smallmatrix} 28 & 28 & 0 \\ 34 & 37 & 0 \end{smallmatrix}$   | } Rendlesham - - -    | $\begin{smallmatrix} 21686 \\ 18204 \end{smallmatrix}$                 |
| Butely Steeple - - -          |                                                                      |                       |                                                                        |
| <i>Rendlesham Steeple</i>     |                                                                      |                       |                                                                        |
| Butely - - -                  | $\begin{smallmatrix} 153 & 23 & 0 \\ 12 & 20 & 0 \end{smallmatrix}$  | } Orford - - -        | $\begin{smallmatrix} 15762 \\ 33057 \end{smallmatrix}$                 |
| Rendlesham - - -              |                                                                      |                       |                                                                        |
| <i>Orford Steeple</i>         |                                                                      |                       |                                                                        |
| Dover Court - - -             | $\begin{smallmatrix} 8 & 2 & 6 \\ 66 & 54 & 0 \end{smallmatrix}$     | } Kesgrave - - -      | $\begin{smallmatrix} 7371 \\ 48505 \end{smallmatrix}$                  |
| Rushmere - - -                |                                                                      |                       |                                                                        |
| <i>Kesgrave Steeple</i>       |                                                                      |                       |                                                                        |
| Dover Court - - -             | $\begin{smallmatrix} 34 & 14 & 16 \\ 62 & 15 & 50 \end{smallmatrix}$ | } Waldringfield - - - | $\begin{smallmatrix} 45360 \\ 28841 \end{smallmatrix}$                 |
| Rushmere - - -                |                                                                      |                       |                                                                        |
| <i>Waldringfield Steeple</i>  |                                                                      |                       |                                                                        |
| Dover Court - - -             | $\begin{smallmatrix} 30 & 58 & 10 \\ 56 & 8 & 30 \end{smallmatrix}$  | } Whertstead - - -    | $\begin{smallmatrix} 40331 \\ 24993 \end{smallmatrix}$                 |
| Kesgrave Steeple - - -        |                                                                      |                       |                                                                        |
| <i>Whertstead Steeple</i>     |                                                                      |                       |                                                                        |
| Falkenham - - -               | $\begin{smallmatrix} 30 & 59 & 0 \\ 36 & 2 & 50 \end{smallmatrix}$   | } Nacton - - -        | $\begin{smallmatrix} 25098 \\ 21959 \end{smallmatrix}$                 |
| Rushmere - - -                |                                                                      |                       |                                                                        |
| <i>Nacton Steeple</i>         |                                                                      |                       |                                                                        |
| Dover Court - - -             | $\begin{smallmatrix} 13 & 29 & 58 \\ 22 & 45 & 20 \end{smallmatrix}$ | } Capel - - -         | $\begin{smallmatrix} 55220 \\ 33325 \end{smallmatrix}$                 |
| Stoke - - -                   |                                                                      |                       |                                                                        |
| <i>Capel Steeple</i>          |                                                                      |                       |                                                                        |
| Stoke - - -                   | $\begin{smallmatrix} 24 & 14 & 18 \\ 103 & 0 & 34 \end{smallmatrix}$ | } Hintlesham - - -    | $\begin{smallmatrix} 40790 \\ 17186 \end{smallmatrix}$                 |
| Capel Steeple - - -           |                                                                      |                       |                                                                        |
| <i>Hintlesham Steeple</i>     |                                                                      |                       |                                                                        |
| Stoke - - -                   | $\begin{smallmatrix} 29 & 43 & 10 \\ 61 & 31 & 40 \end{smallmatrix}$ | } Bildestone - - -    | $\begin{smallmatrix} 42238 \\ 23821 \end{smallmatrix}$                 |
| Lavenham Steeple - - -        |                                                                      |                       |                                                                        |
| <i>Bildestone Steeple</i>     |                                                                      |                       |                                                                        |



| Names of Stations.                    | Observed angles.                                                                   | Distances.               |                         |
|---------------------------------------|------------------------------------------------------------------------------------|--------------------------|-------------------------|
| Stoke - - - - -                       | $\begin{smallmatrix} 0 & ' & '' \\ 33 & 53 & 40 \\ 48 & 50 & 10 \end{smallmatrix}$ | } Aldham - - - {         | Fect.<br>32055<br>23746 |
| Bildestone Steeple - - -              |                                                                                    |                          |                         |
| Aldbam Steeple                        |                                                                                    |                          |                         |
| Lavenham - - - - -                    | $\begin{smallmatrix} 29 & 39 & 50 \\ 93 & 17 & 20 \end{smallmatrix}$               | } Hadleigh - - - {       | 42673<br>21154          |
| Naughton - - - - -                    |                                                                                    |                          |                         |
| Hadleigh Spire                        |                                                                                    |                          |                         |
| Lavenham - - - - -                    | $\begin{smallmatrix} 31 & 40 & 10 \\ 42 & 21 & 50 \end{smallmatrix}$               | } Lindsey - - - {        | 25138<br>19587          |
| Naughton Steeple - - -                |                                                                                    |                          |                         |
| Lindsey Steeple                       |                                                                                    |                          |                         |
| Stoke - - - - -                       | $\begin{smallmatrix} 23 & 7 & 30 \\ 24 & 48 & 40 \end{smallmatrix}$                | } Newton - - - {         | 27153<br>25413          |
| Lavenham - - - - -                    |                                                                                    |                          |                         |
| Newton Steeple                        |                                                                                    |                          |                         |
| Stoke - - - - -                       | $\begin{smallmatrix} 27 & 1 & 0 \\ 42 & 49 & 0 \end{smallmatrix}$                  | } Grotton - - - {        | 19660<br>13140          |
| Newton - - - - -                      |                                                                                    |                          |                         |
| Grotton Steeple                       |                                                                                    |                          |                         |
| Bulmer Steeple - - - - -              | $\begin{smallmatrix} 67 & 27 & 40 \\ 53 & 37 & 50 \end{smallmatrix}$               | } Waldingfield - - - {   | 25637<br>29407          |
| Glemsford Steeple - - -               |                                                                                    |                          |                         |
| Waldingfield Steeple                  |                                                                                    |                          |                         |
| Lavenham - - - - -                    | $\begin{smallmatrix} 56 & 59 & 0 \\ 33 & 6 & 50 \end{smallmatrix}$                 | } Acton - - - {          | 14065<br>21097          |
| Glemsford - - - - -                   |                                                                                    |                          |                         |
| Acton Steeple                         |                                                                                    |                          |                         |
| Lavenham - - - - -                    | $\begin{smallmatrix} 26 & 13 & 10 \\ 91 & 21 & 20 \end{smallmatrix}$               | } Beauchamp - - - {      | 41546<br>18360          |
| Bulmer - - - - -                      |                                                                                    |                          |                         |
| Beauchamp Church, St. Paul's          |                                                                                    |                          |                         |
| Lavenham - - - - -                    | $\begin{smallmatrix} 12 & 31 & 50 \\ 52 & 7 & 20 \end{smallmatrix}$                | } Hedingham Castle {     | 59359<br>16316          |
| Topplesfield Steeple - - -            |                                                                                    |                          |                         |
| High western part of Hedingham Castle |                                                                                    |                          |                         |
| Lavenham - - - - -                    | $\begin{smallmatrix} 26 & 57 & 0 \\ 123 & 32 & 0 \end{smallmatrix}$                | } Ridgewell - - - {      | 62325<br>33886          |
| Bulmer - - - - -                      |                                                                                    |                          |                         |
| Ridgewell Steeple                     |                                                                                    |                          |                         |
| Stoke Steeple - - - - -               | $\begin{smallmatrix} 101 & 57 & 15 \\ 20 & 32 & 45 \end{smallmatrix}$              | } Langham - - - {        | 17904<br>49907          |
| Naughton Steeple - - -                |                                                                                    |                          |                         |
| Langham Steeple                       |                                                                                    |                          |                         |
| Stoke Steeple - - - - -               | $\begin{smallmatrix} 21 & 17 & 20 \\ 8 & 23 & 40 \end{smallmatrix}$                | } Great Horksley - - - { | 13615<br>33859          |
| Great Tey Steeple - - -               |                                                                                    |                          |                         |
| Great Horksley Steeple                |                                                                                    |                          |                         |



| Names of Stations.       | Observed angles. | Distances.         |                |
|--------------------------|------------------|--------------------|----------------|
| Stoke - - -              | 71 21 0          | } Great Horksley - | Feet.<br>13615 |
| Twinestead Steeple -     | 19 53 0          |                    | 37819          |
| Great Horksley Steeple   |                  |                    |                |
| Stoke - - -              | 44 24 0          | } Mount Bures -    | 29360          |
| Great Horksley - -       | 109 43 0         |                    | 21821          |
| Mount Bures Steeple      |                  |                    |                |
| Stoke - - -              | 62 30 40         | } Earles Colne -   | 47756          |
| St. Mary's, Colchester - | 70 48 0          |                    | 44860          |
| Earles Colne Steeple     |                  |                    |                |
| Great Tey - - -          | 24 47 20         | } West Bergholt -  | 21357          |
| St. Mary's Colchester -  | 33 14 0          |                    | 16339          |
| West Bergholt Steeple    |                  |                    |                |
| Danbury - - -            | 6 6 0            | } Braxted - - -    | 41358          |
| Great Tey - - -          | 6 56 40          |                    | 36349          |
| Braxted Steeple          |                  |                    |                |
| Great Tey - - -          | 4 37 24          | } Kelvedon - - -   | 36349          |
| Braxted Steeple - -      | 11 43 36         |                    | 10407          |
| Kelvedon Steeple         |                  |                    |                |
| Great Tey - - -          | 30 14 50         | } Messing - - -    | 22390          |
| Kelvedon - - -           | 58 32 0          |                    | 13223          |
| Messing Steeple          |                  |                    |                |
| Great Tey - - -          | 51 43 10         | } East Thorp -     | 15462          |
| Kelvedon - - -           | 36 4 0           |                    | 20616          |
| East Thorp Steeple       |                  |                    |                |
| Danbury - - -            | 50 48 0          | } Black Notley -   | 51487          |
| Triptree, new station -  | 85 12 30         |                    | 40039          |
| Black Notley Steeple     |                  |                    |                |
| Danbury - - -            | 23 51 34         | } Witham - - -     | 35850          |
| Triptree, old station -  | 77 29 26         |                    | 14852          |
| Witham Steeple           |                  |                    |                |
| Danbury - - -            | 47 47 25         | } Tarling - - -    | 31874          |
| Triptree, old station -  | 58 17 35         |                    | 27751          |
| Tarling Spire            |                  |                    |                |
| Danbury - - -            | 51 43 0          | } Braintree - - -  | 58918          |
| Triptree, old station -  | 90 45 50         |                    | 46252          |
| Braintree Steeple        |                  |                    |                |



Trigonometrical Survey.

699

| Names of Stations.                 | Observed angles. | Distances.               |       |
|------------------------------------|------------------|--------------------------|-------|
|                                    |                  |                          | Fect. |
| Triptree, new station - - -        | 56° 13' 54"      | } Feltstead - - - {      | 63574 |
| Gallywood station - - -            | 64 47 51         |                          | 58409 |
| Feltstead Steeple                  |                  |                          |       |
| Danbury - - - - -                  | 26 31 30         | } Braintree - - - {      | 58918 |
| Feltstead Steeple - - -            | 73 49 10         |                          | 27392 |
| Braintree Steeple                  |                  |                          |       |
| Danbury - - - - -                  | 17 39 30         | } Feltstead - - - {      | 60336 |
| Pleshley Steeple - - -             | 116 15 43        |                          | 20409 |
| Feltstead Steeple                  |                  |                          |       |
| Triptree, new station - -          | 27 23 20         | } Hatfield Peverel - - { | 20267 |
| Danbury - - - - -                  | 27 35 30         |                          | 20132 |
| S. Spire of Hatfield Peverel Abbey |                  |                          |       |
| Pleshley - - - - -                 | 68 3 0           | } Great Leigh - - {      | 24915 |
| Feltstead - - - - -                | 64 21 0          |                          | 25635 |
| Great Leigh Steeple                |                  |                          |       |
| Danbury - - - - -                  | 41 29 44         | } Great Baddow - - {     | 16345 |
| Pleshley - - - - -                 | 16 39 0          |                          | 37796 |
| Great Baddow Steeple               |                  |                          |       |
| Danbury - - - - -                  | 23 59 8          | } Chelmsford - - - {     | 24110 |
| Pleshley - - - - -                 | 20 21 0          |                          | 28186 |
| Chelmsford Spire                   |                  |                          |       |
| Danbury - - - - -                  | 32 38 36         | } Whittle - - - {        | 33552 |
| Pleshley - - - - -                 | 41 51 20         |                          | 27122 |
| Whittle Steeple                    |                  |                          |       |
| Danbury - - - - -                  | 19 16 20         | } Willingale Spain - - { | 60488 |
| Hatfield Broad Oak - - -           | 35 29 15         |                          | 34390 |
| Willingale Spain Steeple           |                  |                          |       |
| Pleshley - - - - -                 | 36 12 0          | } Roxwell - - - {        | 19937 |
| Gallywood station - - -            | 26 14 36         |                          | 26630 |
| Roxwell Steeple                    |                  |                          |       |
| Pleshley - - - - -                 | 103 44 45        | } White Roding - - {     | 33489 |
| Gallywood station - - -            | 34 9 50          |                          | 57926 |
| White Roding Steeple               |                  |                          |       |
| Southweld Steeple - - -            | 27 51 51         | } Doddinghurst - - {     | 17880 |
| Frierning Steeple - - -            | 30 14 50         |                          | 16590 |
| Doddinghurst Steeple               |                  |                          |       |



| Names of stations.            | Observed angles. | Distances.           |       |
|-------------------------------|------------------|----------------------|-------|
| Southweald - - -              | 0 1 0            | } Theydon - - -      | Feet. |
| Epping Windmill - -           | 3 49 0           |                      | 31098 |
| Theydon Mount Steeple         | 7 31 0           |                      | 15824 |
| Southweald - - -              | 49 13 0          | } Navestock - - -    | 9656  |
| Theydon Mount Steeple -       | 16 26 0          |                      | 25846 |
| Navestock new Windmill        |                  |                      |       |
| Southweald - - -              | 5 18 0           | } Theydon Garnon - - | 37107 |
| Theydon Mount - - -           | 149 43 0         |                      | 6797  |
| Theydon Garnon Steeple        |                  |                      |       |
| Theydon Mount - - -           | 111 19 30        | } Havering - - -     | 21090 |
| Theydon Garnon - - -          | 53 38 0          |                      | 24397 |
| Havering Steeple              |                  |                      |       |
| Severndroog Tower - -         | 5 40 20          | } Cupola - - -       | 52260 |
| Highbeeche Station - -        | 14 49 4          |                      | 20197 |
| Cupola of a house at Woodford |                  |                      |       |
| Southweald - - -              | 36 20 20         | } Ruins - - -        | 51340 |
| Highbeeche - - -              | 65 36 20         |                      | 33405 |
| Ruins near Ilford             |                  |                      |       |
| Highbeeche - - -              | 102 38 0         | } Cheshunt - - -     | 34702 |
| St. Paul's - - -              | 26 2 0           |                      | 77151 |
| Cheshunt Station              |                  |                      |       |
| Berkhamstead Gazebo - -       | 25 59 0          | } Hunsdon - - -      | 43157 |
| Naseing Steeple - - -         | 88 51 24         |                      | 18911 |
| Hunsdon Steeple               |                  |                      |       |
| Naseing - - -                 | 94 35 0          | } Broxbourn - - -    | 13899 |
| Hunsdon Steeple - - -         | 34 41 0          |                      | 24348 |
| Broxbourn Steeple             |                  |                      |       |
| Berkhamstead Gazebo - -       | 8 33 28          | } Harlow Steeple - - | 62528 |
| Hatfield Broad Oak Steeple    | 20 11 11         |                      | 26964 |
| Harlow Steeple                |                  |                      |       |
| Hatfield Broad Oak - - -      | 19 44 10         | } Sabridgeworth - -  | 21054 |
| Naseing - - -                 | 11 48 5          |                      | 34763 |
| Sabridgeworth Steeple         |                  |                      |       |
| Thorley Steeple - - -         | 45 17 0          | } Great Hadham - -   | 15253 |
| Albury Steeple - - -          | 40 29 0          |                      | 16995 |
| Great Hadham Steeple          |                  |                      |       |



Trigonometrical Survey.

701

| Names of stations.             | Observed angles.                                                                   | Distances.                 |       |
|--------------------------------|------------------------------------------------------------------------------------|----------------------------|-------|
| Henham on the Mount Steeple    | $\begin{smallmatrix} 31^{\circ} 43' 34'' \\ 53^{\circ} 24' 6'' \end{smallmatrix}$  | } Bishop Stortford - {     | 30524 |
| Albury Steeple -               |                                                                                    |                            | 19993 |
| Bishop Stortford Steeple       |                                                                                    |                            |       |
| Henham on the Mount -          | $\begin{smallmatrix} 42^{\circ} 32' 24'' \\ 23^{\circ} 35' 3'' \end{smallmatrix}$  | } Stanstead Mountfitchet { | 16575 |
| Albury -                       |                                                                                    |                            | 28009 |
| Stanstead Mountfitchet Steeple |                                                                                    |                            |       |
| Henham on the Mount -          | $\begin{smallmatrix} 31^{\circ} 3' 0'' \\ 109^{\circ} 2' 0'' \end{smallmatrix}$    | } Farnham - - {            | 24419 |
| Stanstead Mountfitchet -       |                                                                                    |                            | 13323 |
| Farnham Steeple                |                                                                                    |                            |       |
| Henham on the Mount -          | $\begin{smallmatrix} 38^{\circ} 33' 0'' \\ 73^{\circ} 13' 10'' \end{smallmatrix}$  | } Meesdon - - {            | 39054 |
| Albury -                       |                                                                                    |                            | 25421 |
| Meesdon Windmill               |                                                                                    |                            |       |
| Henham on the Mount -          | $\begin{smallmatrix} 40^{\circ} 10' 40'' \\ 25^{\circ} 58' 10'' \end{smallmatrix}$ | } Octagon Lodge - {        | 21677 |
| Elmdon Steeple -               |                                                                                    |                            | 31938 |
| Chimney on an octagon Lodge    |                                                                                    |                            |       |
| Balsham Steeple -              | $\begin{smallmatrix} 75^{\circ} 15' 8'' \\ 25^{\circ} 0' 22'' \end{smallmatrix}$   | } Shady Camps - {          | 23740 |
| Elmdon -                       |                                                                                    |                            | 53410 |
| Shady Camps Steeple            |                                                                                    |                            |       |
| Balsham -                      | $\begin{smallmatrix} 31^{\circ} 7' 10'' \\ 99^{\circ} 19' 0'' \end{smallmatrix}$   | } Ashdon - - {             | 30778 |
| Shady Camps -                  |                                                                                    |                            | 16120 |
| Ashdon Steeple                 |                                                                                    |                            |       |
| Danbury -                      | $\begin{smallmatrix} 9^{\circ} 35' 0'' \\ 26^{\circ} 0' 9'' \end{smallmatrix}$     | } Little Saling - {        | 76469 |
| Thaxted Spire -                |                                                                                    |                            | 28886 |
| Little Saling Steeple          |                                                                                    |                            |       |
| Elmdon -                       | $\begin{smallmatrix} 22^{\circ} 27' 0'' \\ 64^{\circ} 25' 0'' \end{smallmatrix}$   | } Newport - - {            | 26492 |
| Rickling Steeple -             |                                                                                    |                            | 11216 |
| Newport Steeple                |                                                                                    |                            |       |
| Danbury -                      | $\begin{smallmatrix} 7^{\circ} 53' 6'' \\ 61^{\circ} 38' 0'' \end{smallmatrix}$    | } Stebbing - - {           | 71826 |
| Little Saling Steeple -        |                                                                                    |                            | 11198 |
| Stebbing Steeple               |                                                                                    |                            |       |



ART. XL. *Principal Triangles for the Survey of the Western Part of Kent. Plate XXXIII.*

Frant Steeple from Botley Hill 90362,4 feet.

| Names of stations.      |   |   | Observed angles. | Distances.       |   |                |
|-------------------------|---|---|------------------|------------------|---|----------------|
| Frant Steeple           | - | - | 22 17 10         | } Sevenoaks      | - | Feet.<br>58492 |
| Botley Hill             | - | - | 32 52 47         |                  | - | 44032          |
| Sevenoaks old Windmill  | - | - |                  |                  | - |                |
| Frant                   | - | - | 22 17 10         | } Chiddingstone  | - | 42875          |
| Sevenoaks Windmill      | - | - | 40 52 50         |                  | - | 24858          |
| Chiddingstone Steeple   | - | - |                  |                  | - |                |
| Frant                   | - | - | 35 2 17          | } Mount Sion     | - | 57874          |
| Chiddingstone           | - | - | 97 43 43         |                  | - | 33532          |
| Mount Sion Station      | - | - |                  |                  | - |                |
| Frant                   | - | - | 31 28 30         | } East Peckham   | - | 58964          |
| Mount Sion              | - | - | 76 9 30          |                  | - | 31707          |
| East Peckham Steeple    | - | - |                  |                  | - |                |
| Mount Sion              | - | - | 48 14 0          | } Tudely Steeple | - | 31363          |
| East Peckham            | - | - | 65 11 0          |                  | - | 25772          |
| Tudely Steeple          | - | - |                  |                  | - |                |
| Botley Hill             | - | - | 11 1 48          | } Seal Chart     | - | 59563          |
| Sevenoaks Windmill      | - | - | 141 42 12        |                  | - | 18388          |
| Seal Chart Station      | - | - |                  |                  | - |                |
| Seal Chart              | - | - | 74 10 0          | } Tunbridge      | - | 26851          |
| Sevenoaks Windmill      | - | - | 66 49 0          |                  | - | 28101          |
| Tunbridge Steeple       | - | - |                  |                  | - |                |
| Seal Chart              | - | - | 78 1 0           | } Otford Mount   | - | 20397          |
| Sevenoaks Windmill      | - | - | 54 39 0          |                  | - | 24462          |
| Station on Otford Mount | - | - |                  |                  | - |                |
| Sevenoaks Windmill      | - | - | 69 27 0          | } Silverden Farm | - | 28395          |
| Otford Mount            | - | - | 61 24 0          |                  | - | 30284          |
| Silverden Farm Station  | - | - |                  |                  | - |                |

Norwood from Severndroog Tower 39155 feet.

|                   |   |   |         |             |   |       |
|-------------------|---|---|---------|-------------|---|-------|
| Norwood           | - | - | 53 7 40 | } Well Hill | - | 57393 |
| Severndroog Tower | - | - | 84 8 0  |             | - | 46155 |
| Well Hill Station | - | - |         |             | - |       |



| Names of stations.        | Observed angles. | Distances.         |                |
|---------------------------|------------------|--------------------|----------------|
| Severndroog Tower - - -   | 55 4 14          | } Crayford - - -   | Feet.<br>26479 |
| Well Hill - - -           | 35 0 32          |                    | 37840          |
| Crayford Steeple          |                  |                    |                |
| Well Hill - - -           | 77 37 40         | } Ash - - -        | 34738          |
| Crayford - - -            | 48 8 40          |                    | 45555          |
| Ash Steeple               |                  |                    |                |
| Ash - - -                 | 53 7 10          | } Northfleet - - - | 32237          |
| Crayford - - -            | 44 32 4          |                    | 36767          |
| Northfleet Steeple        |                  |                    |                |
| Ash - - -                 | 15 30 4          | } Gravesend - - -  | 32664          |
| Northfleet - - -          | 85 1 8           |                    | 8762           |
| Gravesend Station         |                  |                    |                |
| Ash - - -                 | 47 33 30         | } Belvidere - - -  | 56308          |
| Northfleet - - -          | 97 53 40         |                    | 41951          |
| Lord Eardley's, Belvidere |                  |                    |                |

Gravesend from Halstow 44836 feet.

|                         |           |                         |       |
|-------------------------|-----------|-------------------------|-------|
| Gravesend - - -         | 31 38 20  | } Gadshill - - -        | 22275 |
| Halstow - - -           | 24 18 20  |                         | 28388 |
| Gadshill Station        |           |                         |       |
| Halstow - - -           | 128 34 28 | } Sheppey from Gadshill | 70686 |
| Sheppey - - -           | 18 18 3   |                         |       |
| Gadshill                |           |                         |       |
| Sheppey - - -           | 88 18 0   | } Stockbury - - -       | 43144 |
| Hernhill Steeple - - -  | 37 2 0    |                         | 71603 |
| Stockbury Steeple       |           |                         |       |
| Frinstead Steeple - - - | 65 27 18  | } Hernhill - - -        | 57820 |
| Sheppey - - -           | 64 9 24   |                         | 58439 |
| Hernhill Steeple        |           |                         |       |

ART. XLI. Secondary Triangles.

|                                |          |                    |       |
|--------------------------------|----------|--------------------|-------|
| Frant Steeple - - -            | 26 37 20 | } Bidborough - - - | 26066 |
| Botley Hill Station - - -      | 9 52 49  |                    | 68071 |
| Bidborough Steeple             |          |                    |       |
| Frant - - -                    | 20 52 0  | } Station - - -    | 27227 |
| Chiddington Steeple - - -      | 29 5 0   |                    | 19951 |
| Station near Bidborough Church |          |                    |       |



| Names of stations.                  | Observed angles.       | Distances.                 |                         |
|-------------------------------------|------------------------|----------------------------|-------------------------|
| Frant - - -                         | $104^{\circ} 24' 36''$ | } Remarkable Tree - {      | Feet.<br>24226<br>99201 |
| Botley Hill - - -                   | $13^{\circ} 40' 51''$  |                            |                         |
| Remarkable Tree near Kibben's Cross |                        |                            |                         |
| Frant - - -                         | $46^{\circ} 32' 0''$   | } Cowden - - {             | 41943<br>30485          |
| Station near Bidborough Church      | $93^{\circ} 3' 30''$   |                            |                         |
| Cowden Steeple                      |                        |                            |                         |
| Station near Bidborough Church      | $76^{\circ} 2' 0''$    | } Mount Sion - {           | 32194<br>35532          |
| Chiddingstone Steeple -             | $68^{\circ} 42' 0''$   |                            |                         |
| Mount Sion Station                  |                        |                            |                         |
| Station near Bidborough Church      | $20^{\circ} 37' 0''$   | } Leigh - - {              | 11241<br>22031          |
| Mount Sion - - -                    | $10^{\circ} 21' 0''$   |                            |                         |
| Leigh Steeple                       |                        |                            |                         |
| Frant - - -                         | $10^{\circ} 5' 30''$   | } Ide Hill - - {           | 62547<br>21689          |
| Chiddingstone - - -                 | $149^{\circ} 38' 30''$ |                            |                         |
| Ide Hill Station                    |                        |                            |                         |
| Chiddingstone - - -                 | $67^{\circ} 42' 0''$   | } Edenbridge - {           | 18639<br>22606          |
| Ide Hill - - -                      | $49^{\circ} 43' 0''$   |                            |                         |
| Edenbridge Steeple                  |                        |                            |                         |
| Seal Church Steeple -               | $57^{\circ} 45' 0''$   | } Sevenoaks - {            | 15132<br>17766          |
| Otford Mount - - -                  | $46^{\circ} 5' 0''$    |                            |                         |
| Sevenoaks Steeple                   |                        |                            |                         |
| Mount Sion Station -                | $20^{\circ} 36' 0''$   | } Hadlow - - {             | 25291<br>11987          |
| Peckham Steeple - - -               | $47^{\circ} 56' 0''$   |                            |                         |
| Hadlow Steeple                      |                        |                            |                         |
| Seal Chart Station -                | $50^{\circ} 45' 0''$   | } Sundrich - - {           | 29804<br>23131          |
| Otford Mount - - -                  | $86^{\circ} 11' 0''$   |                            |                         |
| Sundrich Steeple                    |                        |                            |                         |
| Otford Mount - - -                  | $94^{\circ} 17' 0''$   | } Seal - - - {             | 9705<br>32484           |
| Silverden Station - - -             | $17^{\circ} 20' 0''$   |                            |                         |
| Seal Steeple                        |                        |                            |                         |
| Well Hill Station -                 | $17^{\circ} 40' 40''$  | } Ketson Common Windmill { | 26538<br>33103          |
| Norwood - - -                       | $14^{\circ} 5' 22''$   |                            |                         |
| Windmill, Ketson Common             |                        |                            |                         |
| Well Hill - - -                     | $56^{\circ} 39' 0''$   | } Flagstaff - - {          | 28273<br>38664          |
| Severndroog Tower -                 | $37^{\circ} 39' 0''$   |                            |                         |
| Flagstaff on Hayes Common           |                        |                            |                         |



## Norwood from Severndroog Tower 32155 feet. Between the triangles

| Names of Stations.            | Observed angles. | Distances.        |        |
|-------------------------------|------------------|-------------------|--------|
| Norwood - - -                 | 65° 53' 30"      | } Flagstaff - - { | Feet.  |
| Severndroog Tower - -         | 46 30 0          |                   | 30718  |
| Hayes Common                  |                  |                   | 38654* |
| Norwood - - -                 | 34 27 30         | } Flagstaff - - { | 20391  |
| Hayes Common - - -            | 39 41 0          |                   | 18068  |
| Flagstaff on Addington Common |                  |                   |        |
| Well Hill - - -               | 56 11 40         | } Cudham - - {    | 20860  |
| Norwood - - -                 | 22 44 5          |                   | 48958  |
| Cudham Steeple                |                  |                   |        |

## Well Hill from Otford Mount 19206 feet.

|                             |          |                         |       |
|-----------------------------|----------|-------------------------|-------|
| Otford Mount - - -          | 52 11 0  | } Knockholt Beeches - { | 22860 |
| Well Hill - - -             | 73 58 0  |                         | 18790 |
| Knockholt Beeches, East End |          |                         |       |
| Well Hill - - -             | 22 22 46 | } Race House - {        | 27859 |
| Crayford Steeple - -        | 41 17 10 |                         | 16075 |
| Dome of a Race House        |          |                         |       |
| Well Hill - - -             | 70 25 40 | } Windmill - - {        | 57560 |
| Norwood - - -               | 39 36 24 |                         | 38945 |
| Windmill, Bromley Common    |          |                         |       |
| Well Hill - - -             | 59 1 0   | } Farnborough - {       | 11650 |
| Severndroog Tower - -       | 13 58 0  |                         | 41381 |
| Farnborough Station         |          |                         |       |
| Well Hill - - -             | 58 52 0  | } St. Mary's Cray - {   | 17255 |
| Farnborough - - -           | 79 32 0  |                         | 15019 |
| St. Mary's Cray Steeple     |          |                         |       |
| Well Hill - - -             | 79 42 26 | } Halstead - - {        | 8653  |
| Norwood - - -               | 8 40 4   |                         | 56492 |
| Halstead Steeple            |          |                         |       |
| Norwood - - -               | 36 36 40 | } Bromley - - {         | 22696 |
| Severndroog Tower - -       | 32 52 50 |                         | 24932 |
| Bromley Steeple             |          |                         |       |
| Well Hill - - -             | 32 29 0  | } Bromley - - {         | 36198 |
| Severndroog Tower - -       | 51 13 0  |                         | 22933 |
| Bromley Steeple             |          |                         |       |



| Names of Stations.                                 | Observed angles. | Distances.              |       |
|----------------------------------------------------|------------------|-------------------------|-------|
| Well Hill - - - -                                  | 0 1 0            | } Hayes - - - {         | Eet.  |
| Bromley - - - -                                    | 14 19 0          |                         | 31069 |
| Hayes Steeple                                      | 51 35 0          |                         | 9805  |
| Bromley - - - -                                    | 45 18 0          | } Lewisham - - - {      | 19640 |
| Severndroog Tower - -                              | 51 28 0          |                         | 17846 |
| Lewisham Steeple                                   |                  |                         |       |
| Severndroog Tower from Chiselhurst Steeple, 36778. |                  |                         |       |
| Severndroog Tower - - -                            | 100 42 0         | } New Cross - - - {     | 23529 |
| Chiselhurst Steeple - -                            | 42 22 0          |                         | 34309 |
| New Cross Station                                  |                  |                         |       |
| Severndroog Tower - - -                            | 38 0 0           | } Eastcombe Point - - { | 18014 |
| New Cross - - - -                                  | 49 55 0          |                         | 14496 |
| Eastcombe Point Station                            |                  |                         |       |
| Severndroog Tower - - -                            | 49 39 0          | } Woolwich - - - {      | 9628  |
| Eastcombe Point - - -                              | 31 55 0          |                         | 13879 |
| Woolwich Steeple                                   |                  |                         |       |
| Severndroog Tower - - -                            | 15 1 30          | } Bexley - - - {        | 23453 |
| Crayford - - - -                                   | 57 48 20         |                         | 7185  |
| Bexley Steeple                                     |                  |                         |       |
| Well Hill - - - -                                  | 61 48 0          | } Charlton - - - {      | 22835 |
| Crayford - - - -                                   | 36 39 0          |                         | 33714 |
| Charlton Farm                                      |                  |                         |       |
| Crayford - - - -                                   | 23 17 10         | } Darent - - - {        | 20374 |
| Charlton Farm - - - -                              | 28 14 0          |                         | 17026 |
| Darent Steeple                                     |                  |                         |       |
| Ash Steeple - - - -                                | 12 56 49         | } Dartford Brent - - {  | 33636 |
| Crayford - - - -                                   | 30 32 18         |                         | 14830 |
| Dartford Brent Mill                                |                  |                         |       |
| Crayford - - - -                                   | 16 16 18         | } Stone - - - {         | 21153 |
| Stone Steeple - - - -                              | 31 0 0           |                         | 8069  |
| Dartford Brent                                     |                  |                         |       |
| Ash - - - -                                        | 15 42 50         | } Hartley - - - {       | 7869  |
| Northfleet Steeple - -                             | 4 56 20          |                         | 24750 |
| Hartley Steeple                                    |                  |                         |       |
| Northfleet - - - -                                 | 8 40 40          | } Ridley - - - {        | 33675 |
| Ash - - - -                                        | 101 42 0         |                         | 5189  |
| Ridley Steeple                                     |                  |                         |       |



Trigonometrical Survey.

707

| Names of Stations.                          | Observed angles.                                                      | Distances.             |                                                                        |
|---------------------------------------------|-----------------------------------------------------------------------|------------------------|------------------------------------------------------------------------|
| Northfleet - - -                            | $\begin{smallmatrix} 90 & 15 & 30 \\ 49 & 26 & 6 \end{smallmatrix}$   | } Southfleet - - -     | $\begin{smallmatrix} \text{Feet.} \\ 10290 \\ 13545 \end{smallmatrix}$ |
| Gravesend Station -                         |                                                                       |                        |                                                                        |
| Southfleet Steeple                          |                                                                       |                        |                                                                        |
| Gadshill - - - -                            | $\begin{smallmatrix} 28 & 8 & 54 \\ 121 & 36 & 55 \end{smallmatrix}$  | } Shottenden Mill - -  | $\begin{smallmatrix} 119539 \\ 66221 \end{smallmatrix}$                |
| Sheppey Isle - - -                          |                                                                       |                        |                                                                        |
| Shottenden Windmill                         |                                                                       |                        |                                                                        |
| Gravesend Station - - -                     | $\begin{smallmatrix} 40 & 46 & 7 \\ 92 & 28 & 1 \end{smallmatrix}$    | } Cliff - - -          | $\begin{smallmatrix} 39549 \\ 19967 \end{smallmatrix}$                 |
| Gadshill - - - -                            |                                                                       |                        |                                                                        |
| Cliff Steeple                               |                                                                       |                        |                                                                        |
| Gravesend Station - - -                     | $\begin{smallmatrix} 35 & 48 & 14 \\ 76 & 47 & 15 \end{smallmatrix}$  | } Higham - - -         | $\begin{smallmatrix} 14115 \\ 23489 \end{smallmatrix}$                 |
| Gadshill - - - -                            |                                                                       |                        |                                                                        |
| Higham Steeple                              |                                                                       |                        |                                                                        |
| Gravesend Station - - -                     | $\begin{smallmatrix} 86 & 16 & 16 \\ 4 & 18 & 19 \end{smallmatrix}$   | } Gravesend - - -      | $\begin{smallmatrix} 3373 \\ 44747 \end{smallmatrix}$                  |
| Halstow Station - - -                       |                                                                       |                        |                                                                        |
| Gravesend Steeple                           |                                                                       |                        |                                                                        |
| Gravesend - - - -                           | $\begin{smallmatrix} 25 & 8 & 43 \\ 8 & 11 & 44 \end{smallmatrix}$    | } Chalk - - -          | $\begin{smallmatrix} 11621 \\ 34673 \end{smallmatrix}$                 |
| Halstow - - - -                             |                                                                       |                        |                                                                        |
| Chalk Steeple                               |                                                                       |                        |                                                                        |
| Gravesend - - - -                           | $\begin{smallmatrix} 59 & 21 & 48 \\ 72 & 5 & 57 \end{smallmatrix}$   | } Lower Hope Point - - | $\begin{smallmatrix} 28287 \\ 25577 \end{smallmatrix}$                 |
| Gadshill - - - -                            |                                                                       |                        |                                                                        |
| Lower Hope Point, Chimney of the Guard Room |                                                                       |                        |                                                                        |
| Gravesend - - - -                           | $\begin{smallmatrix} 99 & 28 & 57 \\ 15 & 26 & 18 \end{smallmatrix}$  | } Tilbury Fort - - -   | $\begin{smallmatrix} 6539 \\ 24228 \end{smallmatrix}$                  |
| Gadshill - - - -                            |                                                                       |                        |                                                                        |
| Flagstaff, Tilbury Fort                     |                                                                       |                        |                                                                        |
| Gadshill - - - -                            | $\begin{smallmatrix} 28 & 52 & 26 \\ 26 & 24 & 22 \end{smallmatrix}$  | } Rainham - - -        | $\begin{smallmatrix} 38245 \\ 41527 \end{smallmatrix}$                 |
| Sheppey - - - -                             |                                                                       |                        |                                                                        |
| Rainham Steeple                             |                                                                       |                        |                                                                        |
| Gadshill - - - -                            | $\begin{smallmatrix} 128 & 37 & 56 \\ 29 & 12 & 53 \end{smallmatrix}$ | } Swanscombe - - -     | $\begin{smallmatrix} 36747 \\ 58814 \end{smallmatrix}$                 |
| Halstow - - - -                             |                                                                       |                        |                                                                        |
| Swanscombe Spire                            |                                                                       |                        |                                                                        |
| Gadshill - - - -                            | $\begin{smallmatrix} 124 & 43 & 26 \\ 28 & 58 & 21 \end{smallmatrix}$ | } Northfleet - - -     | $\begin{smallmatrix} 31034 \\ 52658 \end{smallmatrix}$                 |
| Halstow - - - -                             |                                                                       |                        |                                                                        |
| Northfleet Steeple                          |                                                                       |                        |                                                                        |
| Halstow - - - -                             | $\begin{smallmatrix} 4 & 37 & 23 \\ 159 & 53 & 20 \end{smallmatrix}$  | } Southfleet - - -     | $\begin{smallmatrix} 57736 \\ 13534 \end{smallmatrix}$                 |
| Gravesend - - - -                           |                                                                       |                        |                                                                        |
| Southfleet Steeple                          |                                                                       |                        |                                                                        |



| Names of Stations.                | Observed angles.                                                                                                                               | Distances.               |                |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|----------------|
| Gravesend - - - -                 | $\begin{smallmatrix} 8 \\ 38 \end{smallmatrix} \begin{smallmatrix} 6 \\ 36 \end{smallmatrix} \begin{smallmatrix} 50 \\ 50 \end{smallmatrix}$   | } Shorn Mill - - {       | Fect.<br>14947 |
| Halstow - - - -                   | $\begin{smallmatrix} 15 \\ 15 \end{smallmatrix} \begin{smallmatrix} 44 \\ 44 \end{smallmatrix} \begin{smallmatrix} 0 \\ 0 \end{smallmatrix}$   |                          | 34435          |
| Shorn Mill                        |                                                                                                                                                |                          |                |
| Sheppey - - - -                   | $\begin{smallmatrix} 39 \\ 39 \end{smallmatrix} \begin{smallmatrix} 22 \\ 22 \end{smallmatrix} \begin{smallmatrix} 14 \\ 14 \end{smallmatrix}$ | } Gillingham - - {       | 48453*         |
| Stockbury - - - -                 | $\begin{smallmatrix} 79 \\ 79 \end{smallmatrix} \begin{smallmatrix} 31 \\ 31 \end{smallmatrix} \begin{smallmatrix} 3 \\ 3 \end{smallmatrix}$   |                          | 31257          |
| Gillingham Steeple                |                                                                                                                                                |                          |                |
| Sheppey - - - -                   | $\begin{smallmatrix} 63 \\ 63 \end{smallmatrix} \begin{smallmatrix} 7 \\ 7 \end{smallmatrix} \begin{smallmatrix} 52 \\ 52 \end{smallmatrix}$   | } St. James's Church - { | 20164          |
| Gillingham - - - -                | $\begin{smallmatrix} 24 \\ 24 \end{smallmatrix} \begin{smallmatrix} 34 \\ 34 \end{smallmatrix} \begin{smallmatrix} 17 \\ 17 \end{smallmatrix}$ |                          | 43257          |
| St. James's Church, Isle of Grain |                                                                                                                                                |                          |                |
| Halstow - - - -                   | $\begin{smallmatrix} 73 \\ 73 \end{smallmatrix} \begin{smallmatrix} 41 \\ 41 \end{smallmatrix} \begin{smallmatrix} 28 \\ 28 \end{smallmatrix}$ | } Gillingham - - {       | 23822          |
| Sheppey - - - -                   | $\begin{smallmatrix} 28 \\ 28 \end{smallmatrix} \begin{smallmatrix} 9 \\ 9 \end{smallmatrix} \begin{smallmatrix} 15 \\ 15 \end{smallmatrix}$   |                          | 48453*         |
| Gillingham Steeple                |                                                                                                                                                |                          |                |
| Gadshill - - - -                  | $\begin{smallmatrix} 23 \\ 23 \end{smallmatrix} \begin{smallmatrix} 35 \\ 35 \end{smallmatrix} \begin{smallmatrix} 24 \\ 24 \end{smallmatrix}$ | } Friendsbury - - {      | 11049          |
| Sheppey - - - -                   | $\begin{smallmatrix} 4 \\ 4 \end{smallmatrix} \begin{smallmatrix} 10 \\ 10 \end{smallmatrix} \begin{smallmatrix} 33 \\ 33 \end{smallmatrix}$   |                          | 60721          |
| Friendsbury Steeple               |                                                                                                                                                |                          |                |
| Halstow - - - -                   | $\begin{smallmatrix} 73 \\ 73 \end{smallmatrix} \begin{smallmatrix} 39 \\ 39 \end{smallmatrix} \begin{smallmatrix} 6 \\ 6 \end{smallmatrix}$   | } Star Inn - - - {       | 30617          |
| Sheppey - - - -                   | $\begin{smallmatrix} 35 \\ 35 \end{smallmatrix} \begin{smallmatrix} 45 \\ 45 \end{smallmatrix} \begin{smallmatrix} 47 \\ 47 \end{smallmatrix}$ |                          | 50270          |
| Chimney of the Star Inn           |                                                                                                                                                |                          |                |
| Halstow - - - -                   | $\begin{smallmatrix} 88 \\ 88 \end{smallmatrix} \begin{smallmatrix} 11 \\ 11 \end{smallmatrix} \begin{smallmatrix} 56 \\ 56 \end{smallmatrix}$ | } Bell Inn - - - {       | 47500          |
| Sheppey - - - -                   | $\begin{smallmatrix} 44 \\ 44 \end{smallmatrix} \begin{smallmatrix} 45 \\ 45 \end{smallmatrix} \begin{smallmatrix} 13 \\ 13 \end{smallmatrix}$ |                          | 67466          |
| High Staff at the Upper Bell Inn  |                                                                                                                                                |                          |                |
| Sheppey - - - -                   | $\begin{smallmatrix} 75 \\ 75 \end{smallmatrix} \begin{smallmatrix} 21 \\ 21 \end{smallmatrix} \begin{smallmatrix} 37 \\ 37 \end{smallmatrix}$ | } Hove - - - - {         | 59215          |
| Twinstead - - - -                 | $\begin{smallmatrix} 50 \\ 50 \end{smallmatrix} \begin{smallmatrix} 40 \\ 40 \end{smallmatrix} \begin{smallmatrix} 20 \\ 20 \end{smallmatrix}$ |                          | 4732           |
| Hove Steeple                      |                                                                                                                                                |                          |                |
| Gadshill - - - -                  | $\begin{smallmatrix} 17 \\ 17 \end{smallmatrix} \begin{smallmatrix} 43 \\ 43 \end{smallmatrix} \begin{smallmatrix} 23 \\ 23 \end{smallmatrix}$ | } Upchurch - - - {       | 44466          |
| Sheppey - - - -                   | $\begin{smallmatrix} 25 \\ 25 \end{smallmatrix} \begin{smallmatrix} 36 \\ 36 \end{smallmatrix} \begin{smallmatrix} 26 \\ 26 \end{smallmatrix}$ |                          | 31395          |
| Upchurch Spire                    |                                                                                                                                                |                          |                |
| Gadshill - - - -                  | $\begin{smallmatrix} 21 \\ 21 \end{smallmatrix} \begin{smallmatrix} 19 \\ 19 \end{smallmatrix} \begin{smallmatrix} 45 \\ 45 \end{smallmatrix}$ | } Bobbing - - - {        | 60739          |
| Sheppey - - - -                   | $\begin{smallmatrix} 57 \\ 57 \end{smallmatrix} \begin{smallmatrix} 26 \\ 26 \end{smallmatrix} \begin{smallmatrix} 29 \\ 29 \end{smallmatrix}$ |                          | 26212          |
| Bobbing Spire                     |                                                                                                                                                |                          |                |
| Sheppey - - - -                   | $\begin{smallmatrix} 46 \\ 46 \end{smallmatrix} \begin{smallmatrix} 5 \\ 5 \end{smallmatrix} \begin{smallmatrix} 47 \\ 47 \end{smallmatrix}$   | } Flagstaff - - - {      | 13063          |
| Halstow - - - -                   | $\begin{smallmatrix} 13 \\ 13 \end{smallmatrix} \begin{smallmatrix} 7 \\ 7 \end{smallmatrix} \begin{smallmatrix} 45 \\ 45 \end{smallmatrix}$   |                          | 41434          |
| Flagstaff, Sheerness Garrison     |                                                                                                                                                |                          |                |
| Sheppey - - - -                   | $\begin{smallmatrix} 17 \\ 17 \end{smallmatrix} \begin{smallmatrix} 13 \\ 13 \end{smallmatrix} \begin{smallmatrix} 51 \\ 51 \end{smallmatrix}$ | } Hucking - - - {        | 52765          |
| Frinstead - - - -                 | $\begin{smallmatrix} 93 \\ 93 \end{smallmatrix} \begin{smallmatrix} 18 \\ 18 \end{smallmatrix} \begin{smallmatrix} 29 \\ 29 \end{smallmatrix}$ |                          | 15656          |
| Hucking Spire                     |                                                                                                                                                |                          |                |



| Names of Stations.      | Observed Angles. | Distances            |                |
|-------------------------|------------------|----------------------|----------------|
| Sheppey - - - - -       | 29 27 6          | } Hernhill - - - {   | Fect.<br>58439 |
| East Church Station - - | 136 15 56        |                      | 41564          |
| Hernhill Steeple        |                  |                      |                |
| East Church - - - - -   | 44 20 17         | } Milton - - - {     | 32313          |
| Sheppey - - - - -       | 95 42 22         |                      | 22696          |
| Milton Steeple          |                  |                      |                |
| Sheppey - - - - -       | 36 56 30         | } Iwade - - - {      | 12997          |
| Milton - - - - -        | 32 24 0          |                      | 14544          |
| Iwade Steeple           |                  |                      |                |
| Hernhill - - - - -      | 7 28 0           | } Witchling - - - {  | 51579          |
| Frinstead - - - - -     | 45 6 35          |                      | 9461           |
| Witchling Steeple       |                  |                      |                |
| Hernhill - - - - -      | 25 1 0           | } Tenham - - - {     | 33833          |
| Sheppey - - - - -       | 25 51 16         |                      | 30336          |
| Tenham Steeple          |                  |                      |                |
| Tenham - - - - -        | 75 31 0          | } Bapchild - - - {   | 29846          |
| Sheppey - - - - -       | 24 42 40         |                      | 12886          |
| Bapchild Spire          |                  |                      |                |
| Sheppey - - - - -       | 21 32 42         | } Sheldwich - - - {  | 56869          |
| Hernhill - - - - -      | 75 8 0           |                      | 21581          |
| Sheldwich Steeple       |                  |                      |                |
| Sheldwich - - - - -     | 4 41 0           | } Queenborough - - { | 60719          |
| Sheppey - - - - -       | 126 20 44        |                      | 6156           |
| Queenborough Steeple    |                  |                      |                |
| Hadleigh - - - - -      | 21 19 45         | } Minster - - - {    | 69035          |
| Sheppey - - - - -       | 114 38 31        |                      | 9771           |
| Minster Steeple         |                  |                      |                |
| Halstow - - - - -       | 70 9 25          | } St. Mary's - - - { | 7095           |
| Hadleigh - - - - -      | 11 54 16         |                      | 32352          |
| St. Mary's Steeple      |                  |                      |                |
| Hernhill - - - - -      | 29 11 0          | } Feversham - - - {  | 15630          |
| Sheppey - - - - -       | 9 39 22          |                      | 44537          |
| Feversham Spire         |                  |                      |                |
| Tenham - - - - -        | 41 29 0          | } Hartey - - - {     | 20617          |
| Hernhill - - - - -      | 36 36 0          |                      | 22906          |
| Hartey Steeple          |                  |                      |                |



| Names of Stations. | Observed Angles. | Distances.           |             |
|--------------------|------------------|----------------------|-------------|
| Hernhill - - - -   | 85° 12' 0"       | } Sea Salter - - - { | Fect. 17031 |
| East Church - - -  | 22 15 10         |                      | 43580       |
| Sea Salter Steeple |                  |                      |             |
| Tenham - - - - -   | 105 2 0          | } Whitstable - - - { | 50935       |
| Sheppey - - - - -  | 48 28 58         |                      | 65697       |
| Whitstable Steeple |                  |                      |             |

## SECTION FOURTH.

*Determination of the Altitudes of the Stations above the Level of the Sea; and the mean Refractions deduced from observed Angles of elevation and depression.*

## ART. XLII. Elevations and Depressions.

*At Trevoze Head.*

|                            |       |                  |
|----------------------------|-------|------------------|
| The ground at Cadon Barrow | - - - | elevated 39' 24" |
| Bodmin Down                | - - - | elev. 10 48      |
| St. Agnes                  | - - - | depressed 6 39   |
| Hensbarrow                 | - - - | elev. 29 2       |

*At Bodmin Down.*

|                             |       |             |
|-----------------------------|-------|-------------|
| The ground at Carraton Hill | - - - | elev. 27 49 |
| Trevoze Head                | - - - | depr. 22 33 |
| Cadon Barrow                | - - - | elev. 16 0  |
| Brown Willy                 | - - - | elev. 54 24 |

*Cadon Barrow.*

|                                                         |       |             |
|---------------------------------------------------------|-------|-------------|
| The ground at Trevoze Head                              | - - - | depr. 36 49 |
| Brown Willy                                             | - - - | elev. 36 3  |
| The horizon of the sea in the direction of Trevoze Head | - - - | depr. 30 56 |
| Ditto in the direction north                            | - - - | depr. 31 12 |

*St. Stephen's Down.*

|                          |       |             |
|--------------------------|-------|-------------|
| The ground at Black Down | - - - | elev. 25 21 |
| Carraton Hill            | - - - | elev. 35 18 |
| Brown Willy              | - - - | elev. 42 9  |



*Black Down, near Lydford.*

|                             |       |              |
|-----------------------------|-------|--------------|
| The ground at Maker Heights | - - - | depr. 32' 8" |
| Carraton Hill               | - - - | depr. 3 46   |
| St. Stephen's Down          | - - - | depr. 35 18  |

*Mendip Hills.*

|                             |       |             |
|-----------------------------|-------|-------------|
| The ground at Bradley Knoll | - - - | depr. 6 12  |
| Westbury Down               | - - - | depr. 14 59 |
| Farley Down                 | - - - | depr. 18 21 |
| Lansdown                    | - - - | depr. 14 4  |
| Moor Lynch                  | - - - | depr. 34 53 |
| Dundry                      | - - - | depr. 15 45 |
| Dundon Beacon               | - - - | depr. 38 24 |
| Ash Beacon                  | - - - | depr. 20 45 |

*Dundry.*

|                      |       |            |
|----------------------|-------|------------|
| The ground at Mendip | - - - | elev. 5 8  |
| Farley Down          | - - - | depr. 10 1 |
| Lansdown             | - - - | depr. 3 19 |

*Lansdown.*

|                      |       |            |
|----------------------|-------|------------|
| The ground at Dundry | - - - | depr. 5 44 |
| Mendip               | - - - | depr. 1 39 |

*Farley Down.*

|                        |       |            |
|------------------------|-------|------------|
| The ground at Westbury | - - - | depr. 0 12 |
| Mendip                 | - - - | elev. 5 51 |
| Dundry                 | - - - | depr. 1 46 |

*Bradley Knoll.*

|                           |       |             |
|---------------------------|-------|-------------|
| The ground at Bull Barrow | - - - | depr. 8 59  |
| Ash Beacon                | - - - | depr. 20 18 |
| Westbury                  | - - - | depr. 4 36  |

*Westbury Down.*

|                                     |       |            |
|-------------------------------------|-------|------------|
| The ground at Beacon Hill, Amesbury | - - - | depr. 10 9 |
| Bradley Knoll                       | - - - | elev. 7 1  |
| Mendip                              | - - - | elev. 1 28 |
| Farley Down                         | - - - | depr. 9 9  |



*Dundon Beacon.*

|                          |         |       |         |
|--------------------------|---------|-------|---------|
| The ground at Moor Lynch | - - - - | depr. | ° 6' 8" |
| Lugshorn Corner          | - - - - | depr. | 3 56 13 |
| Mendip                   | - - - - | elev. | 28 18   |
| Pilsden                  | - - - - | elev. | 8 38    |

*Moor Lynch.*

|                                   |         |       |         |
|-----------------------------------|---------|-------|---------|
| The ground at Greylock's Foss-way | - - - - | depr. | 1 59 14 |
| Lugshorn Corner                   | - - - - | depr. | 32 45   |
| Dundon Beacon                     | - - - - | elev. | 0 9     |
| Mendip                            | - - - - | elev. | 23 11   |
| Pilsden                           | - - - - | elev. | 9 2     |
| Ash Beacon                        | - - - - | elev. | 6 57    |

*Greylock's Foss-way.*

|                                                        |         |       |         |
|--------------------------------------------------------|---------|-------|---------|
| The ground at Moor Lynch                               | - - - - | elev. | 1 53 56 |
| Dundon Beacon                                          | - - - - | elev. | 34 48   |
| Top of the staff (20 feet high) at Greylock's Foss-way | - - - - | elev. | 0 34    |

*Lugshorn Corner.*

|                                                             |         |       |         |
|-------------------------------------------------------------|---------|-------|---------|
| The ground at Moor Lynch                                    | - - - - | elev. | 27 21   |
| Dundon Beacon                                               | - - - - | elev. | 1 20 58 |
| Top of the staff (20 feet high) at the west end of the base | - - - - | depr. | 1 9     |

*Beacon Hill, Amesbury.*

|                        |         |       |      |
|------------------------|---------|-------|------|
| The ground at Westbury | - - - - | depr. | 4 36 |
| Inkpin                 | - - - - | elev. | 6 22 |

*Inkpin Hill.*

|                                |         |       |       |
|--------------------------------|---------|-------|-------|
| The ground at White Horse Hill | - - - - | depr. | 10 54 |
| Highclere                      | - - - - | depr. | 15 0  |
| Beacon Hill, Amesbury          | - - - - |       | 18 24 |

*White Horse Hill.*

|                         |         |       |      |
|-------------------------|---------|-------|------|
| The ground at Highclere | - - - - | depr. | 7 39 |
| Nuffield                | - - - - | depr. | 12 6 |
| Shotover Hill           | - - - - | depr. | 17 6 |



*Scutchamfly Barrow.*

|                        |   |   |   |   |       |        |
|------------------------|---|---|---|---|-------|--------|
| The ground at Wendover | - | - | - | - | depr. | 5' 36" |
| Whiteham Hill          | - | - | - | - | depr. | 11 20  |

*At Shotover Hill.*

|                                  |   |   |   |   |       |      |
|----------------------------------|---|---|---|---|-------|------|
| The ground at Scutchamfly Barrow | - | - | - | - | elev. | 0 20 |
| Nuffield                         | - | - | - | - | elev. | 1 27 |
| Wendover                         | - | - | - | - | elev. | 2 58 |
| White Horse Hill                 | - | - | - | - | elev. | 1 36 |

*Brill on the Hill.*

|                        |   |   |   |   |       |       |
|------------------------|---|---|---|---|-------|-------|
| The ground at Nuffield | - | - | - | - | depr. | 4 48  |
| Wendover               | - | - | - | - | elev. | 3 55  |
| Bow Brickhill          | - | - | - | - | depr. | 10 44 |
| Epwell                 | - | - | - | - | depr. | 6 58  |
| Stow                   | - | - | - | - | depr. | 7 6   |
| White Horse Hill       | - | - | - | - | depr. | 5 45  |

*Nuffield.*

|                                                                        |   |   |   |   |       |      |
|------------------------------------------------------------------------|---|---|---|---|-------|------|
| The ground at White Horse Hill                                         | - | - | - | - | depr. | 4 45 |
| Top of the Staff at Brill on the Hill. Staff $13\frac{1}{2}$ feet high | - | - | - | - | depr. | 6 2  |
| Bagshot                                                                | - | - | - | - | depr. | 6 43 |
| Highclere                                                              | - | - | - | - | depr. | 4 12 |

N. B. The half stage belonging to the Royal Society was used at this station.

*Wendover.*

|                                 |   |   |   |   |       |       |
|---------------------------------|---|---|---|---|-------|-------|
| The ground at Brill on the Hill | - | - | - | - | depr. | 14 59 |
| Shotover Hill                   | - | - | - | - | depr. | 17 21 |
| Bow Brickhill                   | - | - | - | - | depr. | 17 28 |
| Stanmore                        | - | - | - | - | depr. | 19 57 |

*Stow on the Wold.*

|                        |   |   |   |   |       |       |
|------------------------|---|---|---|---|-------|-------|
| The ground at Shotover | - | - | - | - | depr. | 13 48 |
| White Horse Hill       | - | - | - | - | depr. | 7 30  |
| Broadway Beacon        | - | - | - | - | elev. | 11 29 |
| Brill on the Hill      | - | - | - | - | depr. | 14 45 |
| Epwell                 | - | - | - | - | depr. | 8 0   |

*Broadway Beacon.*

|                    |   |   |   |   |       |       |
|--------------------|---|---|---|---|-------|-------|
| The ground at Stow | - | - | - | - | depr. | 19 0  |
| Epwell             | - | - | - | - | depr. | 17 25 |



*Epwell.*

|                    |   |   |   |   |       |        |
|--------------------|---|---|---|---|-------|--------|
| The ground at Stow | - | - | - | - | depr. | 3' 53" |
| Arbury Hill        | - | - | - | - | depr. | 6 39   |
| Brill on the Hill  | - | - | - | - | depr. | 11 51  |
| Corley             | - | - | - | - | depr. | 20 8   |
| Broadway Beacon    | - | - | - | - | elev. | 8 31   |

*Arbury Hill.*

|                      |   |   |   |   |       |       |
|----------------------|---|---|---|---|-------|-------|
| The ground at Epwell | - | - | - | - | depr. | 14 25 |
|----------------------|---|---|---|---|-------|-------|

*Bow Brickbill.*

|                        |   |   |   |   |       |      |
|------------------------|---|---|---|---|-------|------|
| The ground at Wendover | - | - | - | - | elev. | 3 59 |
| Kinsworth              | - | - | - | - | elev. | 5 35 |
| Brill on the Hill      | - | - | - | - | depr. | 5 28 |

*Kinsworth.*

|                                 |   |   |   |   |       |       |
|---------------------------------|---|---|---|---|-------|-------|
| The ground at Brill on the Hill | - | - | - | - | depr. | 12 37 |
| Bow Brickhill                   | - | - | - | - | depr. | 17 25 |
| Arbury Hill                     | - | - | - | - | depr. | 13 44 |
| Stanmore                        | - | - | - | - | depr. | 17 4  |
| Lillyhoe                        | - | - | - | - | depr. | 23 44 |

*Bagshot Heath.*

|                        |   |   |   |   |       |      |
|------------------------|---|---|---|---|-------|------|
| The ground at Nuffield | - | - | - | - | elev. | 1 29 |
| Stanmore               | - | - | - | - | depr. | 7 28 |

*Stanmore.*

|                             |   |   |   |   |       |      |
|-----------------------------|---|---|---|---|-------|------|
| The ground at Bagshot Heath | - | - | - | - | depr. | 9 34 |
|-----------------------------|---|---|---|---|-------|------|

ART. XLIII. *Heights of the Stations.*

| Stations.          | Ground above low water mark. |   |   |   |   | Fect. |
|--------------------|------------------------------|---|---|---|---|-------|
| Trevoise Head      | -                            | - | - | - | - | 274   |
| St. Agnes Beacon   | -                            | - | - | - | - | 621   |
| Hensbarrow         | -                            | - | - | - | - | 1034  |
| Bodmin Down        | -                            | - | - | - | - | 645   |
| Black Down         | -                            | - | - | - | - | 1160  |
| St. Stephen's Down | -                            | - | - | - | - | 605   |
| Bradley Knoll      | -                            | - | - | - | - | 973   |



| Stations.                              | Ground above low water mark. | Feet. |
|----------------------------------------|------------------------------|-------|
| Mendip - - - - -                       | -                            | 999   |
| Westbury Down - - - - -                | -                            | 775   |
| Dundry - - - - -                       | -                            | 790   |
| Lansdown - - - - -                     | -                            | 813   |
| Farley Down - - - - -                  | -                            | 700   |
| Moor Lynch - - - - -                   | -                            | 330   |
| Dundon Beacon - - - - -                | -                            | 360   |
| Lugshorn Corner - - - - -              | -                            | 49    |
| Greylock's Foss-way - - - - -          | -                            | 42    |
| Ash Beacon - - - - -                   | -                            | 655   |
| Cadon Barrow - - - - -                 | -                            | 1011  |
| Brown Willy - - - - -                  | -                            | 1368  |
| Inkpin - - - - -                       | -                            | 1011  |
| Nuffield - - - - -                     | -                            | 757   |
| White Horse Hill - - - - -             | -                            | 893   |
| Shotover Hill - - - - -                | -                            | 599   |
| Muzzle Hill, (Brill station) - - - - - | -                            | 744   |
| Whiteham Hill - - - - -                | -                            | 576   |
| Wendover, ground above - - - - -       | -                            | 905   |
| Bow Brickhill - - - - -                | -                            | 683   |
| Kinsworth - - - - -                    | -                            | 904   |
| Lillyhoe - - - - -                     | -                            | 664   |
| Stow on the Wold - - - - -             | -                            | 883   |
| Epwell Hill - - - - -                  | -                            | 836   |
| Broadway Beacon - - - - -              | -                            | 1086  |
| Arbury Hill - - - - -                  | -                            | 804   |

ART. XLIV. *Mean Terrestrial Refractions.*

| Between                                     | Mean Refractions. |
|---------------------------------------------|-------------------|
| Bodmin Down and Cadon Barrow - - - - -      | $\frac{1}{3}$     |
| Bradley Knoll and Westbury Down - - - - -   | $\frac{1}{6}$     |
| Maker Heights and Black Down - - - - -      | $\frac{1}{8}$     |
| Highclere and Inkpin - - - - -              | $\frac{1}{8}$     |
| St. Agnes Beacon and Trevoze Head - - - - - | $\frac{1}{9}$     |
| Moor Lynch and Lugshorn Corner - - - - -    | $\frac{1}{11}$    |
| Hensbarrow and Trevoze Head - - - - -       | $\frac{1}{12}$    |



|                                                         |   |   |   |                |
|---------------------------------------------------------|---|---|---|----------------|
| Wingreen and Bradley Knoll                              | - | - | - | $\frac{1}{11}$ |
| Bodmin Down and Trevoze Head                            | - | - | - | $\frac{1}{11}$ |
| Carraton Hill and Black Down                            | - | - | - | $\frac{1}{11}$ |
| Westbury Down and Mendip                                | - | - | - | $\frac{1}{11}$ |
| Carraton Hill and St. Stephen's Down                    | - | - | - | $\frac{1}{11}$ |
| Farley Down and Mendip                                  | - | - | - | $\frac{1}{11}$ |
| Beacon Hill and Westbury Down                           | - | - | - | $\frac{1}{11}$ |
| Dundry and Farley Down                                  | - | - | - | $\frac{1}{11}$ |
| Dundon Beacon and Mendip                                | - | - | - | $\frac{1}{11}$ |
| Bradley Knoll and Mendip                                | - | - | - | $\frac{1}{11}$ |
| Lansdown and Mendip                                     | - | - | - | $\frac{1}{11}$ |
| Moor Lynch and Dundon Beacon                            | - | - | - | $\frac{1}{11}$ |
| Dundry and Mendip                                       | - | - | - | $\frac{1}{11}$ |
| Westbury Down and Farley Down                           | - | - | - | $\frac{1}{11}$ |
| St. Stephen's Down and Black Down                       | - | - | - | $\frac{1}{11}$ |
| Moor Lynch and Dundon Beacon                            | - | - | - | $\frac{1}{11}$ |
| Dundon and Lugshorn Corner                              | - | - | - | $\frac{1}{11}$ |
| Moor Lynch and Greylock's Foss-way                      | - | - | - | $\frac{1}{11}$ |
| Lugshorn Corner and Greylock's Foss-way                 | - | - | - | 0              |
| Cadon Barrow and horizon of the sea in the direction of |   |   |   |                |
| Trevoze Head                                            | - | - | - | $\frac{1}{11}$ |
| Ditto in a northern direction                           | - | - | - | $\frac{1}{11}$ |
| Brill and Nuffield                                      | - | - | - | $\frac{1}{11}$ |
| Broadway and Stow                                       | - | - | - | $\frac{1}{11}$ |
| Epwell and Broadway                                     | - | - | - | $\frac{1}{11}$ |
| Highclere and White Horse Hill                          | - | - | - | $\frac{1}{11}$ |
| Nuffield and White Horse Hill                           | - | - | - | $\frac{1}{11}$ |
| Nuffield and Bagshot                                    | - | - | - | $\frac{1}{11}$ |
| Epwell and Stow                                         | - | - | - | $\frac{1}{11}$ |
| Brill and Stow on the Wold                              | - | - | - | $\frac{1}{11}$ |
| Wendover and Bow Brickhill                              | - | - | - | $\frac{1}{11}$ |
| Kinsworth and Bow Brickhill                             | - | - | - | $\frac{1}{11}$ |
| Shotover and White Horse Hill                           | - | - | - | $\frac{1}{11}$ |
| Epwell and Brill                                        | - | - | - | $\frac{1}{11}$ |
| Bow Brickhill and Brill                                 | - | - | - | $\frac{1}{11}$ |



ART. XLV. *Particulars respecting the Altitudes of the Stations.*

The height of the station on Trevoze Head, above the surface of the sea at low water, was determined in 1797, by levelling. The transit instrument was used for the purpose; and there is reason to believe the result,  $274\frac{2}{10}$  feet, is within a very few inches of the truth.

In the Philosophical Transactions for 1797, p. 471, the height of the station on Maker Heights is said to be 402 feet; this was also found by levelling. The altitude of St. Agnes Beacon, determined from that station, is 599 feet; (see the same volume and page;) but, if the calculation be made from the base of altitude at Trevoze Head, the height of that station, above the level of the sea, will be 621 feet, which gives a difference of 22 feet. It must be recollected, however, that in the first result, the computation was carried through two intermediate stations, which gave three arcs, and as many mean refractions; and, considering the extreme variableness to which refractions are liable, we are assuredly not to consider 22 feet deviation from the truth as a large quantity.

Besides St. Agnes Beacon, the altitudes of Cadon Barrow, Brown Willy, Hensbarrow, and Bodmin Down, have been determined from that of Trevoze Head. Of the remaining stations, some are derived from Maker Heights, others from Dunnose: most of them are mean results, that is, each station has generally been found two ways; and, as it will serve to shew what errors proceed from irregularity of refraction, and imperfection of observation, I shall exhibit a few particulars in relation to them.



| Height of          | deduced from        | Feet. | Mean. |
|--------------------|---------------------|-------|-------|
| Black Down         | Maker Heights -     | 1169  | 1160  |
|                    | Carraton Hill -     | 1152  |       |
| St. Stephen's Down | Black Down -        | 609   | 605   |
|                    | Carraton Hill -     | 600   |       |
| Westbury Down      | Bradley Knoll -     | 779   | 775   |
|                    | Beacon Hill -       | 771   |       |
| Farley Down        | Mendip Hills -      | 703   | 700   |
|                    | Westbury Down -     | 696   |       |
| Moor Lynch         | Mendip Hills -      | 335   | 330   |
|                    | Ash Beacon -        | 325   |       |
| Lugshorn Corner    | Dundon Beacon -     | 46    | 49    |
|                    | Greylock's Foss-way | 52    |       |
| Inkpin Beacon      | Highclere -         | 1014  | 1011  |
|                    | Beacon Hill -       | 1009  |       |
| Ash Beacon         | Bull Barrow -       | 653   | 655   |
|                    | Bradley Knoll -     | 657   |       |

The above will sufficiently shew, what dependence is to be placed on the heights deduced from observed angles of elevation or depression; the results are, indeed, often less consistent, and frequently unsatisfactory; but, generally, they run on a parallel with these. The *data* from which all the heights have been computed, accompany this article.

The measurement of the base on Sedgemoor, shewed a fall of about 7 feet, from Lugshorn Corner to Greylock's Foss-way:



therefore, supposing that fall to be gradual and constant, all the way from the latter station to the surface of the sea at Bridgewater Bay, we shall get 24 feet, for the height of Lugshorn Corner from the surface of the sea. The altitude of this station, deduced from that of Trevoise Head, is 49 feet; and, subtracting 3 feet from it, (the height of the bank on which the instrument stood above the moor,) we get 46 feet for the height of the moor at Lugshorn Corner, above the level of the sea at Bridgewater Bay. But this height, *supposing the fall regular*, is proved to be 24 feet. There is, therefore, a difference of 22 feet, granting the whole of this to be an error on the side of the survey: but, as the general surface of the moor at Bridgewater Bay is several feet above the surface of the sea, we may take a moiety of 24 feet, for the error of the computed height of the station at Lugshorn Corner.

ART. XLVI. *Matters relating to Refraction.*

The refractions contained in this account, like those in our former Papers, tend to prove, that when rays of light pass horizontally, and considerably distant from the surface of the earth, they are less bent or refracted from their rectilinear courses, than theory and opinion have laid down as fact. It is very certain, however, that objection lies against particular conclusions drawn from such *data* as we possess; because the angles of elevation and depression of corresponding stations are observed *at different times*, and almost always, therefore, under different circumstances; but, with the experience and continual practice of thus obtaining means of computing these refractions, although we may not be able to determine the refracting power of the air under given circumstances, yet, as the causes which render



it variable, are as likely to predominate when the angles of depression or elevation are observed from low stations as when observed from high ones, we may be enabled to make some general deductions.\*

When the instrument formerly made use of by General ROY was intrusted to my care, I possessed the means of determining, in a more accurate manner than had yet been done, the refractive power of the air near the horizon. To devote much time to it, has not, as yet, been in my power; because a more rapid extension of the survey was an object of greater

\* As many instances of strong atmospherical refraction have been related, and ingeniously accounted for, in some of the late publications of the Royal Society, I think it right to mention, by way of note, a very extraordinary instance of its variability.

In the month of June, 1795, when the instrument and party were stationed at Pilsden Hill, in Dorsetshire, on a particular day, at about the hour of four, I employed myself in observing the angles of depression or elevation of the surrounding hills. After I had done all that was necessary in this matter, I turned the telescope to *Glastonbury Tor*, and observed the depression of it. The air was so unusually clear, that, desirous of proving to a gentleman then with me in the observatory tent, the excellence of the telescope, I desired him to apply his eye to it: this he did, and, agreeably to a desire he expressed, I again took the depression of the upper part of the old building, which I was enabled to do with great accuracy, and found it 2" different; the first being 30', 0", and the last 30', 2". The unusual distinctness of this object, led me to keep my eye a long time at the telescope; and, whilst my attention was engaged, I perceived the top of the building *gradually rise* above the micrometer wire, and so continue to do, till it was elevated 10', 45" above its first apparent situation; it then remained stationary, and as night drew on, the object became indistinct. The following evening, I observed the depression again, and found it 29', 50". To what cause this extraordinary change in the refraction could be owing, I am at a loss to conjecture. The former part of the day had been warm, with little wind, and cloudy. The thermometer, at the time of observation, was 65°, and continued stationary for a considerable time. The sky was cloudy, but yet, as I have before observed, the air was remarkably clear. The top of *Glastonbury Tor*, I suppose, is about 200 feet from the surface of Sedgemoor, over a considerable tract of which, the line joining Pilsden with that object passes. The gentleman of whom I speak, as being with me in the tent, was Captain DARCY, of the Royal Engineers, who, no doubt, well remembers the circumstance.



importance. I did not, however, lose any opportunity which the subsequent season offered; the first was, when the instruments were at White Horse Hill and Whiteham Hill; the second, when one was stationed at Brill and the other at Arbury Hill; and the third opportunity offered itself, when one party was stationed at the latter place and the other at Wendover.

On these occasions, the instructions which I communicated to Mr. Woolcot, and by which I governed myself, were to observe the elevation or depression of the corresponding station at the expiration of every hour, beginning at six A. M. and to have the watch well regulated from observed altitudes of the sun's limb. I requested him also to be very minute in entering on his book the state of the weather; to keep the instrument properly sheltered from the wind; to be always cautious to adjust his level; and also to insert the state of the air, as to temperature and density, by noting the thermometer and barometer.

During the time we were at the two first stations, White Horse and Whiteham Hills, there was only one day when the air was sufficiently clear for the purpose; this was the 6th of June. On that day, the following observations were made *at the same time as shewn by signal.*

*Whiteham Hill. June 6th, 1799.*

| Hours. | Wh Horse H.<br>Elevated. | Baromet.<br>ter. | Thermo-<br>meter. | Remarks.                                             |
|--------|--------------------------|------------------|-------------------|------------------------------------------------------|
|        |                          | In. pts.         | Degrees.          |                                                      |
| 3      | 6 4                      | 29,730           | 60.3              | Light airs at SW. Sun not shining; remarkably clear. |
| 4      | 6 24                     | 29,724           | 62.5              | Ditto. Ditto ditto.                                  |
| 5      | 6 14                     | 29,728           | 58.7              | Ditto. Ditto ditto.                                  |
| 6      | 6 10                     | 29,732           | 58.5              | Ditto. Ditto ditto.                                  |
| 7      | 6 11                     | 29,728           | 57.5              | Ditto. Ditto ditto.                                  |
| 8      | 6 21                     | 29,732           | 57                | Very calm, and cloudy, but clear.                    |
| * 9    | 5 37                     | 29,736           | 55.7              | Ditto. Lamp at Shotover very bright. Dew falling.    |
| * 10   | 5 39                     | 29,740           | 55.5              | Ditto. Ditto.                                        |



## White Horse Hill. June 6th.

| Hours. | Whiteham H.<br>Depressed. | Barome-<br>ter. | Thermo-<br>meter. | Remarks.                                           |
|--------|---------------------------|-----------------|-------------------|----------------------------------------------------|
|        | ' "                       | In. pts.        | Degrees.          |                                                    |
| 3      | 18 21                     | 29,412          | 57,7              | Light airs at SW. Sun not shining; very clear.     |
| 4      | 18 16                     | 29,408          | 59,5              | Ditto. Ditto ditto.                                |
| 5      | 18 24                     | 29,410          | 57,6              | Ditto. Sun shining a little; not so clear.         |
| 6      | 18 20                     | 29,412          | 55,5              | More wind. Sun not shining, and darker.            |
| 7      | 18 25                     | 29,412          | 55,5              | Calm and cloudy.                                   |
| 8      | 18 15                     | 29,438          | 54,2              | Quite calm, and a little dew falling.              |
| * 9    | 18 10                     | 29,438          | 53,4              | Ditto. Fine night. Lamp at Whiteham very distinct. |
| * 10   | 18 25                     | 29,438          | 53,2              | Ditto, but lamp rather indistinct.                 |

Similar observations were also made when the instruments were at Brill and Arbury Hill: they were as follows.

## Arbury Hill. July 11th, 1799. Watch regulated.

| Hours. | Brill.<br>Depressed. | Barome-<br>ter. | Thermo-<br>meter. | Remarks.                                                |
|--------|----------------------|-----------------|-------------------|---------------------------------------------------------|
|        | ' "                  | In. pts.        | Degrees.          |                                                         |
| 9 A.M. | 11 15                | 29,180          | 65,5              | Light airs at SW. Cloudy, but sun shining now and then. |
| 10     | 11 15                | 29,200          | 70,0              | Ditto. Cloudy.                                          |
| 11     | 11 15                | 29,200          | 70,7              | Ditto. Ditto.                                           |
| 12     | 11 6                 | 29,199          | 70,2              | Ditto. Ditto.                                           |
| 3 P.M. | 11 6                 | 29,162          | 68,0              | Ditto. Ditto. Very clear.                               |
| 4      | 10 5                 | 29,168          | 72,5              | Ditto. Sun shining a little, yet free from any tremor.  |
| * 9    | 10 30                | 29,132          | 63,0              | Ditto. Lamp at Brill perfectly distinct.                |

## Brill on the Hill. July 11th, 1799. Watch regulated.

| Hours. | Arbury H.<br>Depressed. | Barome-<br>ter. | Thermo-<br>meter. | Remarks.                                                    |
|--------|-------------------------|-----------------|-------------------|-------------------------------------------------------------|
|        | ' "                     | In. pts.        | Degrees.          |                                                             |
| 9 A.M. | 8 40                    | 29,100          | 61,0              | Light airs at SW. Appearances of rain from SW. Cloudy.      |
| 10     | 8 36                    | 29,210          | 67,5              | Ditto. Clearer, but cloudy. Arbury Hill very distinct.      |
| 11     | 8 36                    | 29,210          | 67,5              | Ditto. More cloudy and equally clear. [round.               |
| 12     | 8 36                    | 29,210          | 65,0              | The air remarkably clear and free from tremor. Cloudy all   |
| 3 P.M. | 8 36                    | 29,210          | 71,0              | Ditto ditto. More cloudy.                                   |
| 4      | 8 46                    | 29,250          | 71,5              | Ditto ditto. Not so cloudy.                                 |
| * 9    | 8 48                    | 29,200          | 61,75             | The lamp at Arbury H. very bright. A very fine quiet night. |



The next opportunity which offered, was at the former station and Wendover: the observations were as follows.

*Arbury Hill. July 27th, 1799. Watch regulated.*

| Hours. | Wendover.<br>Depressed. | Barome-<br>ter. | Thermo-<br>meter. | Remarks.                                                              |
|--------|-------------------------|-----------------|-------------------|-----------------------------------------------------------------------|
|        |                         | In. pts.        | Degrees.          |                                                                       |
| 12     | 12 8                    | 28,728          | 62 .0             | Fresh wind from SW. Rather dark weather, sun shining here [and there. |
| 1      | 12 3                    | 28,734          | 64 .2             | Ditto. Air tremulous, ditto.                                          |
| 2      | 12 11                   | 28,740          | 64 .0             | Ditto. Ditto, ditto.                                                  |
| 3      | 12 10                   | 28,738          | 63 .5             | Ditto. Air more steady, ditto. Clearer.                               |
| 4      | 12 22                   | 28,740          | 64 .0             | Ditto. Very steady. Sun shining a little.                             |
| 5      | 11 50                   | 28,740          | 64 .2             | Ditto. Ditto. Ditto.                                                  |
| 6      | 12 17                   | 28,740          | 61 .0             | Less wind, and the air very clear. Wendover perfectly distinct.       |

*Wendover. July 27th, 1799. Watch regulated.*

| Hours. | Arbury H.<br>Depressed. | Barome-<br>ter. | Thermo-<br>meter. | Remarks.                                                       |
|--------|-------------------------|-----------------|-------------------|----------------------------------------------------------------|
|        |                         | In. pts.        | Degrees.          |                                                                |
| 5 A.M. | 16 12                   | 29,030          | 53 .2             | Wind at SW, rather fresh; sun shining, and air very clear.     |
| 6      | 16 12                   | 29,030          | 53 .0             | Ditto, ditto.                                                  |
| 7      | 15 26                   | 29,030          | 54 .5             | Less wind, and the air very steady. Arbury Hill very distinct. |
| 8      | 14 44                   | 29,100          | 54 .0             | Little wind. Dew falling very fast. Ditto.                     |

Another opportunity for making contemporary observations occurred, when the parties were on Broadway Beacon and Epwell: I place them last, because I think them inferior to the others.

*Epwell. June 26th, 1799. Watch regulated.*

| Hours. | Broadway B.<br>Elevated. | Barome-<br>ter. | Thermo-<br>meter. | Remarks.                                                |
|--------|--------------------------|-----------------|-------------------|---------------------------------------------------------|
|        |                          | In. pts.        | Degrees.          |                                                         |
| 12     | 6 6                      | 29,100          | 60.5              | Wind SW. Cloudy. Much rain preceding night.             |
| 1 P.M. | 6 8                      | 29,100          | 63.2              | Ditto, but calmer; sun not shining at Broadway.         |
| 2      | 6 12                     | 29,208          | 60.7              | Very calm, and cloudy all round.                        |
| 3      | 6 20                     | 29,100          | 59.0              | Ditto: Appearances of rain in SW quarter.               |
| 4      | 8 32                     | 29,100          | 57.5              | Foggy, but easily perceive the tent at Broadway Beacon. |

*Broadway Beacon. June 26th, 1799. Watch regulated.*

| Hours. | Epwell.<br>Depressed. | Thermo-<br>meter. | Remarks.                                 |
|--------|-----------------------|-------------------|------------------------------------------|
|        |                       | Degrees.          |                                          |
| 2      | 19 0                  | 57.5              | Light airs from SW. Inclined to rain.    |
| 3      | 19 2                  | 57.5              | Ditto. Still more so.                    |
| 4      | 19 3                  | 57.5              | Ditto, but misty. Barometer tube broken. |



To determine the refractions on the first arc, White Horse and Whiteham Hills, we have the distance between those stations = 88662.2 feet, which subtends an arc of  $14' 32''$  nearly.

To determine those on the second, we have the distance between Brill and Arbury Hill = 146530 feet, subtending an arc of  $24' 3''.9$ ; those on the third, Wendover and Arbury Hill, 210628 feet =  $34' 35''$ ; and, for finding the refractions from the two last tables, we have the distance from Broadway Beacon to Epwell = 80611.4 feet, which subtends an arc of  $13' 11''$  nearly.

The depressions and elevations were all taken to the ground, excepting those which are marked with asterisks. At White Horse Hill and Whiteham Hill, lamps were used at the hours of 9 and 10: they were also made use of at Arbury Hill and Brill at 9 o'clock. In the first instances, the lamps were placed (the centres of them)  $1\frac{1}{2}$  feet from the bottoms of the respective instruments; and in the last  $2\frac{1}{2}$  feet.

The height of the transit telescope above the ground was always  $5\frac{1}{2}$  feet; therefore, an allowance must be made, at each station, for the angle which that space subtends at its corresponding one; this premised, the refraction will be found from one of the two following rules, *viz.* if  $A$  be the contained arc, and  $D$   $d$  the observed depressions, the quantity answering to the refraction,  $R$ , will be expressed by  $\frac{A - D - d}{2}$ ; or, if one of the angles should be an elevation,  $e$ , then  $R = \frac{A + e - d}{2}$ : these rules give the refractions in the following table.

| Hour | Distance | Refraction  |
|------|----------|-------------|
| 9    | 88662.2  | $14' 32''$  |
| 9    | 146530   | $24' 3''.9$ |
| 9    | 210628   | $34' 35''$  |
| 10   | 80611.4  | $13' 11''$  |



*Refractions found from the preceding Angles of Elevation and Depression.*

| 1. Arc.<br>White Horse Hill & Whiteham Hill. |                                |        |        | 2. Arc.<br>Brill and Arbury Hill. |                                |        |        | 3. Arc.<br>Arbury Hill and Wendover. |                                |        |        | 4. Arc.<br>Broadway Beacon and Epwell. |                                |        |        |
|----------------------------------------------|--------------------------------|--------|--------|-----------------------------------|--------------------------------|--------|--------|--------------------------------------|--------------------------------|--------|--------|----------------------------------------|--------------------------------|--------|--------|
| Hours.                                       | Refraction.<br>pts. cont. arc. | Barom. | Therm. | Hours.                            | Refraction.<br>pts. cont. arc. | Barom. | Therm. | Hours.                               | Refraction.<br>pts. cont. arc. | Barom. | Therm. | Hours.                                 | Refraction.<br>pts. cont. arc. | Barom. | Therm. |
| 3 P.M.                                       | $\frac{1}{10.8}$               | 29,5   | 58,0   | 9 A.M.                            | $\frac{1}{10.9}$               | 29,1   | 63,2   | 5                                    | $\frac{1}{10.3}$               | 28,8   | 54,6   | 2                                      | $\frac{1}{33.1}$               | 29,2   | 54,1   |
| 4                                            | $\frac{1}{9.4}$                | 29,5   | 61,0   | 10                                | $\frac{1}{10.7}$               | 29,2   | 68,7   | 6                                    | $\frac{1}{11.6}$               | 28,8   | 61,5   | 3                                      | $\frac{1}{31.0}$               | 57,5   | 58,2   |
| 5                                            | $\frac{1}{10.4}$               | 29,5   | 58,1   | 11                                | $\frac{1}{10.7}$               | 29,2   | 68,1   |                                      |                                |        |        | 4                                      | $\frac{1}{8.6}$                | 29,1   | 57,5   |
| 6                                            | $\frac{1}{10.4}$               | 29,5   | 57,0   | 12                                | $\frac{1}{10.4}$               | 29,2   | 67,6   |                                      |                                |        |        |                                        |                                |        |        |
| 7                                            | $\frac{1}{10.6}$               | 29,5   | 57,0   | 3 P.M.                            | $\frac{1}{10.4}$               | 29,2   | 72,5   |                                      |                                |        |        |                                        |                                |        |        |
| 8                                            | $\frac{1}{9.5}$                | 29,6   | 55,6   | 4                                 | $\frac{1}{7.4}$                | 29,2   | 72,0   |                                      |                                |        |        |                                        |                                |        |        |
| 9                                            | $\frac{1}{12.6}$               | 29,6   | 54,5   | 9                                 | $\frac{1}{9.8}$                | 29,2   | 62,3   |                                      |                                |        |        |                                        |                                |        |        |
| 10                                           | $\frac{1}{11.0}$               | 29,5   | 54,3   |                                   |                                |        |        |                                      |                                |        |        |                                        |                                |        |        |



On examining the refractions obtained on the first arc, we perceive them to have been tolerably regular from 3 o'clock till 8; the mean being  $\frac{1}{10.1}$  part of the contained arc. The height of Whiteham Hill is 576 feet, and that of White Horse Hill 893 feet, above the level of the sea: the ray passes, therefore, through a tract of air considerably elevated, as the country between the stations is, for the most part, flat and low.

The air is not often clear enough, or sufficiently free from tremulous motions, for these delicate observations. On the present occasion, however, the state of it was highly fit for the purpose; and, as care was taken, I am of opinion an error of more than 3", taking that of the arch of altitude into the account, cannot have obtained in any of the angles. The refractions at 9 and 10 o'clock are less than at the preceding hours; but this does not appear to have been owing to any change in the refractive power of the air throughout the whole extent of the ray, because the depression of Whiteham Hill, from the other station, varied little at those hours. These changes in the observed angles of elevation at Whiteham, (44" and 42" being the differences,) *without* corresponding ones at White Horse Hill, prove that some *partial* alteration, from floating strata, had taken place in the refraction near the former station. Whoever considers the matter, must perceive a case may be constructed in which this will take place, causing a great variation in one of the angles, whilst the other *apparently* remains the same: and this suggested the idea, that to afford any accurate conclusions in this way, a long series of observations would be necessary. It furthermore appears, that dew could not have caused these differences at Whiteham Hill, since the same cause would equally operate to vary the observed angles at White Horse Hill; but those remained nearly the same.



The refractions on the second and third arcs, I consider as most accurate, on account of the great distance between the stations; and also as more to be depended on, from the circumstance of the ray generally passing 300 feet above the ground.

The fourth arc affords another instance of the refraction varying at one station, and remaining constant at the other. This, no doubt, was owing to the intervention of some partial stratum of air, nearer to Epwell than Broadway Beacon. The refractions, deduced from these contemporary observations are certainly inconclusive. The mean refractions, (neglecting the fourth arc) brought under one point of view, will be as follows.

| Arcs.                                    | Mean height<br>of ray above<br>the sea. | Refraction.<br>Propl. pt. | Barom.   | Therm. |
|------------------------------------------|-----------------------------------------|---------------------------|----------|--------|
|                                          | Feet.                                   |                           | in. pts. |        |
| 1. White Horse Hill and Whiteham         | 734                                     | $\frac{1}{10,9}$          | 29,5     | 57,8   |
| 2. Arbury H. and Brill, 5 first refracs. | 774                                     | $\frac{1}{10,6}$          | 29,2     | 67,8   |
| 3. Arbury Hill and Wendover -            | 854                                     | $\frac{1}{11,2}$          | 28,8     | 58,1   |

If the air had been in a quiescent state, previous to and also at the times when these observations were made, it might be expected that the differences of altitudes in the stations would be obtained, tolerably near the truth, *barometrically*. The remarks in the tables appertaining to the first and second arcs, shew that such opportunities offered; but those which belong to the third, prove the wind to have been fresh; and, as the space between the stations which constitute the extremities of that arc is 34 miles, nearly, it is not to be expected that a true result should be obtained. The differences of altitudes of the stations constituting the extremities of the two first arcs, obtained by means of the observed angles of elevation and depression, as well



as from the heights of the mercury in the barometer, will be as follows.

| Arcs. | Obs. Ang. | Barom. | Diff. |
|-------|-----------|--------|-------|
| 1     | 317       | 282    | 35    |
| 2     | 60        | 15     | 45    |

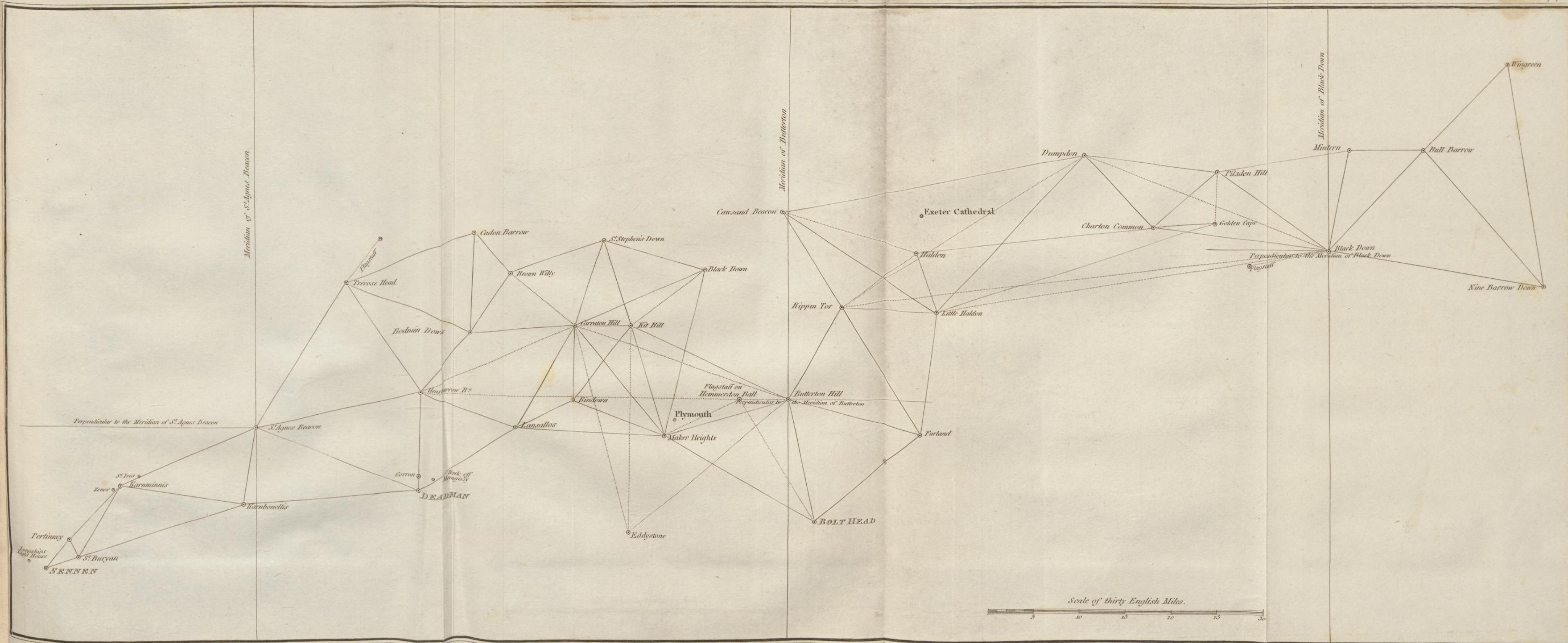
The little done on this subject, points out the necessity of doing more; it therefore remains with me to observe, that I shall lose no opportunity of employing the apparatus committed to my charge in the best and most diligent manner, both as relating to matters of refraction, and to all others connected with the Trigonometrical Survey.

In the Introduction, page 540, it is stated that this Account would be comprized in three Sections, but it was afterwards thought more convenient to divide it into four.

In Page 583, line penult. *dele* and Prittlewell.

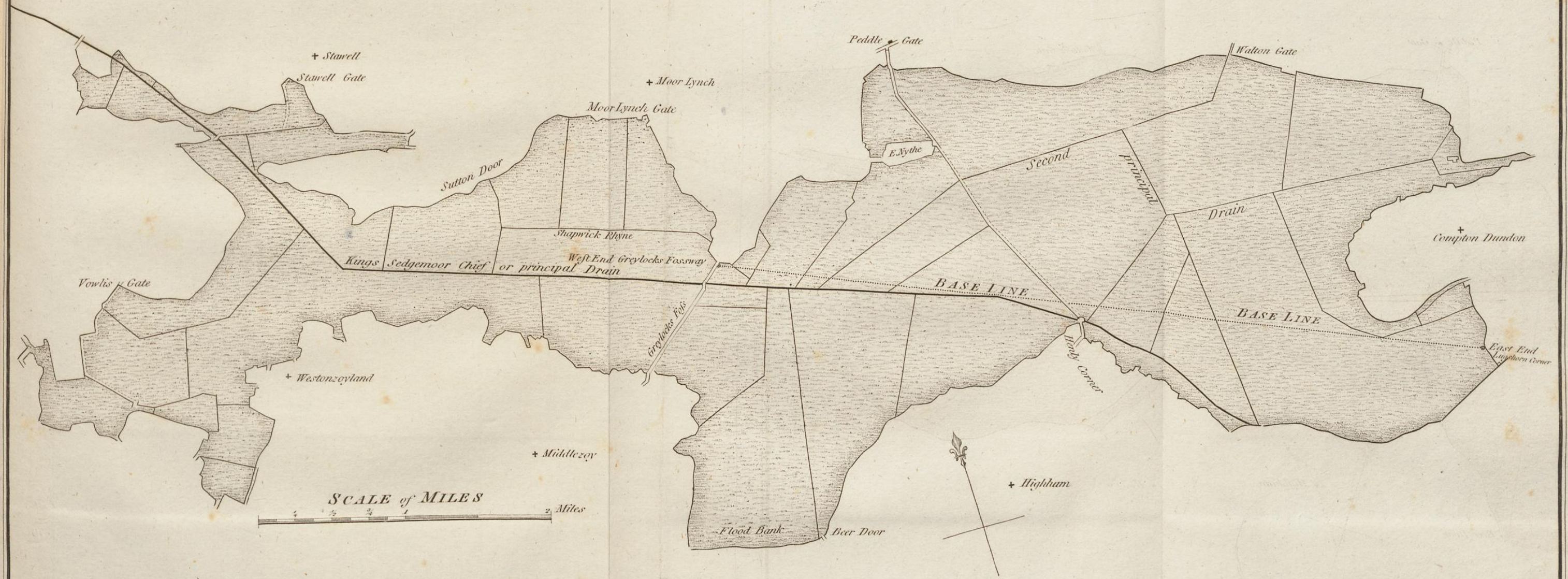
— 665, — 14, for 1792, read 1772.







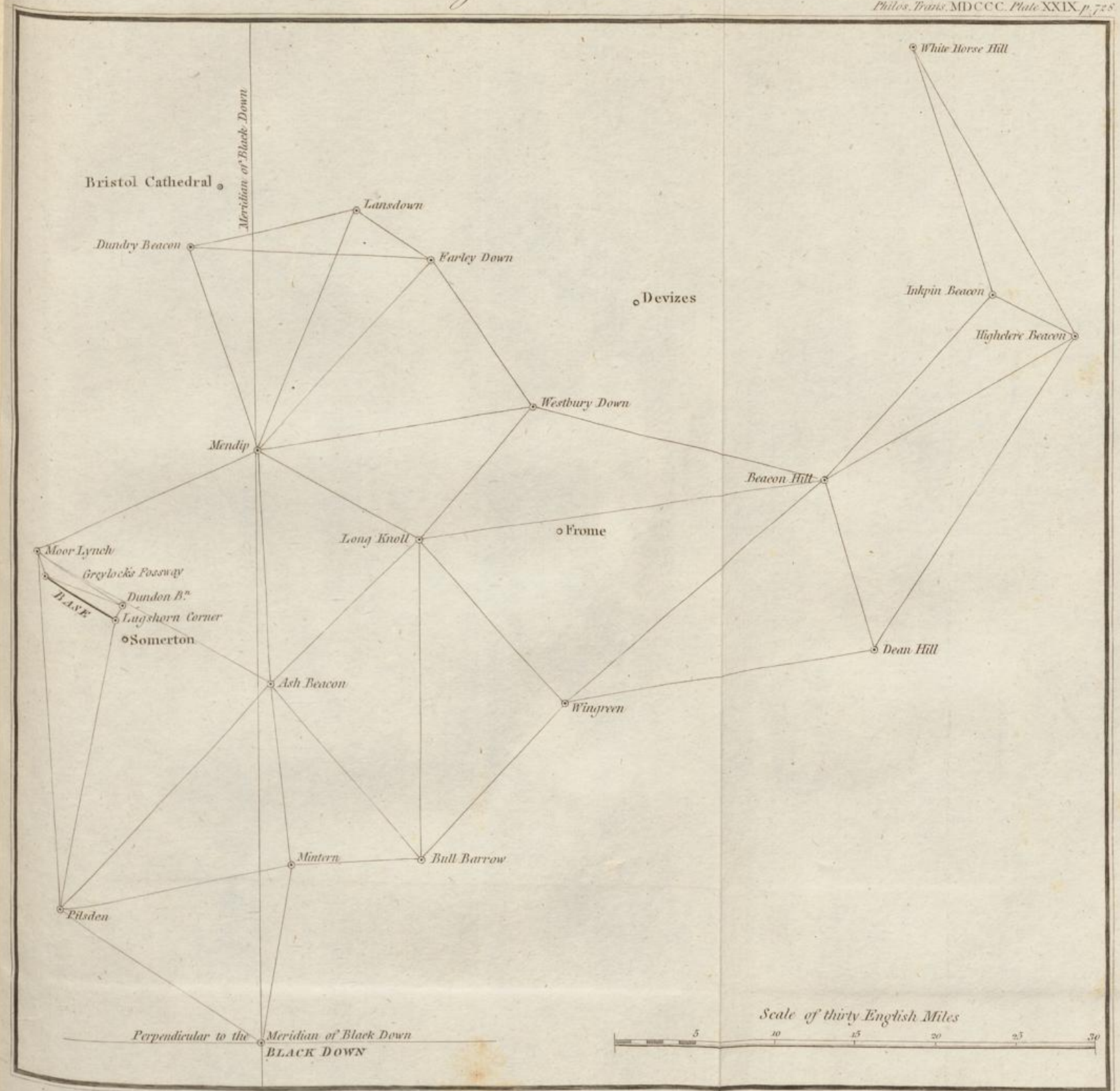
*A Plan*  
of KING'S SEDGEMOOR with the *BASE LINE* measured thereon.



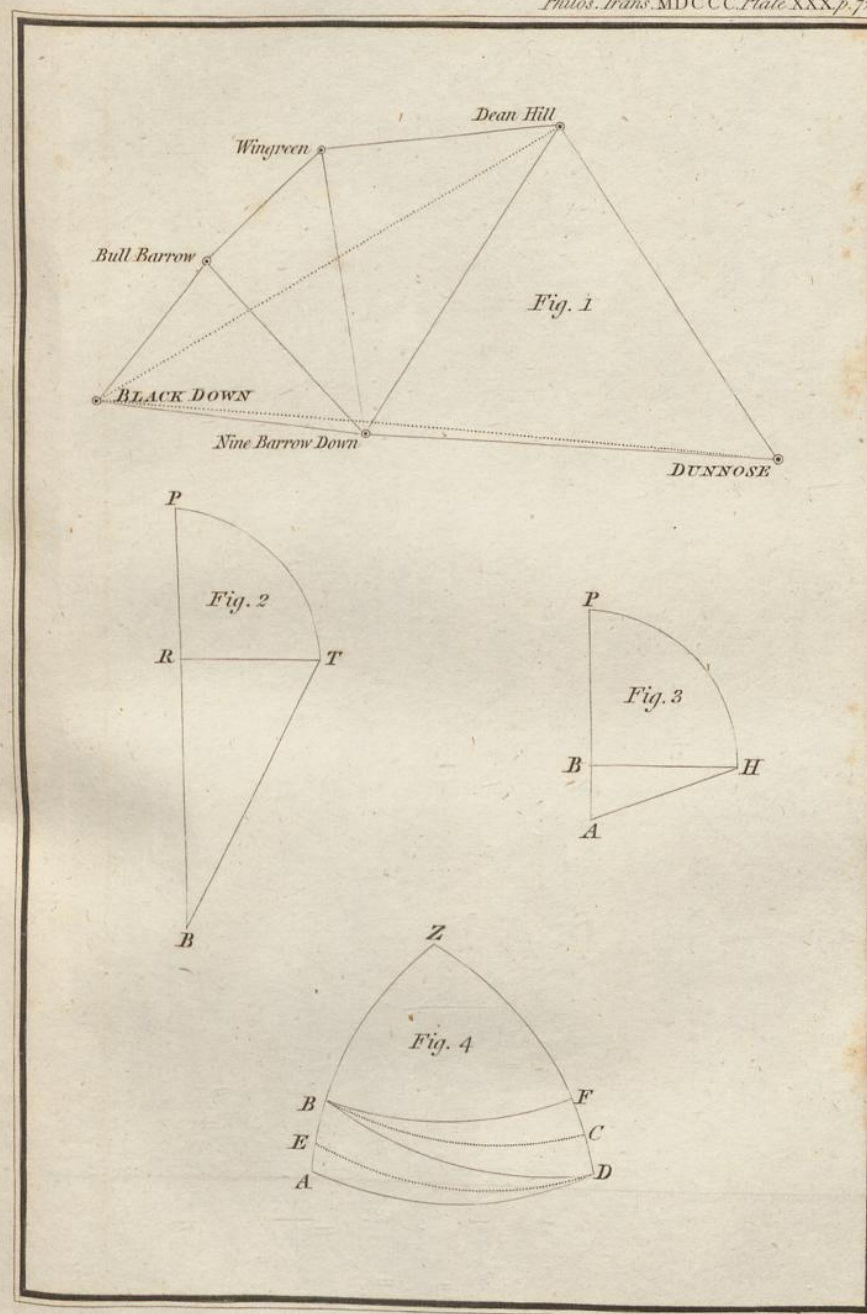
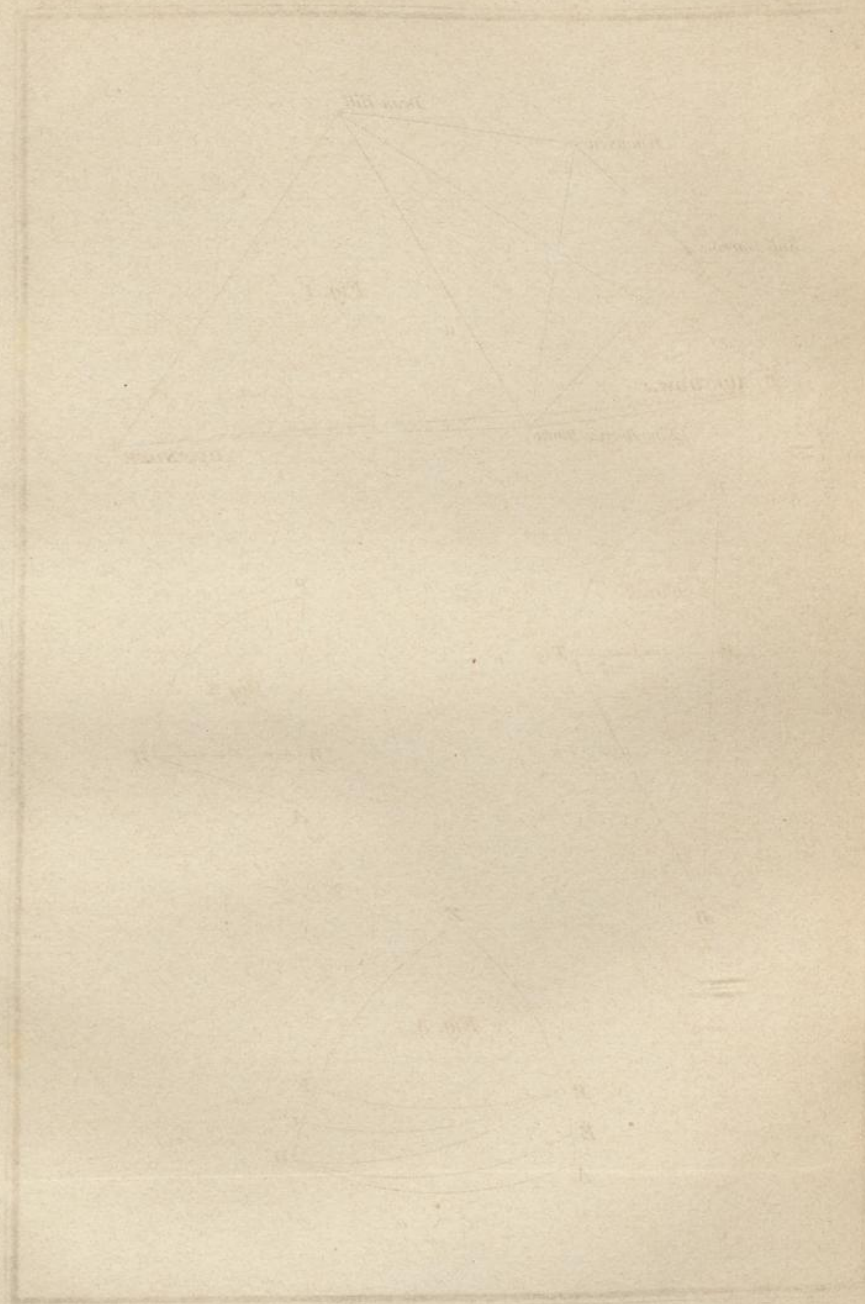


PLAN of the Principal Triangles in the TRIGONOMETRICAL SURVEY, 1798.

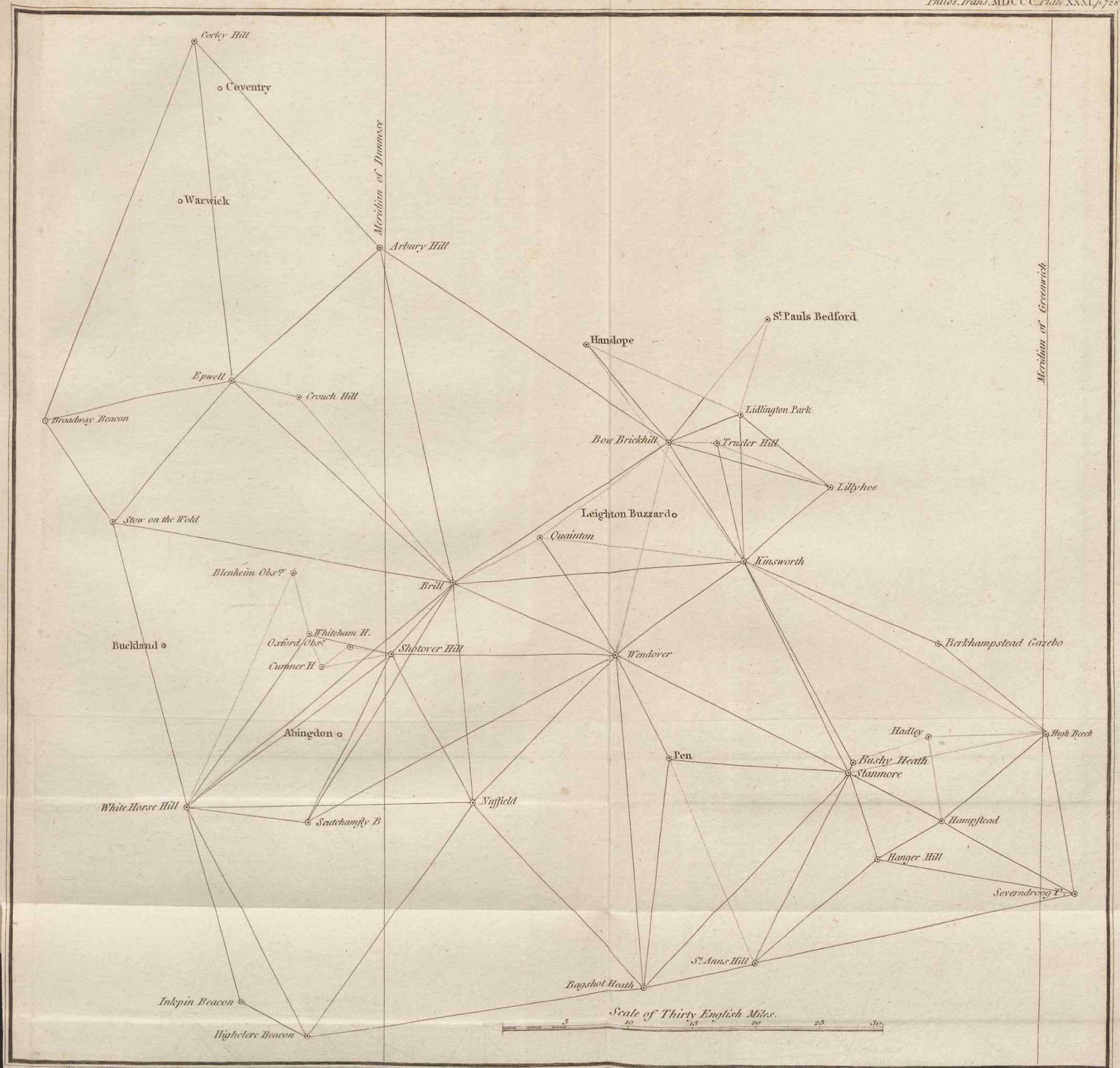
Philos. Trans. MDCCC. Plate XXIX. p. 728.













TRIANGLES for the Survey of ESSEX and parts of the ADJOINING COUNTIES, 1797, 1798, 1799.

Philos. Trans. MDCCLXXXII. p. 728





# TRIANGLES for the Survey of the Northern & Western parts of KENT, 1799.

Philos. Trans. MDCCLXXXIII. p. 728.

