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 prefatory 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 Butterton 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.

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 Butterton. 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 Butterton.

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 Butterton; 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 Butterton; 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 Trevose 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 *rhynes* 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 37	35,25
Rippin Tor and Abbotsbury staff - - -	3	8	51,75 52,75	52,5
Pilsden and Abbotsbury staff - - -	45	16	15 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 8,5	7,75
Hemmerdon Ball and Hensbarrow - - -	1	52	2,75 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 Trevose Head - - -	47	10	0,75	
Hensbarrow and Peranzabulo staff - - -	31	50	55,5 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 Trevose Head.

St. Agnes Beacon and Hensbarrow - -	65	43	43,75 47 50	47

Between	°	′	″	Mean
Hensbarrow and Bodmin Down	34	17	45 46	″ 45,5
Bodmin Down and Cadon Barrow	42	33	43 46,5	rejected.
			51,75 52,75	52

At Hensbarrow.

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

At Bodmin Down.

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

On Cadon Barrow.

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

At St. Stephen's Down.

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

Between	°	′	″	Mean.
Warbstow Beacon and Brendon Moor	39	41	18,5	18,75
			18,75	
			19	
Brendon Moor and Broadbury Down	90	0	40,75	41
			41	
Broadbury Down and Black Down	45	34	36 D	
			41,75	42,25
			43	
Black Down and Carraton Hill	91	18	12,25	12,75
			13,5	
Carraton Hill and Kit Hill	37	1	56	
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	
Trevose 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	
		16	1,5	
			4,5	
Bleak Down and Brent Knoll	29	11	35,75	39,25
			38	
			41,25	
			41,75	
Bleak Down and Dundry Beacon	33	39	30,5	30,5
			30,5	

Between	°	′	″	Mean.
Dundry Beacon and Lansdown	41	3	58,5	58,5
			58,75	
Lansdown and Farley Down	19	32	16,5	16,75
			17	
Farley Down and Westbury Down	38	55	17	17,5
			18,25	
Westbury Down and Bradley Knoll	37	47	57	58,5
			57,75	
			58,75	
			59	
		48	0,25	
Farley Down and Dundry Beacon	60	36	15	15,5
			15,75	
Farley Down and Bradley Knoll	76	43	14	19,75
			18,5	
			21	

At Dundry Beacon.

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

At Lansdown.

Kingsweston and Dundry	36	38	29	

On Farley Down.

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

Between	° ′ ″	Mean.
Westbury Down and Mendip Hills	77 21 51,75 55,75	″ 53,75
Bradley Knoll and Mendip Hills	40 16 23 23,75	23,5
Mendip Hills and Dundry Beacon	49 31 15,25 21,5	rejected.
	23 23,75	23,5

On Bradley Knoll.

Mendip Hills and Westbury Down	101 23 56,5 57,75 24 0 1,75	59
Westbury Down and Beacon Hill	42 43 29,25 30,5	29,75
St. Ann's Hill and Westbury Down	7 28 44 45,25 46,5	45
Westbury Down and Milk Hill	10 12 49,5 53,25	51,5
Beacon Hill and Wingreen	57 50 38,25	
Beacon Hill and Bull Barrow	98 34 31 33,5 34	32,5
Wingreen and Bull Barrow	40 43 51,25 52,75	52
Bull Barrow and Ash Beacon	45 43 3,25 3,75	3,5
Ash Beacon and Mendip Hills	71 34 54,75 55,25	55
Mendip Hills and Farley Down	63 0 21,5 D	

At Bull Barrow.

Ash Beacon and Mintern	51 26 41 41,75 43	42
Bradley Knoll and Wingreen	42 55 32,75	

At Pilsden Hill.

Mintern and Ash Beacon	35 2 59 3 3,25	1

At Mintern.

Between	°	′	″	Mean.
Pilsden and Ash Beacon	95	35	21,25 22,5	22″
Ash Beacon and Bull Barrow			94,14,22 24	23

On Westbury Down.

Beacon Hill and Bradley Knoll	114	12	18,25 18,5 18,75	18,5
Bradley Knoll and Mendip Hills	40	48	1 1,75 1,75	1,75
Mendip Hills and Farley Down	63	42	50,5 52	51,25
Farley Down and St. Ann's Hill	88	50	1 3 4¼	2,75
St. Ann's Hill and Beacon Hill	52	26	42,25 43,25	42,75
Beacon Hill and Milk Hill	48	7	31 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 57,75	57,75
Westbury Down and Milk Hill	51	11	9	
Westbury Down and St. Ann's Hill	46	34	6 9,25	7,75

On Inkpin Down.

White Horse Hill and Highclere	133	27	57,25 57,5	57,5
Highclere and Beacon Hill	106	16	52,25 54,25	53,25
Beacon Hill and Hewish	51	53	31,25 33,5 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 minutiæ 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 38,5 39,5	38

At Gravesend.

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

Isle of Sheppey.

Gad's Hill and Halstow	18	18	1,5 3 3,5	3
Halstow and Hadleigh	31	28	23 24,5 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 21,25	21,25
Gravesend and Hadleigh	107	49	5,25 5,25	5,25
Hadleigh and Sheppey	99	18	4 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

Between	°	′	″	Mean.
Gravesend and Severndroog Tower	26	16	56,75 57,75	″ 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 31,25	31
Greylock's Foss and Moor Lynch	15	51	58,5 59 59,75	59
Moor Lynch and Dundon Beacon	93	52	33,75	

At Greylock's Foss.

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

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 4,25	3,25
Lugshorn Corner and Dundon Beacon	8	0	10 10,25	10,25
Dundon Beacon and Mendip Hills	54	38	50 50	50
Mendip Hills and Ash Beacon	54	3	20 23,5 23,75	22,5
Ash Beacon and Pilsden Hill	57	19	2,5 3,75 4,5	3,5
Dundon Beacon and Pilsden Hill	56	43	36,25 36,5 37,25	36,75
Pilsden and Quantock Hills	87	15	6 7	6,5
Quantock Hills and Brent Knoll	71	38	57,75 58,5 58,5	58,25
Brent Knoll and Bleak Down	46	1	32,75 35,25 39	35,75
Bleak Down and Mendip Hills	43	41	43,5 45 45,25 46,75	45,25
Brent Knoll and Mendip Hills	89	43	19,5 20,5 24	21,25

On Dundon Beacon.

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

At Ash Beacon.

Between	° ′ ″	Mean.
Moor Lynch and Mendip Hills	56 29 50	″
	52,25	51,5
	52,25	
Mendip Hills and Bradley Knoll	50 8 45,25	
	45,75	45,5
Bradley Knoll and Bull Barrow	93 38 10,5	
	13	12,5
	14	
Bull Barrow and Pilsden	83 40 33,5	
	35,5	34,5
Mintern Hill and Pilsden	49 21 35,75	
	39,75	38,25
	39,75	
Pilsden and Quantock Hills	59 34 40,5	
	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	
	21,5	22
	24,25	
Ash Beacon and Moor Lynch	69 26 46,5	
	49	48,25
	49,25	
Dundon Beacon and Moor Lynch	23 58 16,5	
	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 Highbeech, 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 Highbeech, 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 Highbeech, 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 17	16″,25
Highbeech and Shooter's Hill - -	70	6	35,5 34,5	35
Highbeech and St. Paul's, London - -	83	1	17,25 22,75	20
Severndroog Tower on Shooter's Hill, and Hanger Hill Tower	117	22	13 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 Friering Steeple - -	95	25	0
Friering Steeple and Station on Rayleigh Steeple -	88	14	19
Friering 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 Highbeech.

Severndroog Tower and Brentwood Spire - -	71	16	43 45	44
Severndroog Tower and Southweald - -	44	34	27 29	28
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 30	57 0	58,5

At Shotover Hill.

Nuffield and White Horse Hill - -	81	53	27,75 29,75	28,75
Scutchamfly Barrow and White Horse Hill - -	26	8	7,75 7,75 8,25	8
White Horse Hill and Whiteham Hill - -	48	5	31,25 32,75 33,75	32,75
Wendover and Scutchamfly Barrow - -	117	30	55 57,25	56

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 35,5	35
Staff over the Quadrant at Blenheim and White Horse Hill	131	25	34,5 38,5	36,5

On Cumner Hill.

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

On White Horse Hill.

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

At Nuffield.

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

On Scutchamfly Barrow.

White Horse Hill and Shotover Hill	111	47	50	
Shotover Hill and Wendover	34	26	50 50,75 52,75 54,5	52

At Stow on the Wold.

Cleave and Broadway Beacon	54	44	54,5 54,5 57 57	55,75

Between	°	′	″	Mean.
Broadway Beacon and Epwell	72	38	48,5	49,5
			49	
			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	19¼	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	

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	
			53	52

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	44,5
			44,75	
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	

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	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	

Between	°	′	″	Mean.
Bow Brickhill and Lillyhoe	82	50	26	30,5
			30	
			35	
Lillyhoe and Tharfield Tower	12	12	39,75	40,75
			42	
Tharfield and Station on Gazebo at Berkhamstead	50	2	55,5	53,25
			56	
		3	0,5	
			1	
Stanmore and Berkhamstead	41	15	56,5	57,25
			57,75	
Bow Brickhill and Stanmore	173	37	43	44
			45	
Near Lillyhoe.				
Bow Brickhill and Kinsworth	54	58	52,5	53
			52,5	
			52,5	
			53,75	
Lidlington and Bow Brickhill	23	59	30	31
			32	
Bow Brickhill and Trusler Hill	5	52	11,5	
Station on the Ground near Tharfield Tower and Kinsworth	166	4	44,5	46,25
			48	
At Lidlington.				
Kinsworth and Bow Brickhill	68	16	19	22,25
			22,75	
			25,25	
At Crouch Hill.				
Brill and Epwell	145	23	25,75	26,25
			27	
At Stanmore.				
Wendover and Kinsworth	37	41	39,25	41
			43	
Pen Tower and Wendover	23	4	47,5	48,5
			47,5	
			47,75	
			49,25	
			49,25	
Bagshot and Pen Tower	49	32	29,5	
Bagshot Heath and Hanger Hill Tower	59	55	54,25	54
			53,75	

Between	°	′	″	Mean.
Hampstead Heath and Hanger Hill Tower - -	45	25	51	51,75
			51,5	
			51,5	
			52,75	
On Bushy Heath.				
Wendover and Kinsworth - - -	38	22	5	6,75
			8,5	
On Bagshot 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.*

Trevose 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 south-west 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.

Lugshorn 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 *Lugshorn 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.

Lillyhoe, Hertfordshire. The station is on a commanding eminence, having the *Icknield 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.

Bushy 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° 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.

Prittlewell 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.	Shoebury Ness, Staff.	Copdock St.

Naughton St.
Lavenham St.
Bulmer St.
Glemsford St.
Toppesfield St.
Twinestead St.
Southweald St.
Pleshley St.
High Easter St.
HatfieldBroad Oak St.
Beauchamp Roding St.
Hornchurch St.
Naseing St.
Henham on the Mount St.
Thorley St.
Albury St.
Elmdon St.
Rickling St.
Thaxted St.
Balsham St.
Westham St.
Barking, Staircase.
Berkhampstead, Gazebo.
Gallywood Common.
Purfleet Cliff.
Babraham Mount.
Epping Mill, Base.
Brentwood Spire, surveyed round.

Stations in Kent.

Frant Steeple. Station of 1787.
Botley Hill. Do.
Chiddingstone St.
Mount Sion.
East Peckham St.
Tudely St.
Seal Chart.
Tunbridge St.
Oxford Mount.
Silverden Farm.
Well Hill.
Crayford St.
Ash St.
North Fleet St.
Stockbury St.
Hernhill 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 $66\frac{1}{2}°$.

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 $69\frac{1}{2}°$.

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°, A was found to exceed 100 feet, $\frac{11425}{100000}$ of an inch; therefore, adding the wear which took place on Salisbury Plain, *viz.* $\frac{1}{260}$ 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-feet 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-feet chain, $31\frac{1}{4}$ divisions. Therefore the length of the short chain, in the temperature of 54°, may be taken at 50,00075 feet.

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

Days.	Spaces measured. Yards.	Mean temp. by 15 therm.	Days.	Spaces measured. Yards.	Mean temp. by 15 therm.	Days.	Spaces measured. Yards.	Mean temp. by 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.*

	Feet.
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
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°, 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, $\frac{98511}{5} - 54° \times 272,8 \times \frac{0,0075}{12} = 3,1069$ 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°, 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 $\frac{1372}{5} - 54° \times 4 \times \frac{,0075}{12} = 0,0365$ 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 $\frac{0{,}01237 \times 272{,}8 \times 8^{\circ}}{12} = 2{,}2497$ feet; which subtract —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	
	Trevose Head -	65 43 47	—0,57			65 43 43,75	
		180 0 1		1,31	—0,31		
	Trevose Head from { St. Agnes Beacon -						98108,1
	Hensbarrow - -						78099,9

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	
	Trevose Head	34 17 45,5	−0,23			34 17 45,25	
		180 0 2,25		0,86	+1,39		
	Trevose Head from { Bodmin Down						81967,6
	Hensbarrow						78093

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

III.	Trevose 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 { Trevose Head						85625
	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
	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
	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
	St. Stephen's Down from { 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
	St. Stephen's Down from { 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
	Black Down from { 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						72074
	Bradley Knoll from { Beacon Hill						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						105180
	Bull Barrow from { Wingreen						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.
XI.	Bull Barrow -	40 38 47,75	−0,28			40 38 45,25	
	Bradley Knoll	45 43 3,5	−0,28			45 43 3,25	
	Ash Beacon -	93 38 12,5	−0,65			93 38 11,5	
		180 0 3,75		1,25	+2,50		
	Ash Beacon from { Bradley Knoll -						68650,6
	Ash Beacon from { Bull Barrow -						75451
XII.	Beacon Hill -	23 4 15	−0,08			23 4 14,75	
	Bradley Knoll	42 43 29,75	+0,07			42 43 28,25	
	Westbury Down	114 12 18,5	−0,97			114 12 17	
		180 0 3,25		1,17	+2,08		
	Westbury Down from { Beacon Hill -						100625,1
	Westbury Down from { Bradley Knoll -						58118,2
XIII.	Westbury Down	40 48 1,75	−0,12			40 48 1,75	
	Bradley Knoll -	101 23 59	−0,48			101 23 59,75	
	Mendip Hills -	37 47 58,5	−0,16			37 47 58,5	
		179 59 59,25		0,77	−1,52		
	Mendip Hills from { Westbury Down -						92954,0
	Mendip Hills from { Bradley Knoll -						61961,1

Base of verification.—Greylock's Foss to Lugshorn Corner, 27680 feet.

XIV.	Lugshorn Corner	107 44 31				107 44 31	
	Greylock's Foss -	8 30 0				8 30 0	
	Dundon Beacon -	63 45 29				63 45 29	
		180 0 0			0		
	Dundon Beacon from { Lugshorn Corner						4561,5
	Dundon Beacon from { Greylock's Foss						29393

No. of triangles	Names of stations.	Observed angles.	Diff.	Spherical excess.	Error.	Angles corrected for calculation.	Distances.
		° ′ ″	″	″	″	° ′ ″	Feet.
xv.	Greylock's Foss -	105 40 0,25				105 40 0,5	
	Moor Lynch -	59 58 14				59 58 14,5	
	Dundon -	14 21 44,75				14 21 45	
		179 59 59			−1,0		
	Moor Lynch from { Greylock's Foss -						8421,5
	Moor Lynch from { Dundon Beacon -						32688,7
xvi.	Lugshorn Corner -	13 51 59				13 51 58,75	
	Greylock's Foss -	114 9 59				114 9 58,5	
	Moor Lynch -	51 58 3,25				51 58 2,75	
		180 0 1,25			+1,25		
	Moor Lynch from { Lugshorn Corner -						32061,3
	Moor Lynch from { Greylock's Foss -						8421,8
xvii.	Lugshorn Corner -	93 52 33,75				93 52 34,25	
	Moor Lynch -	8 0 10,25				8 0 10,75	
	Dundon Beacon -	78 7 14,5				78 7 15	
		179 59 58,5			−1,5		
	Dundon Beacon from { Lugshorn Corner -						4561,5
	Dundon Beacon from { Moor Lynch -						32689,0

Hence the mean distance from Moor Lynch to Dundon Beacon is 32688,85 feet.

xviii.	Moor Lynch -	54 38 50	−0,07			54 38 49,5	
	Dundon Beacon -	101 22 54,5	−0,32			101 22 53,75	
	Mendip Hills -	23 58 17	−0,10			23 58 16,75	
		180 0 1,5		0,5	+1,0		
	Mendip Hills from { Moor Lynch -						78876,8
	Mendip Hills from { Dundon Beacon -						65622,7

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 - -						88571
	Ash Beacon from { Mendip Hills -						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 -						61963,5
	Bradley Knoll from { Ash Beacon - -						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
	Mintern from { 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
	Pilsden from { 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.
		° ′ ″	″	″	″	° ′ ″	Feet.
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
		Mendip from { 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 Bagshot 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.
		° ′ ″	″	″	″	° ′ ″	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 - -					120557,7
		{ Highclere - -					108563,1
	Distance from Beacon Hill to Highclere, 98694,4 feet. Phil. Trans. 1795. p. 497.						
xxxi.	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 - -					31278,8
		{ Beacon Hill - -					85247,9
xxxii.	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 - -					108565,5
		{ Inkpin - - -					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.
		° ′ ″	″	″	″	° ′ ″	Feet.
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
		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
		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
		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
		Epwell - - -					80611,4

No. of triangles.	Names of stations.	Observed angles.	Diff.	Spherical excess.	Error.	Angles corrected for calculation.	Distances.
		° ′ ″	″	″	″	° ′ ″	Feet.
XXXVII.	Broadway Beacon	56 32 45	—0,34			56 32 44,75	
	Epwell -	95 34 25,25	—1,62			95 34 24,75	
	Corley - -	27 52 49,75	—0,61			27 52 50,5	
		180 0 0		1,58	—1,58		
		Corley from Broadway Beacon - -					171568
XXXVIII.	Brill - -	34 23 58,5	—0,65			34 23 57,5	
	Epwell -	85 0 18,5	—1,10			85 0 17,5	
	Arbury Hill -	60 35 45,5	—0,70			60 35 57,5	
		180 0 2,5		2,46	—0,04		
		Arbury Hill from { Epwell -					83098,4
		Brill - -					146530
XXXIX.	Arbury Hill -	89 57 4,5	—1,14			89 57 5,5	
	Epwell -	54 45 18,75	—0,57			54 45 18,25	
	Corley -	35 17 36,75	—0,57			35 17 36,25	
		180 0 0		2,29	—2,29		
		Corley from { Arbury Hill -					117463
		Epwell - -					143827,8

By the triangle Broadway Beacon, Epwell, Corley, (see the above) the distance from Corley to Broadway Beacon is the only distance computed; and this has been obtained through the means of two observed angles only. When the observations were made at Broadway Beacon, it was not imagined Corley could be seen; and the contrary was not known till the party arrived at the latter place. In so large a triangle, it would certainly be right to observe all the angles: but I have given the angles as they now stand, because the distance from Epwell to Corley comes out 143831 feet, which determination differs only three feet from the same distance found by the last triangle.

XL.	Bow Brickhill -	68 22 56,75	—1,21			68 22 59	
	Arbury Hill -	43 16 55,5	—0,99			43 16 54,5	
	Brill - -	68 20 7,75	—1,22			68 20 6,5	
		180 0 0		3,43	—3,43		
		Bow Brickhill from { Arbury Hill - -					146481
		Brill - -					108058,9

It will now be expedient to compute the distance from Bow Brick-hill 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.
XLI.	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
XLII.	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
XLIII.	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.
		° ′ ″	″	″	″	° ′ ″	Feet.
LI.	Kinsworth -	31 4 5				31 4 4	
	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
LII.	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.

LIII.	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.

LIV.	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

No. of triangles	Names of stations.	Observed angles.	Diff.	Spherical excess.	Error.	Angles corrected for calculation.	Distances.
		° ′ ″	″	″	″	° ′ ″	Feet.
LIV.	Crouch Hill -	145 23 26,25				145 23 26	
	Epwell - -	27 3 10				27 3 10	
	Brill - -	. . .				7 33 24	
	Crouch Hill from { Brill - -						102608
	Crouch Hill from { Epwell - -						29668,8

Distance from White Horse Hill to Shotover Hill 108050,2 feet.

LV.	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
	Whiteham Hill from { Shotover Hill -						34827,4
LVI.	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
	Cumner Hill from { 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 - -						14492
	Oxford Observatory from { Shotover Hill - -						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 -						107831,9
	Blenheim Observatory from { Whiteham Hill - -						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° 33′ 58″,5. In 1793, the angle between the staff on Pen Church Tower and Hampton Poor House was taken, and found = 95° 57′ 34″,5; therefore, the angle between Pen Tower and Hanger Hill is 70° 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.
		° ′ ″	″	″	″	° ′ ″	Feet.
LIX.	St. Ann's Hill	80 43 48				80 43 48	
	Bagshot - -	70 30 37				70 30 37	
	Pen Tower -	. . .				28 45 35	
	Pen Tower from { St. Ann's Hill - -						92000,5
	Pen Tower from { 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

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° 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° 18′	8″,5
Wendover -	-	38 25	21,25
Kinsworth -	-	95 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° 22′ 29″; from which, subtracting 38° 25′ 21″,25, the angle between Bow Brickhill and Kinsworth, we get 63° 57′ 7″,75, for the angle between Kinsworth and Stanmore. Again, the observed angle at Kinsworth, between Bow Brickhill and Stanmore, is 173° 37′ 44″; from which, subtracting the angle between Bow Brickhill and Wendover, we get 78° 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° 41′ 39″, nearly: but the observed angle was 37° 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°	57′	7″,75	which, corrected for calculation, becomes,
Kinsworth -	78	21	13,75	
Stanmore - -	37	41	41,75	
	180	0	3,25	

	°	′	″
Wendover -	63	57	7
Kinsworth -	78	21	12
Stanmore -	37	41	41

which triangle gives

the distance of Stanmore from { Wendover = 107464,1 / Kinsworth = 98577,5 } 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
Stanmore -	23	44	48
Pen Tower -	118	1	54

} which, corrected for calculation, becomes,

Wendover -	38	13	18,25
Stanmore -	23	44	48,25
Pen Tower -	118	1	54,5

which triangle gives

the distance of Pen from { Wendover = 49027 / Stanmore = 75325,4 } 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 observed.	Distances of the Stations from the intersected Objects.	
	° ′ ″		Feet.
Little Haldon - -	23 54 50	Great Haldon -	18974
Ball's Obelisk - - -	132 41 8		19366
Great Haldon, secondary station			
Great Haldon from Ball's Obelisk 19366 feet.			
Great Haldon - - -	68 0 35	Topsham Steeple -	28316
Ball's Obelisk - -	71 32 30		27679
Topsham Steeple			
Little Haldon from Furland 72776 feet.			
Little Haldon - -	18 2 2	Hope's Nose -	37656
Furland - - -	18 42 53		39028
Hope's Nose, secondary station			
Bodmin from Trevose 81967,6 feet.			
Bodmin - -	15 48 43	St. Minvern Steeple	45936
Trevose - - -	21 28 36		36866
St. Minvern Steeple			
Bodmin - -	12 5 33	St. Minvern Windmill	34852
Trevose - - -	8 46 51		48478
St. Minvern Windmill			

Trevose from Cadon Barrow 85624,8 feet.

Triangles.	Angles observed.	Distances of the stations from the intersected objects.	
Trevose Cadon Barrow *St. Isey Steeple*	° ′ ″ 55 38 59 19 15 48	St. Isey Steeple	29256 73216
Trevose Cadon Barrow *St. Merian Steeple*	58 41 39 6 38 22	St. Merian Steeple	10894 80504

Black Down from St. Stephen's 62506,7 feet.

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

Carraton from St. Stephen's 52994 feet.

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

Long Knoll from Westbury 58118,2 feet.

Long Knoll Westbury *Frome Steeple*	45 5 0 34 53 50	Frome Steeple	33765 41793

Lansdown from Farley Down 28730,4 feet.

Triangles.	Angles observed.	Distances of the stations from the intersected objects.	Feet.
Lansdown Farley Down *Cold Aston*	° ′ ″ 56 43 16 28 2 35	Cold Aston	13563 24120

Moor Lynch from Dundon 32688,8 feet.

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

Dundry from Lansdown 55248,9 feet.

Triangles.	Angles observed.	Distances of the stations from the intersected objects.	Feet.
Dundry Lansdown *Puckle Church Steeple*	° ′ ″ 22 7 16 85 25 0	Puckle Church Steeple	57757 21819
Dundry Lansdown *Westleigh Steeple*	30 37 18 86 18 39	Westleigh Steeple	61842 31566
Dundry Lansdown *Bristol Cathedral*	51 19 11 22 23 3	Bristol Cathedral	21920 44935
Dundry Lansdown *Redcliff Steeple*	44 18 9 21 22 24	Redcliff Steeple	22096 42346
Dundry Lansdown *Long Aston Steeple*	78 18 19 14 32 8	Long Aston Steeple	13883 54168
Dundry Lansdown *Clifden Windmill*	67 33 51 13 17 8	Clifden Windmill	12860 51725
Dundry Lansdown *Blaze Castle*	75 37 25 39 7 35	Blaze Castle	38391 58932
Dundry Lansdown *Penpole Park Gazebo*	89 10 18 32 52 56	Penpole Park Gazebo	35391 65180
Dundry Lansdown *St. George's Steeple*	32 16 31 31 49 52	St. George's Steeple	32391 32795
Dundry Lansdown *Duke of Beaufort's House, Stoke*	44 54 50 48 5 1	Duke of Beaufort's House	41168 39064
Dundry Lansdown *Harfield Steeple*	57 15 32 39 14 57	Harfield Steeple	35182 46773

Triangles.	Angles observed.	Distances of the Stations from the intersected Objects.	Feet.
Dundry Lansdown *Durham Steeple*	° ′ ″ 13 58 8 120 8 3	Durham Steeple	66541 18573
Dundry Lansdown *Knowle Steeple*	63 45 11 59 9 55	Knowle Steeple	56512 59030
Dundry Lansdown *Mangotsfield Steeple*	29 42 10 59 59 41	Mangotsfield Steeple	47845 27376
Dundry Lansdown *Winterbourn Steeple*	46 12 31 66 38 49	Winterbourn Steeple	55045 43280
Mendip from Dundry 69196 feet.			
Dundry Mendip *Leigh Steeple on Mendip*	15 0 54 104 10 15	Leigh Steeple on Mendip	76847 20533
Dundry Mendip *Dundry Steeple*	90 22 22 1 10 22	Dundry Steeple	1417 69221
Mendip from Long Knoll 61962,3 feet,			
Long Knoll Mendip *Doulting Spire*	7 20 24 25 42 22	Doulting Spire	49286 14517
Farley Down from Westbury 59849,5 feet,			
Westbury Farley Down *Devizes Steeple*	81 25 20 44 6 53	Devizes Steeple	51197 72726
Whitehorse from Scutchamfly 51261,9 feet.			
Whitehorse Scutchamfly *Abingdon Spire*	32 55 51 104 3 27	Abingdon Spire	72898 40852

Triangles.	Angles observed.	Distances of the Stations from the intersected Objects.	Feet.
Whitehorse Scutchamfly *Wallingford Steeple*	° ′ ″ 10 39 30 158 52 26	Wallingford Steeple	101693 52185
Whitehorse Scutchamfly *Great Coxwell Windmill*	121 19 20 21 7 0	Great Coxwell Windmill	30295 71834
Whitehorse Scutchamfly *Highworth Steeple*	153 24 7 11 21 56	Highworth Steeple	38449 87355
Whitehorse Scutchamfly *Drayton Steeple*	28 6 9 99 45 35	Drayton Steeple	63991 30586
Whitehorse Scutchamfly *Radley Steeple*	34 8 57 109 33 56	Radley Steeple	81618 48624
Whitehorse Scutchamfly *Buckland Steeple*	75 25 57 44 15 50	Buckland Steeple	41189 57115
Whitehorse Scutchamfly *Witney Steeple*	81 19 12 62 34 49	Witney Steeple	57229 86007
Whitehorse Scutchamfly *Bampton Steeple*	90 57 40 48 27 50	Bampton Steeple	58992 78799

Whiteham from Brill 62066,1 feet.

Whiteham Brill *Islip Steeple*	19 47 5 14 55 46	Islip Steeple	28983 38073
Whiteham Brill *Woodstock Steeple*	78 47 7 25 3 58	Woodstock Steeple	27956 64725
Whiteham Brill *Kidlington Spire*	38 39 25 18 59 22	Kidlington Spire	24677 47373

Whitehorse from Brill 146603,2 feet.

Triangles.	Angles observed.	Distances of the Stations from the intersected Objects.	
	° ′ ″		Feet.
Whitehorse Brill *Witchwood Forest Beacon*	46 10 15 40 32 9	Witchwood Forest Beacon	95439 105936

Broadway from Epwell 80611,4 feet.

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

Corley from Arbury Hill 117463 feet.

Corley Arbury *Dun Church Windmill*	10 17 47 18 1 45	Dun Church Windmill	70621 44249
Corley Arbury *Gazebo on Bardon Hill, Leicestershire*	107 11 9 34 20 2	Gazebo on Bardon Hill	106471 180344
Corley Arbury *Markfield Windmill*	100 41 54 36 37 26	Markfield Windmill	103373 170270
Corley Arbury *Newnham Windmill*	2 45 41 101 33 35	Newnham Windmill	118771 5845

Corley from Broadway 171570 feet.

Broadway Corley *Building on Breadon Hill*	96 31 27 14 33 9	Building on Breadon Hill	46201 182682

Epwell from Crouch Hill 29668,8 feet,

Triangles.	Angles observed.	Distances of the Stations from the intersected Objects.	Feet.
Epwell Crouch Hill *Deddington Steeple*	° ′ ″ 24 43 28 124 8 31	Deddington Steeple	47493 24000
Epwell Crouch Hill *Bloxham Spire*	22 2 57 89 27 20	Bloxham Spire	31887 11971
Epwell Crouch Hill *Aynoe Steeple*	12 41 39 155 28 33	Aynoe Steeple	60070 31802
Epwell Crouch Hill *Adderbury Spire*	12 45 23 143 29 30	Adderbury Spire	43823 16265
Epwell Crouch Hill *Farthingo Steeple*	9 33 29 162 29 20	Farthingo Steeple	64520 35605

Epwell from Arbury Hill 83098,4 feet.

Epwell Arbury Hill *Round House, Edge Hills*	27 30 1 8 9 42	Round House, Edge Hills	20235 65816
Epwell Arbury Hill *St. Martin's, Coventry*	50 9 8 87 15 6	St. Martin's, Coventry	122636 94262
Epwell Arbury Hill *Round House Windmill, Edge Hills*	28 31 46 7 34 6	Round House Windmill	18576 67364

Brill from Quainton 40908,6 feet.

Brill Quainton *Wingrove Steeple*	19 36 52 140 7 47	Wingrove Steeple	75747 39665
Brill Quainton *Hardwick Steeple*	16 25 48 128 12 5	Hardwick Steeple	55539 19989

Triangles.	Angles observed.	Distances of the Stations from the intersected Objects.	Feet.
Brill Quainton *Luggersal Steeple*	° ′ ″ 16 42 12 4 24 16	Luggersal Steeple	8710 32664
Brill Quainton *Granborough Steeple*	8 30 43 144 20 22	Granborough Steeple	52266 13270
Brill Quainton *Bicester Steeple*	105 7 30 32 10 53	Bicester Steeple	32132 58210
Brill Quainton *Centre of the Great House at Wooton*	17 37 12 9 28 57	House at Wooton	14793 27181

Stow from Broadway 52203,2 feet.

Stow Broadway *Sarsden Chapel*	123 23 50 19 25 13	Sarsden Chapel	28720 72115
Stow Broadway *Walford Spire*	56 10 42 49 34 47	Walford Spire	41295 45063
Stow Broadway *Bourton Chapel*	14 3 44 21 32 40	Bourton Chapel	32926 21786

Stow from Epwell 78938,2 feet.

Stow Epwell *Stow on the Wold Steeple*	60 30 20 6 37 9	Stow on the Wold	9876 74573

Wendover from Brill 92400,7 feet.

Brill Wendover *Pitchcot Windmill*	43 30 12 46 37 4	Pitchcot Windmill	53739 50901

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

Wendover from Quainton 72889,4 feet.

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

Quainton from Bow Brickhill 67490,6 feet.

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

Wendover from Kinsworth 84462 feet.

Kinsworth Wendover *Leighton Buzzard Spire*	69 56 52 31 6 26	Leighton Buzzard	35317 64215

Kinsworth from Quainton 84996,3 feet.

Kinsworth Quainton *Aylesbury Steeple*	17 49 12 51 5 23	Aylesbury Steeple	70886 27879

Bow Brickhill from Lidlington 32035,6 feet.

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

Lillyhoe from Lidlington 49026,1 feet.

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

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

Kinsworth from Lidlington 61255,3 feet.

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

Kinsworth from Bow Brickhill 57668 feet.

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

Lillyhoe from Trusler Hill 50673,6 feet.

Lillyhoe Trusler Hill *Knotting Green Elm Tree*	51 56 21 103 29 55	Knotting Green Elm Tree	118536 95981
Lillyhoe Trusler Hill *Sundon Windmill*	36 45 37 27 4 1	Sundon Windmill	25692 33790

Bow Brickhill from Trusler Hill 20138,7 feet.

Triangles.	Angles observed.	Distances of the stations from the intersected objects.	
Bow Brickhill Trusler Hill *Crawley Steeple*	° ′ ″ 25 13 54 50 16 22	Crawley Steeple	15998 8867
Bow Brickhill Trusler Hill *Moulshoe Steeple*	93 18 15 49 17 46	Moulshoe Steeple	25136 33101
Bow Brickhill Trusler Hill *Woburn Steeple*	13 27 17 19 46 14	Woburn Steeple	12432 8552

Bow Brickhill from Lillyhoe 69867 feet.

Bow Brickhill Lillyhoe *Renhold Steeple*	60 57 17 68 43 59	Renhold Steeple	84608 79373
Bow Brickhlll Lillyhoe *Ravensden Steeple*	64 55 32 66 41 24	Ravensden Steeple	85825 84646

Kinsworth from Lillyhoe 47278,7 feet.

Kinsworth Lillyhoe *Flitwick Steeple*	43 44 48 71 53 53	Flitwick Steeple	49849 36264

SECTION SECOND.

Determination of the Latitudes and Longitudes of the Stations on Black Down, in Dorsetshire, Butterton, 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 XXVIIth triangles, published in the Philosophical Transactions of 1795, and LIIId 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, substracted 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° 50′ 19″, (see Phil. Trans. for 1795. p. 501,) and the angle between Black Down and Nine Barrow, as just found, is 29° 22′ 55″,75, which, increased by the proper correction for the difference between the chord and horizontal angles, becomes 29° 22′ 57″,5. The sum of these angles ,94° 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° 30′ 25″,75: this, subtracted from the angle between Dean Hill and Dunnose, leaves 35° 36′ 29″, for the angle at Black Down; which, corrected for the purpose of reduction to their respective chord angles, become 94° 13′ 11″,5, and 35° 36′ 25″,75, from whence we get the angle at Dunnose = 50° 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° 19′ 19″,25
And on the 19th, in the afternoon -	98 42 47
Half their sum is the angle between the meridian and Abbotsbury staff - -	101 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 19 25,25
And on the 19th, in the afternoon -	98 42 35,5
Half their sum is the angle between the meridian and Abbotsbury staff - -	101 31 0,5

Therefore, 101° 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° 26′ 35″25; and the angle between the meridian and the same staff, by double azimuths of the Pole Star, 101° 31′ 2″. Wherefore their sum, subtracted from 360°, leaves 94° 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 $94° 2' 22'',75$, and the second $84° 54' 53''$; therefore, in the triangle ABD the angle at B is $85° 57' 36'',75$, and, in the triangle BDC, the angle at D $= 84° 54' 53''$: hence, the angles of these triangles, when reduced to those formed by the chords, are as follows:

In the triangle BDC
$$\begin{cases} \text{DDC} = 84° 54' 52'',5 \\ \text{CDB} = 91 \quad 2 \quad 44,75 \\ \text{CBD} = \quad 4 \quad 2 \quad 22,75 \end{cases}$$

And in the triangle ABD
$$\begin{cases} \text{ABD} = 85 \quad 57 \quad 36,75 \\ \text{BAD} = 88 \quad 57 \quad 16,25 \\ \text{BDA} = \quad 5 \quad 5 \quad 7 \end{cases}$$

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,

In the triangle BCD $\begin{cases} \text{BC} = 313128 \\ \text{CD} = 21146,9 \end{cases}$ feet.

And in the triangle ABD $\begin{cases} \text{AD} = 313581,2 \\ \text{AB} = 27864,5 \end{cases}$ feet.

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° 2′ 45″,75, and the last 88° 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,

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

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

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

$$\left.\begin{array}{r} \text{CF} = 2859{,}1 \\ \text{And EA} = 2859{,}8 \end{array}\right\} \text{feet.}$$

Therefore FD = DC + CF = 22146,9 + 2859,1 = 25006 feet. And BE = BA = 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° 41′. See Phil. Trans. for 1795, p. 537.

Now the latitude of Dunnose is 50° 37′ 7″,3, and its longitude 1° 11′ 36″; (Phil. Trans. for 1795, p. 536;) therefore, 50° 37′ 7″3 + 4′ 6″,5 = 50° 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° 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° 41′ 14″ for the latitude, and 1° 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 Mouvemens apparens des Corps Célestes*, the latitude of Black Down comes out 50° 41′ 13″,9, and the longitude 1° 20′ 45″,75. We may, therefore, admitting the supposition of Dunnose being situated in 50° 37′ 7″,3, safely take 50° 41′ 13″,8 for the latitude, and 2° 32′ 22″,4 for the longitude, of Black Down; that of Dunnose being 1° 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 XLVIIth, 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° 37′ 27″,25, which, reduced to the angle formed by the chords, becomes 152° 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° 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° 33′ 53″,75. The two sides are 581012,5 feet, and 103345 feet; which *data* give the following triangle:

Charton - - 141° 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° 14′ 21″,25; and in the LIST, (Rippin Tor, Cawsand Beacon, and Little Haldon) the angle at the same station is 25° 30′ 39″,75; their sum is 68° 45′ 1″, and, adding 1″ for the necessary correction, it becomes 68° 45′ 2″. Computing with this angle, and the including sides, (64020,5 and 18334 feet,) we obtain the following triangle:

Rippin Tor - - 90° 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° 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° 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° 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° 36′ 4″,5
Dumpdon	-	125 54 24,5
Black Down	-	28 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° 8′ 52″,5, and the angle between Pilsden and the same staff 45° 16′ 13″; their difference, 42° 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° 37′ 50″,5, (which is very nearly the same as the horizontal one,) and the angle between Dumpdon and Rippin Tor = 28° 29′ 31″, which it is also unnecessary to correct: their sum is 42° 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° 31′ 1″,5, nearly, and that between Rippin Tor and the same staff = 3° 8′ 52″,5; therefore, 98° 22′ 8″ is the angle which Rippin Tor makes with the meridian, and this, taken from 180°, leaves 81° 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° 33′ 59″,1, and the longitude west from Black Down, 1° 13′ 3″,8; consequently, its longitude west of Greenwich is 3° 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°	29′	13″75
And on the 7th, in the afternoon - -	97	4	14
Half their sum is the angle between the meridian and the staff on Hemmerdon Ball -	94	16	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	29	12
Half the sum of this, and the angle observed			

in the forenoon of the same day, (97° 4′ 14″)
is - - - - - 94° 16′ 43″

Hence, 94° 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° 17′ 7″,75; therefore, 121° 17′ 7″,75 — 94° 16′ 44″ = 27° 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° 26′ 0″,9, and RT = 4′ 40″,3, We have, consequently, cosine 4′ 40″,3 : radius : : cosine 39° 26′ 0,″9 : cosine 39° 26′ 0,″7, the co-latitude of the point R. So PB = PR + RT = 39° 26′ 0″,7 + 9′ 13″ = 39° 35′ 13″,7; therefore, the latitude of Butterton is 50° 24′ 46″,3, and its longitude west from Greenwich, 3° 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 LVIth, LVIIth, and LXIVth triangles, in the series of 1796, where the sum of the observed angles at Carraton Hill is 136° 52′ 43″. The correction for reducing this angle to that formed by the chords, is 4″; therefore, 136° 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° 3′ 44″,25. (See Phil. Trans. 1797.) The angle between Hensbarrow and Rippin Tor is 119° 35′ 3″,25; therefore, 18° 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° 31′ 23″,5, gives 18° 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° 52′ 4″,5; therefore, as the angle between the latter and the meridian = 94° 16′ 44″, we get 92° 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° 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° 23′ 3″,3, and its longitude, west of Butterton, 55′ 20″,2; consequently, its longitude, west of Greenwich, is 3° 52′ 47″,5 + 55′ 20″,2 = 4° 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° 26′ 1″,5

And on the 22d, in the afternoon - 44 0 33,25

Half their sum is the angle between the meridian and staff - - - 41 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° 50′ 55″,5; wherefore, 41° 13′ 17″,5 + 31° 50′ 55″,5 = 73° 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° 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° 36′ 56″,7 : cosine 39° 36′ 54″,2, the co-latitude of B; hence 39° 36′ 54″,2 + 4′ 38″,8 = 39° 41′ 33″,0 the co-latitude of A; hence 50° 18′ 27″ is the latitude of St. Agnes. Its longitude, west from Hensbarrow, is also found by a simple proportion; sine 39° 36′ 54″,2 : radius : : sine 15′ 10″,9 : sine 0° 23′ 48″; therefore, 4° 48′ 7″,7 + 0° 23′ 48″ = 5° 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°, 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° 10′,) is 60842 fathoms, (which supposition may be considered just, provided the latitude of Paris, 48° 50′ 14″, be as near the truth as 51° 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° 41′; (see Phil. Trans. 1795, p. 537;) these 9 fathoms, however, were not arbitrarily assumed, but computed. If the latitude of Paris be 48° 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° 41′, 60849 instead of 60842 fathoms.

The latitude of the station on Beachy Head, 50° 44′ 23″,7, was found by using 60861 fathoms for the length of a degree on the meridian in 51° 6′; but, if it be true that 48° 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 $\frac{1}{33}$d 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° 44′ 23″,7.

It would have been fortunate, had the difference of latitude between Black Down and Butterton, and Butterton 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 Butterton 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° 41′ 13″,8, the latitude of Butterton, 50° 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 Butterton being admitted as correct. Supposing, therefore, the latitude of Greenwich to be 51° 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° 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 Butterton 5″; and that of St. Agnes Beacon 6″.

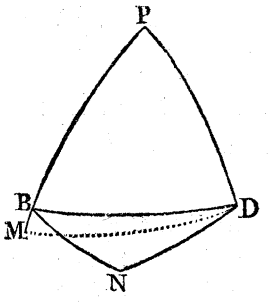
The latitudes and longitudes of these important stations, brought under one point of view, will be as follows:

	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° 30′ 28″, and BND 172° 27′ 33″,5; these give the angle BDN = 3° 1′ 59″,5, nearly, because the excess of the three angles above 180° is 1″. The observed angle at D, Dunnose, between Nine Barrow Down and the meridian DP, or PDN, was 87° 56′ 53″; therefore, 87° 56′ 53″ — 3° 1′ 59″,5 = 84° 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° 20′ 46″,4; and, since BP is very nearly = PD, and BD is small, we shall have rad. : tang. $\frac{1}{2}$P :: cosine DP : cosine BMD = 89° 28′ 47″. But the angle PDB has been found = 84° 54′ 53″,5; therefore, 89° 28′ 47″ — 84° 54′53″,5 = 4° 33′ 53,″5, the angle BDM; hence, 180° 0′ 2″ — 94° 2′ 40″,5 = 85° 57′ 21,″5, or MBD; therefore, 94° 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° 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 Butterton 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. $d = \frac{p\,m}{p + m - p \cdot s^2}$; 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, Butterton 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 from merid.	Distances from perp.
		° ′ ″	Feet.	Feet.
Bull Barrow -	Black Down	42 2 30 N E	53643,2	59489,7
Mintern - - - -		10 36 33 N E	10996,8	58709
Pilsden - - - -		56 14 48 N W	65775,6	43955,4
Charton Common - -		83 30 3 N W	102681	11697,5
Dumpdon -	Charton Common	45 4 0 N W	143749	52670,9
Rippin Tor - - -		81 37 52 S W		

Meridian of Butterton.

Rippin Tor -	Butterton	27 0 23 N E	28585,3	56086,6
Furland - - -		78 37 39 S E	78966,3	15883
Bolt Head - - -		14 49 48 S E	18551,3	70065,4
Maker Heights - -		70 36 9 S W	71467,9	25164,3
Kit Hill - - -		67 12 12 N W	93081,9	39121,7
Carraton Hill - - -		73 53 22 N W	126408,9	36511,3
Cawsand Beacon -	Rippin Tor	35 35 29 N W	86744,4	108147,5
Little Haldon -	Furland	4 25 2 N E	84571,4	56676,8
Bindown - -	Maker	70 4 48 N W	52926,6	19180,1
Hensbarrow - - -		87 35 18 S W	92878,0	28271,0

Meridian of St. Agnes Beacon.

Hensbarrow -	St. Agnes Beacon	73 4 13 N E	92877,4	28279,9
Deadman - - -		72 24 27 S E	97292,5	30849
Karnbonellis - - -		3 27 27 S W	2741,7	45379,2
Karnminnis - - -		61 13 58 S W	74168,1	40719
Bodmin, Lansallos	Hensbarrow	37 30 45 N E	121703,2	65825,8
		75 29 51 S E	152945,3	12733,5
St. Burian -	Karnbonellis	67 20 59 S W	94831,5	83807,3
Pertinney - -	Karnminnis	39 25 32 S W	100465,1	72704,4
Sennen - -	Pertinney	40 50 18 S W	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
Meridian of Butterton Hill.		From merid. of Butterton.		
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
Meridian of St. Agnes.		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, Butterton Hill, and St. Agnes Beacon; and likewise their Distances from these Meridians.*

Meridian of Black Down.

Bearings from the Parallels to the Meridian.		Distances from merid.	Distances from perp.
At Bull Barrow.	° ′ ″	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. Frampton'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
At Black Down.			
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
At Pilsden.			
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
At Dumpdon.			
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 Butterton.

Bearings from the Parallels to the Meridian.					Distances from merid.	Distance from per
	°	′	″		Feet.	Feet.
At Little Haldon.						
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
At Butterton.						
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 Edgecumbe 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
At Butterton.						
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
At Rippin Tor.						
Great Haldon	52	27	0	N E	72023	89479

Bearings from the Parallels to the Meridian.					Distances from merid.	Distances from perp.
At Maker.	°	′	″		Feet.	Feet.
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
At Kit Hill.						
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
At Carraton Hill.						
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.

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

Names of Objects.	Latitude	Longitude from 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
Puncknoll 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 Butterton Hill.

Names of Objects.	Latitude.	Longitude from Butterton 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
Marlborough 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 Butterton Hill.	Longitude west of Greenwich. In degrees.	In time.
	° ′ ″	° ′ ″	° ′ ″	m. s.
Rame Steeple	50 19 18,7	0 37 59,8 W	4 30 47,3	18 3,1
Flagstaff, Statten Battery	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 (D.)	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
Polparrow Flagstaff	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 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
Flagstaff, Deadman	50 13 15,8	0 24 47,7 E	4 47 8,0	19 8,5
Gwineas Rocks	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
Flagstaff, Blackhead	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 4,11
Old Tower at Polruan	50 19 40,2	0 34 47,7 E	4 37 8,0	18 28,5
Flagstaff, St. Anthony's Head	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
Peranzabulo	50 21 59,4	0 4 57,6 E	5 6 58,2	20 27,9

Names of Objects.	Latitude.	Longitude from 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
Flagstaff, Pendennis Castle	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,	0 10 6,0 W	5 22 1,7	21 28,1
Cow and Calf	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
Windmill, Lizard	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
Madern Steeple	50 7 56,6	0 20 47,5 W	5 32 43,2	22 10,9
Park Lough Flagstaff	50 0 9,9	0 2 43,8 W	5 14 39,5	20 58,6
Lizard Flagstaff	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
St. Leven's Point, Flagstaff	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 distinguised 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, Butterton Hill, and St. Agnes Beacon; and likewise their Distances from those Meridians*

Meridian of Black Down.

Names of the Stations.		Bearings.	Distances from merid.	Distances 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 Butterton 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
White Horse Hill	Stow on the Wold	14 29 27 NW	114915	469942
	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 -	Cumner 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 - -	Bow Brickhill	56 46 9 NE	151413	190493
Arbury Hill -		54 50 52 SE		
Brill - -	Kinsworth -	85 8 30 NE	120910	141562
Bow Brickhill -		31 55 51 SE		
Bow Brickhill -	Lillyhoe -	74 6 27 SE	84215	171367
Kinsworth -		50 54 40 NE		
Bow Brickhill -	Lidlington -	67 24 37 NE	121834	202802
Lillyhoe -		50 6 55 NW		
Bow Brickhill -	Trusler Hill -	89 1 15 SE	131278	190151
Lillyhoe -		68 14 71 NW		

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

Names of the Stations.	Latitude.	Longitude from Butterton 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.
Trevose 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.	Longitude west of Greenwich. 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.	Longitude west of Greenwich. 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, Butterton Hill, and St. Agnes Beacon; and likewise their Distances from those Meridians.*

Meridian of Black Down.

Bearings from the Parallels to the Meridian.					Distances from merid.	Distances from perp.
	°	′	″		Feet.	Feet.
At Moor Lynch.						
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
At Dundry.						
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
At Long Knoll.						
Doulting Spire	68	59	51	N W	9544	182322
Frome Steeple	5	20	25	N W	52415	198272
At Farley Down.						
Devizes Steeple	79	51	30	S E	129342	245113
Cold Aston Steeple	33	43	21	N W	44362	277983

Meridian of Butterton Hill.

Bearings from the Parallels to the Meridian.		Distances from merid.	Distances from perp.
	° ′ ″	Feet.	Feet.
At Furland.			
Hope's Nose	23 7 55 NE	93759	18745
At St. Stephen's.			
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
At Carraton Hill.			
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.

At Bodmin.			
St. Minvern Steeple	58 18 36 NW	79549	91845
St. Minvern Windmill	61 51 46 NW	90966	82260
At Trevose Head.			
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.

At Epwell.			
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
At Arbury Hill.			
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 from merid.	Distances from perp.
		Feet	Feet.
Markfield Windmill	5 20 7 NW	18608	755819
Newnham Windmill	59 36 2 NE	2261	589244
At Corley Hill.			
Gazebo, Breadon Hill	35 45 58 SW	188086	525408
At Crouch Hill.			
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
At Arbury Hill.			
Round House, Edge Hills	56 15 5 SW	57501	549724
Windmill, near the Round House	55 39 29 SW	58398	548286
At Brill.			
Wingrove Steeple	81 17 5 NE	103826	454713
Hardwick Steeple	78 6 1 NE	83299	454687
Luggersal Steeple	44 56 1 NE	35106	449401
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
At Whitehorse Hill.			
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	388578
Buckland Steeple	20 8 12 NE	69616	388204
At Stow.			
Stow on the Wold Steeple	20 55 25 NW	118442	479166
At Broadway.			
Sarsden Chapel	52 29 8 SE	86195	469777
Bourton Chapel	54 36 35 SE	125636	501076
Walford Spire	82 38 42 SE	98704	507924

Meridian of Greenwich.

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

Bearings from the Parallels to the Meridian.		Distances from merid.	Distances 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
Ampthill 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, Butterton Hill, and St. Agnes Beacon.*

Meridian of Black Down.

Names of the Objects.	Latitude.	Longitude from Black Down.	Longitude west of Greenwich. In degrees.	In time.
	° ′ ″	° ′ ″	° ′ ″	m. s.
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 Black Down.	Longitude west of Greenwich. In degrees.	In time.
	° ′ ″	° ′ ″	° ′ ″	m. s.
Doulting Spire	51 11 11,4	0 2 29,3 E	2 29 53,1	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 Butterton Hill.

Names of Objects.	Latitude.	Longitude from Butterton Hill.	Longitude west of Greenwich. In degrees.	In time.
	° ′ ″	° ′ ″	° ′ ″	m. s.
Hope's Nose, Torbay	50 27 48,5	0 26 4,4 E	3 26 43,1	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 St. Agnes Beacon.	Longitude west of Greenwich. In degrees.	In time.
	° ′ ″	° ′ ″	° ′ ″	m. s.
St. Minvern Steeple	50 33 30,6	0 20 28,1 E	4 51 27,6	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 Dunnose.	Longitude west of Greenwich. In degrees.	In time.
	° ′ ″	° ′ ″	° ′ ″	m. s.
Warwick Steeple	52 16 53,0	0 23 18,3 W	1 34 54,3	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 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.
	° ′ ″	° ′ ″	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		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
Ridgemont 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
Souldrope Spire	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
Tottenhoe 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		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
Ampthill 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 Butterton, is 67° 12′ 12″, and the angle between it and the flagstaff on Drake's Island, 41° 40′ 8″; therefore, the bearing of the latter from the meridian is 71° 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 Butterton, 50° 24′ 46″,3 and 3° 52′ 47″,5, give 50° 21′ 21″,1 for the latitude, and 4° 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° 21′ 20″ ⊙'s LL.
50 21 30,5 ditto.
50 21 31 ditto.
50 21 29 α Aquilæ.
50 21 26,5 α Ophiuchi.
50 21 55 ⊙'s LL. The mean of these is 50° 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° 18′ 52″; but the longitude deduced from the recent operations, is 4° 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 Butterton, between the Old Church tower and Kit Hill, is 37° 45′ 5″,2; its bearing, therefore, south-west from the meridian, is 75° 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° 22′ 13″,6, and longitude 4° 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, 1783.	Mr. MUDGE's clock* at Plymouth, fast for mean time	0^{m}	32^{s},15
	Timekeeper faster than Mr. MUDGE's clock -	0	25 ,6
14th.	Timekeeper slower than London clock -	14	29 ,4
	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^{s},15
	Timekeeper faster than Mr. MUDGE's clock -	0	37 ,4
14th.	Timekeeper slower than London clock -	14	17 ,2
	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^{s},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° 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° 40′ 5″, it follows, that the bearing of the light-house from the said parallel is 4° 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° 18′ 27″, and 5° 11′ 55″,7, give the latitude of the light-house = 49° 57′ 44″, and longitude west of Greenwich 5° 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° 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, hat 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,

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

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° 57′ 27″,5 and 49° 57′ 44″, gave for the latitude of the Observatory - - - -	49° 57′ 35″
Six meridional observations of the Pole Star below the Pole, the extreme results of which were 49° 57′ 35″ and 49° 57′ 20″,4, gave for the latitude - - - -	49 57 23 ,2
Thirteen observations of Arcturus, α Coronæ Borealis, and α Serpentis, the extreme results of which were 49° 57′ 54″,7 and 49° 57′ 2″,7, gave for the latitude - - -	49 57 29
Fifteen observations of α, β, γ Draconis, the extreme results of which were 49° 57′ 22″,2 and 49° 57′ 2″7, gave for the latitude -	49 57 33
The mean of which is -	49 57 30

According to the trigonometrical operations, the latitude is 49° 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	- -	$20^m\ 30^s,6$
Two emersions of Jupiter's first satellite, calculated by ditto	- - - -	21 14 ,5
Transit of Venus, calculated by Doctor MASKELYNE		20 57 ,0
	Mr. WITCHELL -	20 56 ,5
	Mr. WALES -	20 57 ,0
Sun's eclipse, calculated by Mr. WITCHELL	-	20 44 ,5
	Mr. SEJOUR -	20 45 ,1
	Mr. EULER -	20 59 ,0
	Mr. LEXEL -	20 51 ,0
Mean of the whole	-	20 52 ,12

From the trigonometrical operations, we find the longitude in time to be $20^m\ 44^s,3$; there is, therefore, a difference of $7^s,82$ 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^s 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. Martin's from -	St. Buryan	75° 44′ 52″	S W
	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
246804
246821
} feet, for the distance of the Day-mark from the meridian of St. Agnes;

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

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. Mary, from	Pertinney -	65° 32′ 30″	S W
the Flagstaff of the Fort		Pertinney -	66 53 5	S W

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-House from { Sennen - 68° 6′ 54″ S W
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
Windmill, St. Mary's - -	49 54 32,7
Flagstaff, ditto - -	49 54 59,1
St. Agnes Light-House* - -	49 53 36,8

			In Time
and longitude west from St. Agnes.	Day-mark 1° 2′ 43″,1	from the meridian of Greenwich. -	6° 14′ 38″,8	24ᵐ 58ˢ,6
	Windmill 1 5 3,2		6 16 58,7	25 7,5
	Flagstaff 1 6 2,7		6 17 57,4	25 11,5
	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″ (1ᵐ 46ˢ½ 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 oʰ 25ᵐ 18ˢ 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 4ˢ,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° 30′ 13″,5, with the parallel to the meridian of *Dunnose*. The staff, therefore, bears from the parallel 25° 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° 13′ 21″,4; therefore, the latitude of the Observatory is 51° 50′ 28″,3, and its longitude 9′ 39″,9 from Dunnose: but 1° 11′ 36″ is the longitude of that station; therefore, 1° 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° 59′ 27″ S E. Blenheim will, therefore, be found to bear 26° 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° 50′ 28″,1 for the latitude, and 1° 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:

					Degrees.	Time.
Latitude	observed	51° 50′ 24″,9	Longitude west from Greenwich.	observed	1° 21′ 6″,0	5ᵐ 24ˢ,4
	computed	51 50 28 ,1		computed	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 5ᵐ 2ˢ 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:

			Degrees.	Time.
Latitude	observed	51° 45′ 39″,5	Longitude west from Greenwich. 1° 15′ 22″,5	5ᵐ 1ˢ,5
	computed	51 45 38 ,0	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° 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° 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.	Feet.
Wrotham Gravesend *Severndroog Tower*	° ′ ″ 62 54 38 82 39 21	Gravesend	45578 71762
Gravesend Langdon Hill *Severndroog Tower*	95 53 59 53 47 25	Langdon Hill	44886 88470
Gravesend Hadleigh Steeple *Langdon Hill*	34 31 53 43 11 51	Hadleigh Steeple	64076 37171
Gravesend Hadleigh Halstow	30 24 19—21 41 46 32—33 107 49 5— 6 179 59 57	Halstow Steeple	44839 34064
Gravesend Halstow *Gadshill*	31 38 21 24 18 21	Gadshill	22277 28390
Halstow Hadleigh Steeple Sheppey Isle	59 18 6 —5 49 13 33½—32 31 28 24 —23 180 0 3 ,5	Sheppey	49409 64387

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	46204
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 / Hadleigh = 15554 } Feet.

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

Mean distance from Langdon Hill to Friering Steeple 46313 feet.

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

Names of the Stations.	Observed angles.	Distances.		
	° ′ ″			Feet.
Peldon	46 14 2	Stoke	Peldon	63941*
Great Tey	90 56 9		Great Tey	46182
Stoke				

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	Thorp	20481
Little Bentley	53 2 30		Dover Court	42981
Dover Court				
Thorp	41 12 53	Little Bentley	Thorp	20481
Little Bentley	123 30 18		Peldon	51205
Peldon				
Tillingham	96 57 20	West Mersea	Tillingham	28924
Danbury Spire	61 46 57		Danbury Spire	79173
West Mersea				
Rayleigh	54 27 44	West Mersea	Rayleigh	96701
West Mersea	29 13 0		Danbury	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	Little Bromley	44356
Stoke	47 58 26		Stoke	33706
St. Mary's, Colchester				
Dover Court	18 58 19	Tattingstone	Dover Court	38946
Stoke	14 53 50		Stoke	49250
Tattingstone				
Thorp	37 52 49	Tattingstone	Thorp	50690
Stoke	39 12 4		Stoke	49245
Tattingstone				
Dover Court	50 26 54	Falkenham	Dover Court	31651
Rushmere	38 25 20		Rushmere	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.	
	° ′ ″		Feet.
Dover Court Rushmere *Tattingstone*	43 40 51 49 46 9	Tattingstone	38946 35232
Dover Court Rushmere Woodbridge Steeple	25 55 13 96 25 30 57 39 17 180 0 0	Woodbridge	59894 26346*
Falkenham Rushmere *Woodbridge*	41 25 50 58 0 10	Woodbridge	33761 26342*
Falkenham Woodbridge *Butley Steeple*	48 42 0 83 10 0	Butley	45013 34058
Falkenham Butley *Orford Light House*	21 58 1 116 14 59	Orford Light House	60589 25207
Rushmere Woodbridge Otley Steeple	62 45 1–0 63 30 1–0 53 45 0 180 0 2	Otley	29238 29044
Rushmere Otley Henley Steeple	40 25 30 46 25 0 93 9 30 180 0 0	Henley	21211 18988
Dover Court Rushmere *Obelisk, Woolverstone Park*	12 43 40 13 22 10	Obelisk	26766 25503
Rushmere Copdock Steeple *Obelisk*	61 35 58 53 5 10	Copdock	28984 28057
Rushmere Copdock Henley	85 25 0 37 46 0 56 49 0 180 0 0	Henley	21209 34520

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

Names of stations.	Observed angles.	Distances.	Feet.
Danbury Pleshley *Hatfield Broad Oak Steeple*	° ′ ″ 12 4 30 152 53 10	Hatfield Broad Oak	85096 39058
Danbury High Easter *Thaxted Spire*	25 45 6 29 43 54	Thaxted	101330 53429
Hatfield Broad Oak Pleshley *Beauchamp Roding Spire*	54 20 51 39 25 0	Beauchamp Roding	24853 31806

The angle observed from the station on Danbury Steeple, between Hatfield Broad Oak and Thaxted, was 30° 33′ 40″; this, with the including sides, 85094 and 101330 feet, gives the following triangle:

Danbury - 30° 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 Peldon *Stoke*	27 24 19 118 2 28	Stoke	122630 63951

Again, the angle observed at Danbury, between Thaxted and Stoke was 66° 43′ 8″; this, with the sides which form it, Danbury and Thaxted, Danbury and Stoke, gives the following triangle:

Danbury - 66° 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° 10′ 30″, which, with the distances of these latter stations from Lavenham, 48039 and 124430 feet, gives

Lavenham - 89° 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° 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° 44′ 30″
Southweald - 67 42 5
Hatfield Broad Oak 57 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° 58′ 10″
Southweald - 94 49 5
Langdon Hill - 56 12 45, is had from the included angle at Severndroog Tower, 28° 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.	Feet.
Severndroog Tower -	° ′ ″ 24 24 35	Brentwood -	78553*
Langdon Hill - -	62 26 39		36616
Brentwood Steeple			
Severndroog Tower -	4 33 29	Brentwood -	78553*
Southweald - -	125 53 12		7706
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 53 4	Highbeech -	71534
St. Paul's - - -	51 24 12		61919
Highbeech			
Severndroog Tower -	44 34 28	Southweald -	73795*
Highbeech - - -	69 53 13		55156
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.	Feet.
Severndroog Tower Highbeech *Brentwood Spire*	° ′ ″ 49 8 1 71 16 44	Brentwood	78558* 62727
Severndroog Tower Highbeech *Hampstead Heath*	51 24 12 58 29 19	Hampstead Heath	64855 59455
Highbeech Hampstead *St. Paul's*	24 36 5 83 1 11	St. Paul's	61919 25966

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 Berkhamstead Gazebo *St. Paul's*	105 21 44 41 55 23	Gazebo	49631 88872
Southweald Highbeech, old station *Stand of Epping Windmill*	16 46 15 52 16 51	Epping Windmill	46717 17042*
Severndroog Tower Highbeech *Stand of Epping Windmill*	10 8 44 122 10 45	Epping Windmill	81891 17043*

Names of Stations.	Observed angles.	Distances.		
	° ′ ″			Feet.
Highbeech, old station -	99 19 16	Epping Windmill -		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° 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		60219
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° 47′ 38″. The distances from the former stations to the latter are 37882 and 45275 feet, which give the following triangle:

Henham - 72° 47′ 38″
Albury - 60 28 27
Elmdon - - 46 43 35, from whence we get the distance between Albury and Elmdon = 49701 feet.

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

The angle at Henham on the Mount, between Hatfield Broad Oak and Thaxted Steeples, is 109° 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° 10′ 44″
Thaxted - - 45 56 29
Hatfield Broad Oak - 24 52 47, which gives 51608 feet for the distance of Thaxted from Hatfield Broad Oak.

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

Names of Stations.	Observed angles.	Distances.	Feet.
Gravesend - - -	° ′ ″ 24 32 30	Purfleet Cliff -	35517
Hornchurch - - -	31 26 22		28282
Purfleet Cliff Station			
Severndroog Tower - -	39 44 2	Barking - -	25383
Hornchurch - - -	27 16 44		35404
Staircase of Barking Steeple			
Severndroog Tower - -	39 41 6	Westham - -	28046
St, Paul's - - - -	44 15 27		25662
Westham Steeple			

ART. XXXIX. *Secondary Triangles.*

St. Paul's from Severndroog Tower 39962 feet.

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

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

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

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

Names of stations.	Observed angles.	Distances.	
	° ′ ″		Feet.
Prittlewell Steeple -	33 10 0	Signal Staff - -	21208
Bank Flagstaff - -	39 20 30		18302
Signal Staff, Shoebury-ness			
Triptree, new Station -	38 5 18	Maldon - -	19425
Danbury - - -	30 11 27		23829
Maldon Spire			
Triptree, new Station -	36 48 30	Purleigh - -	36118
Danbury - - -	72 9 0		22734
Purleigh Steeple			
Danbury - - -	17 47 32	Steple - -	49647
Purleigh Steeple -	148 16 30		28850
Steple Steeple			
Danbury - - -	26 17 40	Hockley - -	41401
Canewden - -	51 8 0		23555
Hockley Steeple			
Danbury - - -	27 21 50	Hockley - -	41400
Rettenden - - -	109 22 0		20170
Hockley Steeple			
Danbury - - -	53 39 40	Rettenden - -	30079
Canewden - -	35 25 0		41810
Rettenden Steeple			
Rettenden - -	34 41 0	Stow, St. Mary's -	23571
Canewden - -	30 53 0		26131
Stow, St. Mary's Steeple			
Rayleigh - - -	71 51 18	Rettenden - -	20760
Langdon Station - -	27 38 45		42526
Rettenden Steeple			
Rayleigh - - -	51 8 10	Runwell - -	21207
Langdon - -	28 10 20		34975
Runwell Steeple			
Danbury - - -	48 57 22	Burghstead - -	53254
Rayleigh - -	72 39 17		42079
Great Burghstead Steeple			
Danbury - - -	59 11 7	Hanningfield -	17666
Gallywood Station -	41 40 10		22822
East Hanningfield Steeple			

Names of stations.	Observed angles.	Distances.	
	° ′ ″		Feet.
Friering Steeple - -	36 7 48	Stock - -	16826
Danbury - - -	15 38 36		36793
Stock Steeple			
Triptree, old Station -	18 38 11	Southminster -	55075
Tillingham Steeple -	83 33 14		17711
Southminster Steeple			
Peldon Steeple - -	97 35 31	Layer Marney -	20180
Tillingham - -	23 54 4		49369
Layer Marney Steeple			
Peldon - - -	80 20 6	Signal Staff -	60701
Tillingham -	61 39 24		67990
Signal Staff, St. Osyth Point			
Thorp Steeple - -	143 7 36	Signal Staff -	21517
Little Bentley - -	18 54 29		39844
Great Clackton Signal Staff			
Thorp - - -	71 35 55	Great Clackton -	18920
Peldon - - -	16 58 13		61508
Great Clackton Steeple			
Dover Court Steeple -	24 36 48	Finton - -	38998
Thorp - - -	92 26 41		16257
Finton Steeple			
Dover Court - -	39 16 34	Signal Staff - -	34686
Thorp - - -	70 11 16		23340
Finton Signal Staff			
Dover Court - -	53 15 26	Walton - -	26275
Thorp - - -	47 52 22		28389
Walton Tower or Sea-mark			
Dover Court - -	133 57 30	Cupola - - -	15085
Thorp - - -	13 29 57		46517
Cupola, Landguard Fort			
Thorp - - -	46 16 17	Ardleigh - -	47494
Peldon - - -	47 1 34		46901
Ardleigh Steeple			
Peldon - - -	106 10 16	Frating - -	35433
Great Tey Steeple -	32 32 11		03274
Frating Steeple			

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

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

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

Names of Stations.	Observed angles.	Distances.	
	° ′ ″		Feet.
Stoke	71 21 0	Great Horksley	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			

Names of Stations.	Observed angles.	Distances.	Feet.
	° ′ ″		
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			
Southweald Steeple -	27 51 51	Doddinghurst -	17880
Frierning Steeple - -	30 14 50		16590
Doddinghurst Steeple			

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

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

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.	Feet.
Frant Steeple - -	° ′ ″		
Botley Hill - -	22 17 10	Sevenoaks - -	58492
Sevenoaks old Windmill	32 52 47		44032
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		18588
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.	Feet.
Severndroog Tower Well Hill *Crayford Steeple*	° ′ ″ 55 4 14 35 0 32	Crayford	26479 37840
Well Hill Crayford *Ash Steeple*	77 37 40 48 8 40	Ash	34738 45555
Ash Crayford *Northfleet Steeple*	53 7 10 44 32 4	Northfleet	32237 36767
Ash Northfleet *Gravesend Station*	15 30 4 85 1 8	Gravesend	32664 8762
Ash Northfleet *Lord Eardley's, Belvidere*	47 33 30 97 53 40	Belvidere	56308 41951
Gravesend from Halstow 44836 feet.			
Gravesend Halstow *Gadshill Station*	31 38 20 24 18 20	Gadshill	22275 28388
Halstow Sheppey *Gadshill*	128 34 28 18 18 3	Sheppey from Gadshill	70686
Sheppey Hernhill Steeple *Stockbury Steeple*	88 18 0 37 2 0	Stockbury	43144 71603
Frinstead Steeple Sheppey *Hernhill Steeple*	65 27 18 64 9 24	Hernhill	57820 58439

ART. XLI. *Secondary Triangles.*

Frant Steeple Botley Hill Station *Bidborough Steeple*	26 37 20 9 52 49	Bidborough	26666 68071
Frant Chiddingstone Steeple *Station near Bidborough Church*	20 52 0 29 5 0	Station	27227 19951

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

Norwood from Severndroog Tower 32155 feet. Between the triangles

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

Well Hill from Otford Mount 19206 feet.

Otford Mount Well Hill *Knockholt Beeches, East End*	52 11 0 73 58 0	Knockholt Beeches	22860 18790
Well Hill Crayford Steeple *Dome of a Race House*	22 22 46 41 17 10	Race House	27859 16075
Well Hill Norwood *Windmill, Bromley Common*	70 25 40 39 36 24	Windmill	57560 38945
Well Hill Severndroog Tower *Farnborough Station*	59 1 0 13 58 0	Farnborough	11650 41381
Well Hill Farnborough *St. Mary's Cray Steeple*	58 52 0 79 32 0	St. Mary's Cray	17255 15019
Well Hill Norwood *Halstead Steeple*	79 42 26 8 40 4	Halstead	8653 56492
Norwood Severndroog Tower *Bromley Steeple*	36 36 40 32 52 50	Bromley	22696 24932
Well Hill Severndroog Tower *Bromley Steeple*	32 29 0 51 13 0	Bromley	36198 22938

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

Names of Stations.	Observed angles.	Distances.	
	° ′ ″		Feet.
Northfleet Gravesend Station *Southfleet Steeple*	90 15 30 49 26 6	Southfleet	10290 13545
Gadshill Sheppey Isle *Shottenden Windmill*	28 8 54 121 36 55	Shottenden Mill	119539 66221
Gravesend Station Gadshill *Cliff Steeple*	40 46 7 92 28 1	Cliff	30549 19967
Gravesend Station Gadshill *Higham Steeple*	35 48 14 76 47 15	Higham	14115 23489
Gravesend Station Halstow Station *Gravesend Steeple*	86 16 16 4 18 19	Gravesend	3373 44747
Gravesend Halstow *Chalk Steeple*	25 8 43 8 11 44	Chalk	11621 34673
Gravesend Gadshill *Lower Hope Point, Chimney of the Guard Room*	59 21 48 72 5 57	Lower Hope Point	28287 25577
Gravesend Gadshill *Flagstaff, Tilbury Fort*	99 28 57 15 26 18	Tilbury Fort	6539 24228
Gadshill Sheppey *Rainham Steeple*	28 52 26 26 24 22	Rainham	38245 41527
Gadshill Halstow *Swanscombe Spire*	128 37 56 29 12 53	Swanscombe	36747 58814
Gadshill Halstow *Northfleet Steeple*	124 43 26 28 58 21	Northfleet	31034 52658
Halstow Gravesend *Southfleet Steeple*	4 37 23 159 53 20	Southfleet	57736 13534

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

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

Names of Stations.	Observed Angles.	Distances.	
	° ′ ″		Feet.
Hernhill - - -	85 12 0	Sea Salter - -	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 Trevose 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
	Trevose Head - - - -	*depr.*	22 33
	Cadon Barrow - - - -	*elev.*	16 0
	Brown Willy - - - -	*elev.*	54 24

Cadon Barrow.

The ground at	Trevose Head - - -	*depr.*	36 49
	Brown Willy - - - -	*elev.*	36 3
The horizon of the sea in the direction of Trevose 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	29	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 57
	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 13½ 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 Brickhill.

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. Feet.
Trevose 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	$\frac{1}{5}$
Bradley Knoll and Westbury Down	$\frac{1}{6}$
Maker Heights and Black Down	$\frac{1}{6}$
Highclere and Inkpin	$\frac{1}{8}$
St. Agnes Beacon and Trevose Head	$\frac{1}{9}$
Moor Lynch and Lugshorn Corner	$\frac{1}{11}$
Hensbarrow and Trevose Head	$\frac{1}{12}$

Wingreen and Bradley Knoll - - - $\frac{1}{15}$
Bodmin Down and Trevose Head - - $\frac{1}{13}$
Carraton Hill and Black Down - - - $\frac{1}{13}$
Westbury Down and Mendip - - - $\frac{1}{13}$
Carraton Hill and St. Stephen's Down - - $\frac{1}{13}$
Farley Down and Mendip - - - $\frac{1}{16}$
Beacon Hill and Westbury Down - - - $\frac{1}{16}$
Dundry and Farley Down - - - $\frac{1}{16}$
Dundon Beacon and Mendip - - - $\frac{1}{17}$
Bradley Knoll and Mendip - - - $\frac{1}{18}$
Lansdown and Mendip - - - - $\frac{1}{19}$
Moor Lynch and Dundon Beacon - - - $\frac{1}{20}$
Dundry and Mendip - - - - $\frac{1}{20}$
Westbury Down and Farley Down - - $\frac{1}{21}$
St. Stephen's Down and Black Down - - $\frac{1}{24}$
Moor Lynch and Dundon Beacon - - - $\frac{1}{27}$
Dundon and Lugshorn Corner - - - $\frac{1}{3}$
Moor Lynch and Greylock's Foss-way - - $\frac{1}{6}$
Lugshorn Corner and Greylock's Foss-way - - 0
Cadon Barrow and horizon of the sea in the direction of Trevose Head - - - - - $\frac{1}{13}$
Ditto in a northern direction - - - $\frac{1}{12}$
Brill and Nuffield - - - - - $\frac{1}{6}$
Broadway and Stow - - - - $\frac{1}{16}$
Epwell and Broadway - - - - $\frac{1}{14}$
Highclere and White Horse Hill - - $\frac{1}{13}$
Nuffield and White Horse Hill - - $\frac{1}{12}$
Nuffield and Bagshot - - - - $\frac{1}{17}$
Epwell and Stow - - - - $\frac{1}{17}$
Brill and Stow on the Wold - - - $\frac{1}{19}$
Wendover and Bow Brickhill - - - $\frac{1}{19}$
Kinsworth and Bow Brickhill - - - $\frac{1}{18}$
Shotover and White Horse Hill - - $\frac{1}{18}$
Epwell and Brill - - - - $\frac{1}{22}$
Bow Brickhill and Brill - - - - $\frac{1}{38}$

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

The height of the station on Trevose 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, $274\frac{3}{10}$ 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 Trevose 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 Trevose 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 Trevose 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 em ployed 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. Elevated.	Barometer.	Thermometer.	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	29,723	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. Depressed.	Barometer.	Thermometer.	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. Depressed.	Barometer.	Thermometer.	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. Depressed.	Barometer.	Thermometer.	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.
12	8 36	29,210	65 ,0	[round. 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. Depressed.	Barometer.	Thermometer.	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. Depressed.	Barometer.	Thermometer.	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. Elevated.	Barometer.	Thermometer.	Remarks.
	′ ″	In. pts.	Degrees.	
12	6 6	29,100	60,5	Wind SW. Cloudy. Much rain preceding night.
1P.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. Depressed.	Thermometer.	Remarks.
	′ ″	Degrees.	
2	19 0	57,5	Light airs from SW. Inclinable 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.

Refractions found from the preceding Angles of Elevation and Depression.

1. Arc. White Horse Hill & WhitehamHill.				2. Arc. Brill and Arbury Hill.				3. Arc. Arbury Hill and Wendover.				4. Arc. Broadway Beacon and Epwell.			
Hours.	Refraction. pts. cont. arc.	Barom.	Therm.	Hours.	Refraction. pts. cont arc.	Barom.	Therm.	Hours.	Refraction. pts. cont. arc.	Barom.	Therm.	Hours.	Refraction. pts. cont. arc.	Barom.	Therm.
		in. pts.	°			in. pts.	°			in. pts.	°			in. pts.	°
3 P. M.	1/10,8	29,5	58,0	9 A. M.	1/10,9	29,1	63,2	5	1/10,8	28,8	54,6	2	1/35,1	29,2	54,1
4	1/9,4	29,5	61,0	10	1/10,7	29,2	68,7	6	1/11,6	28,8	61,5	3	1/31,0	57,5	58,2
5	1/10,4	29,5	58,1	11	1/10,7	29,2	68,1					4	1/8,6	29,1	57,5
6	1/10,4	29,5	57,0	12	1/10,4	29,2	67,6								
7	1/10,0	29,5	57,0	3 P. M.	1/10,4	29,2	72,5								
8	1/9,5	29,6	55,6	4	1/7,4	29,2	72,0								
9	1/12,6	29,6	54,5	9	1/9,8	29,2	62,3								
10	1/14,0	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 of ray above the sea.	Refraction. 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.

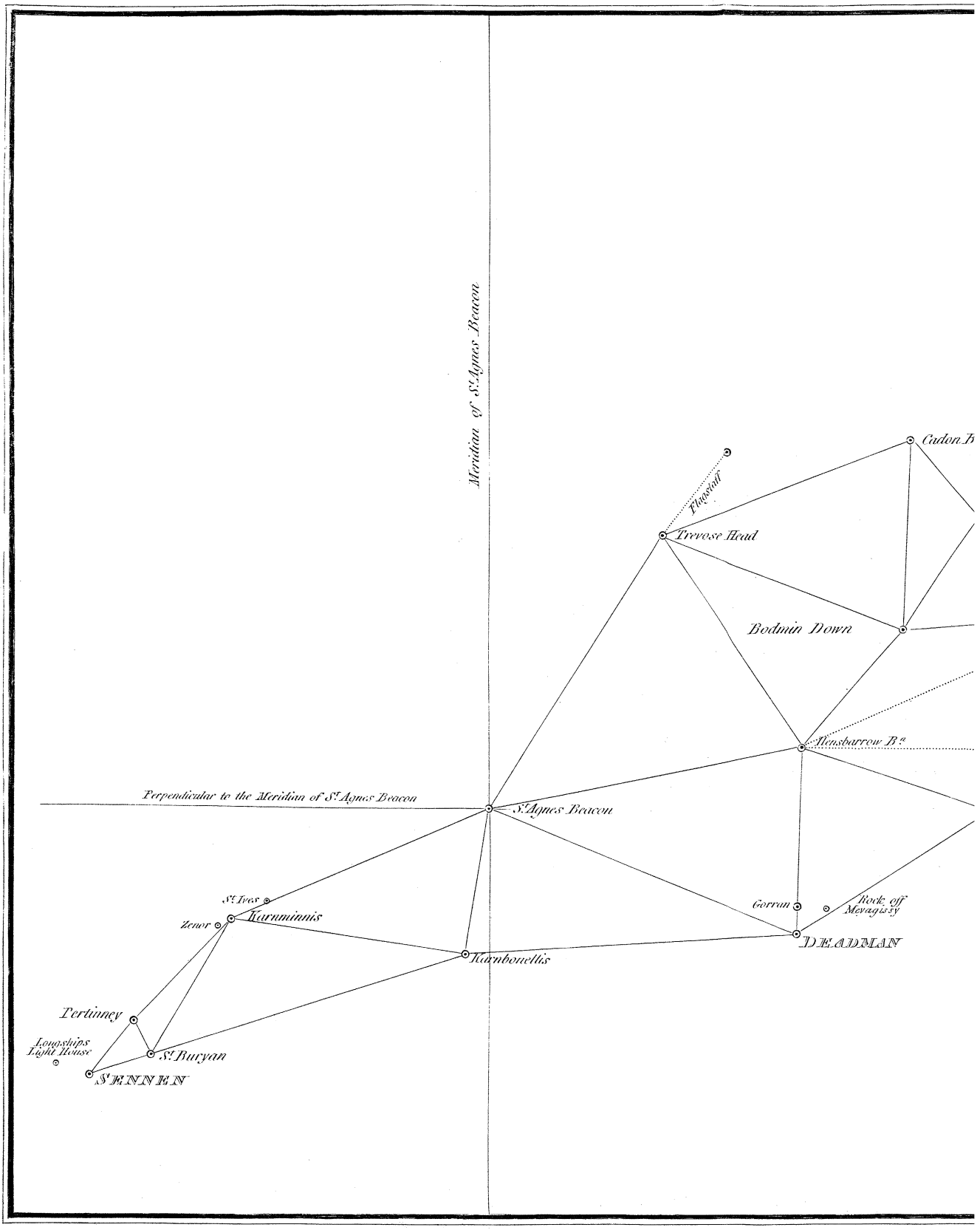
Arcs.	Obs. Ang.	Barom.	Diff.
1	317	282	35
2	60	15	45

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.

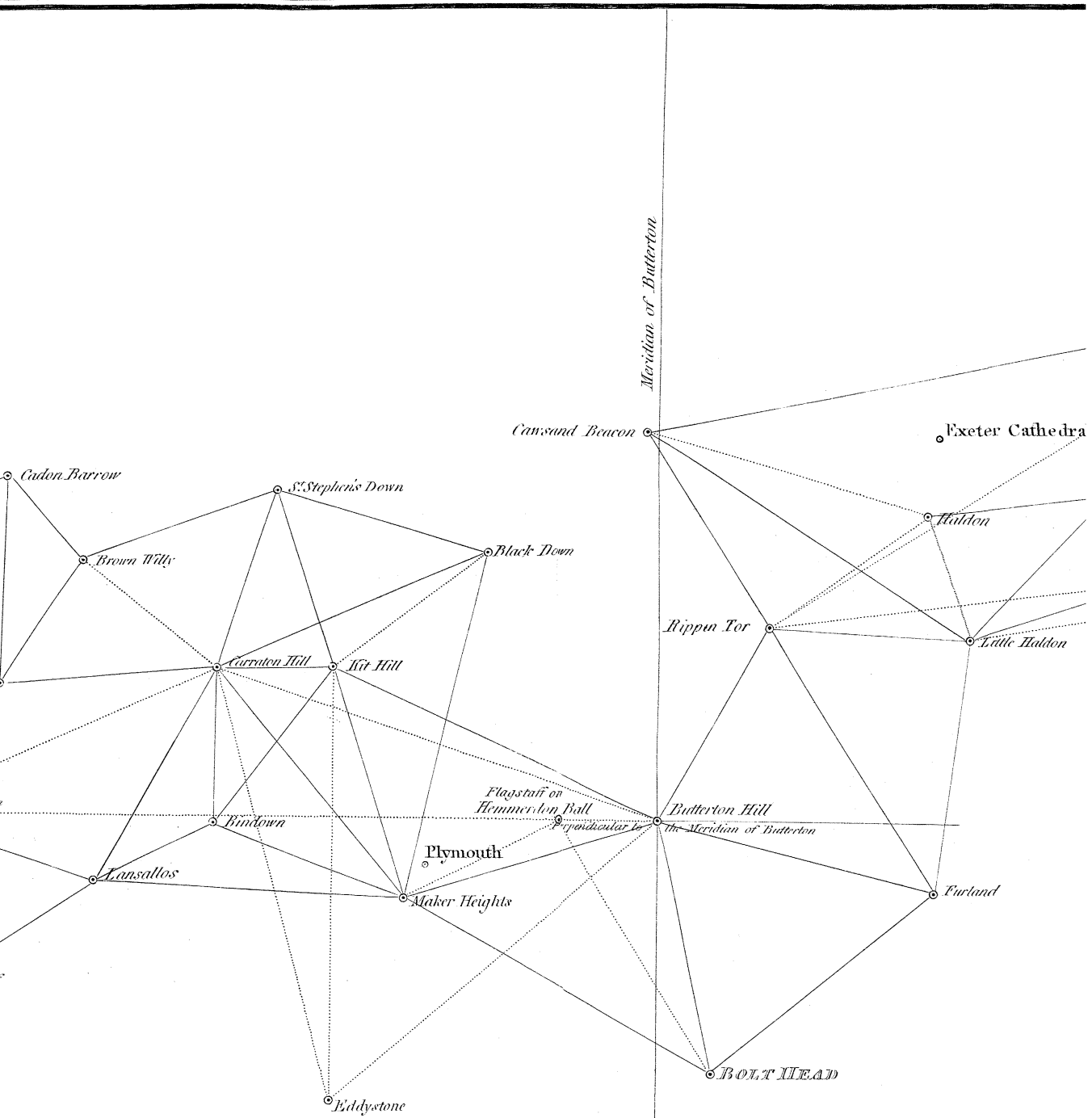
In the Introduction, page 540, it is stated that this Account would be comprized in three Sections, but it was afterwards thought more convenient to divide it into four.

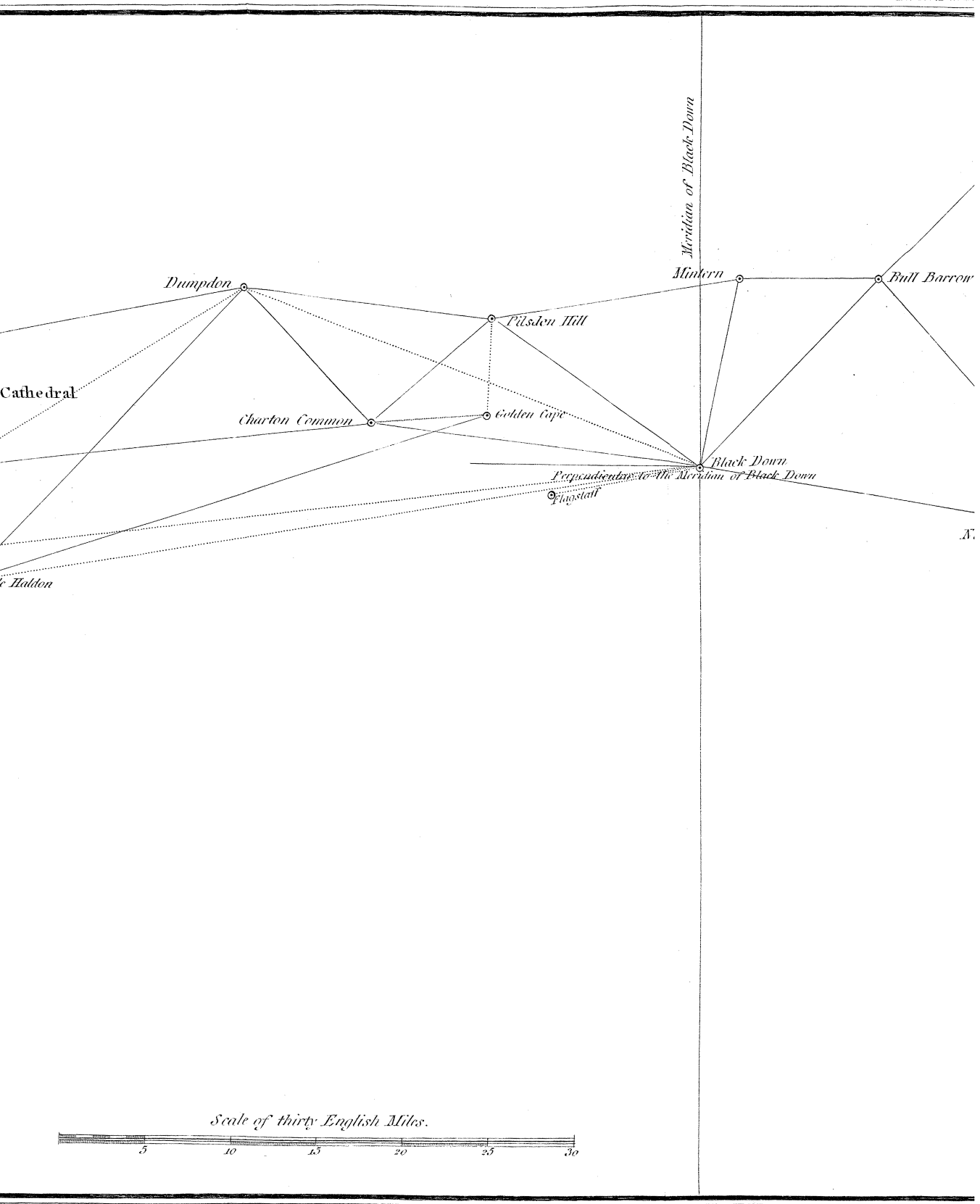
In Page 583, line penult. *dele* and Prittlewell.
—— 665, —— 14, *for* 1792, *read* 1772.

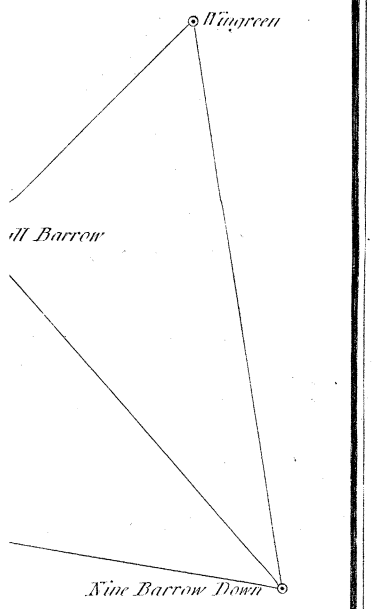
PLAN of the PRINCIPAL TRIANGLES in the TRIGO



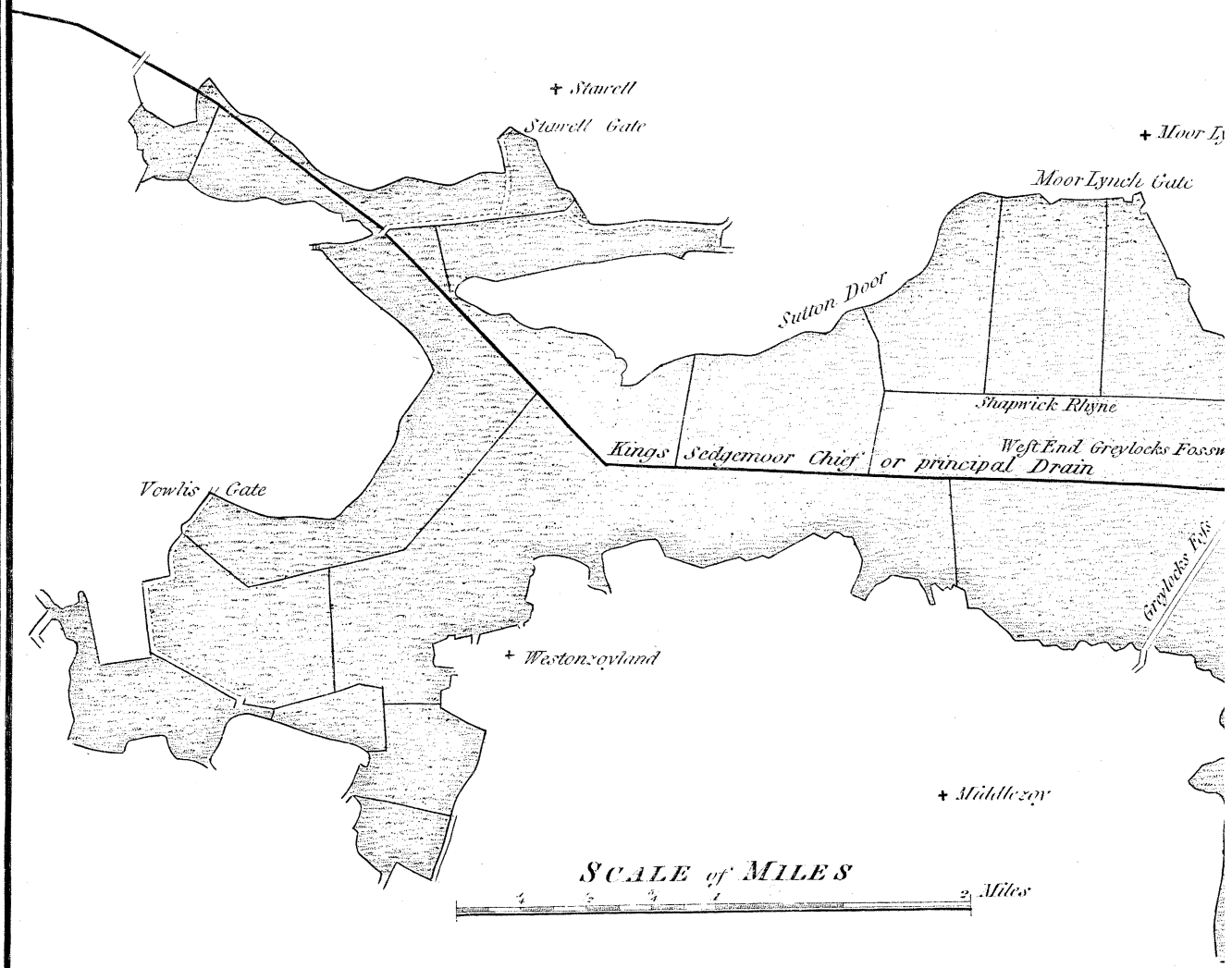
RIGONOMETRICAL SURVEY, 1795, 1796, 1799 shewing the DIRECTIONS of the MERIDIA




Meridian of Black Down
Minterne
Bull Barrow
Dumpdon
Pilsden Hill
Cathedral
Charton Common
Golden Cape
Black Down
Perpendicular to the Meridian of Black Down
Flagstaff
Haldon
Scale of thirty English Miles.
5
10
15
20
25
30

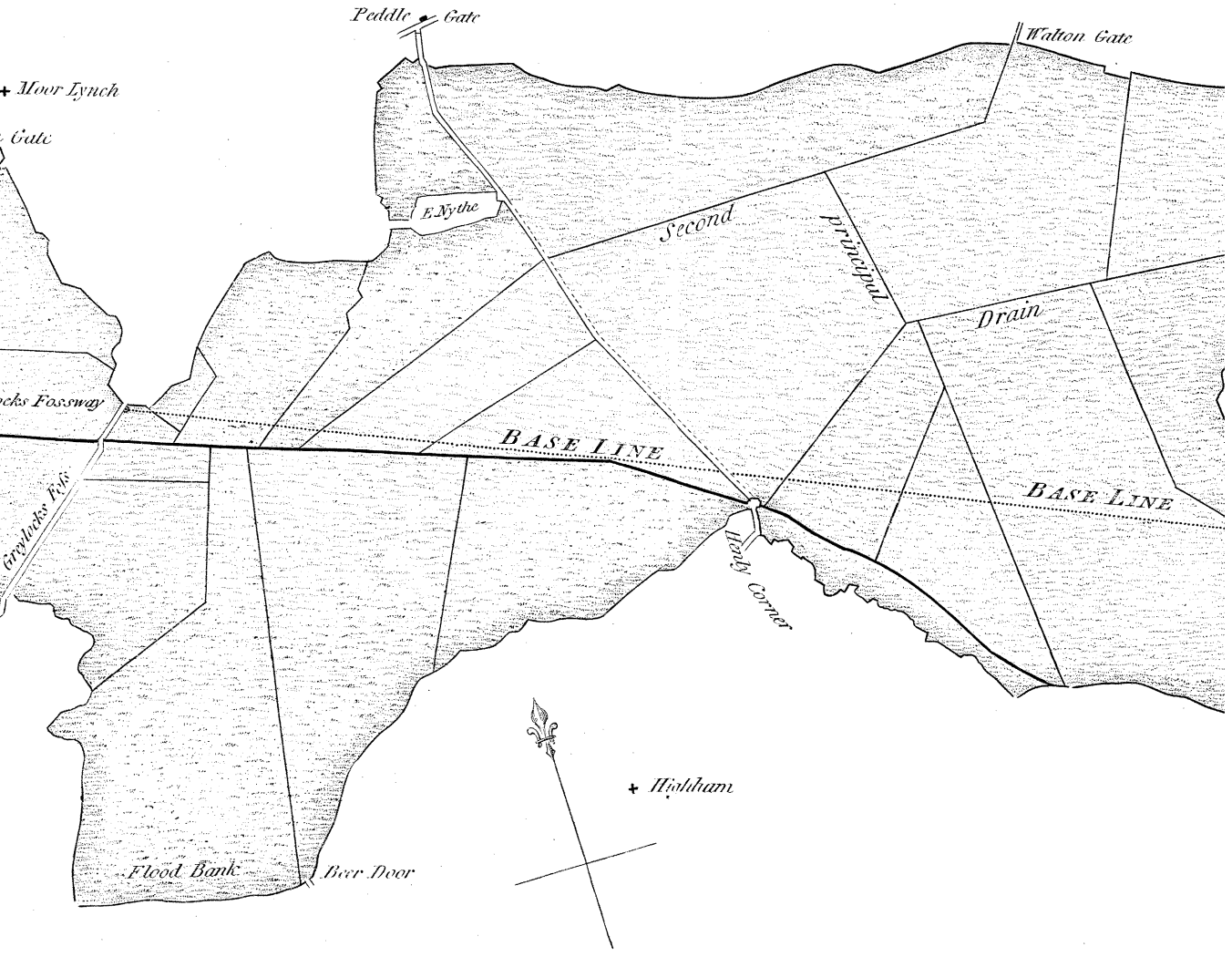

Waggreen
ill Barrow
Nine Barrow Down

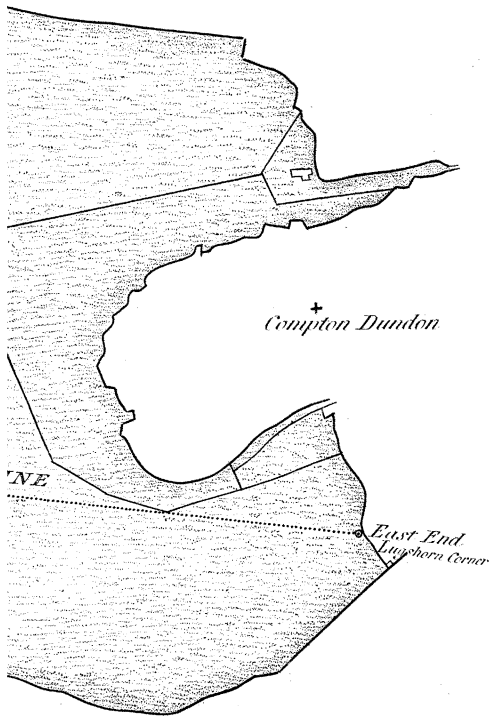
# of KING'S SEDGEMOO



A Plan

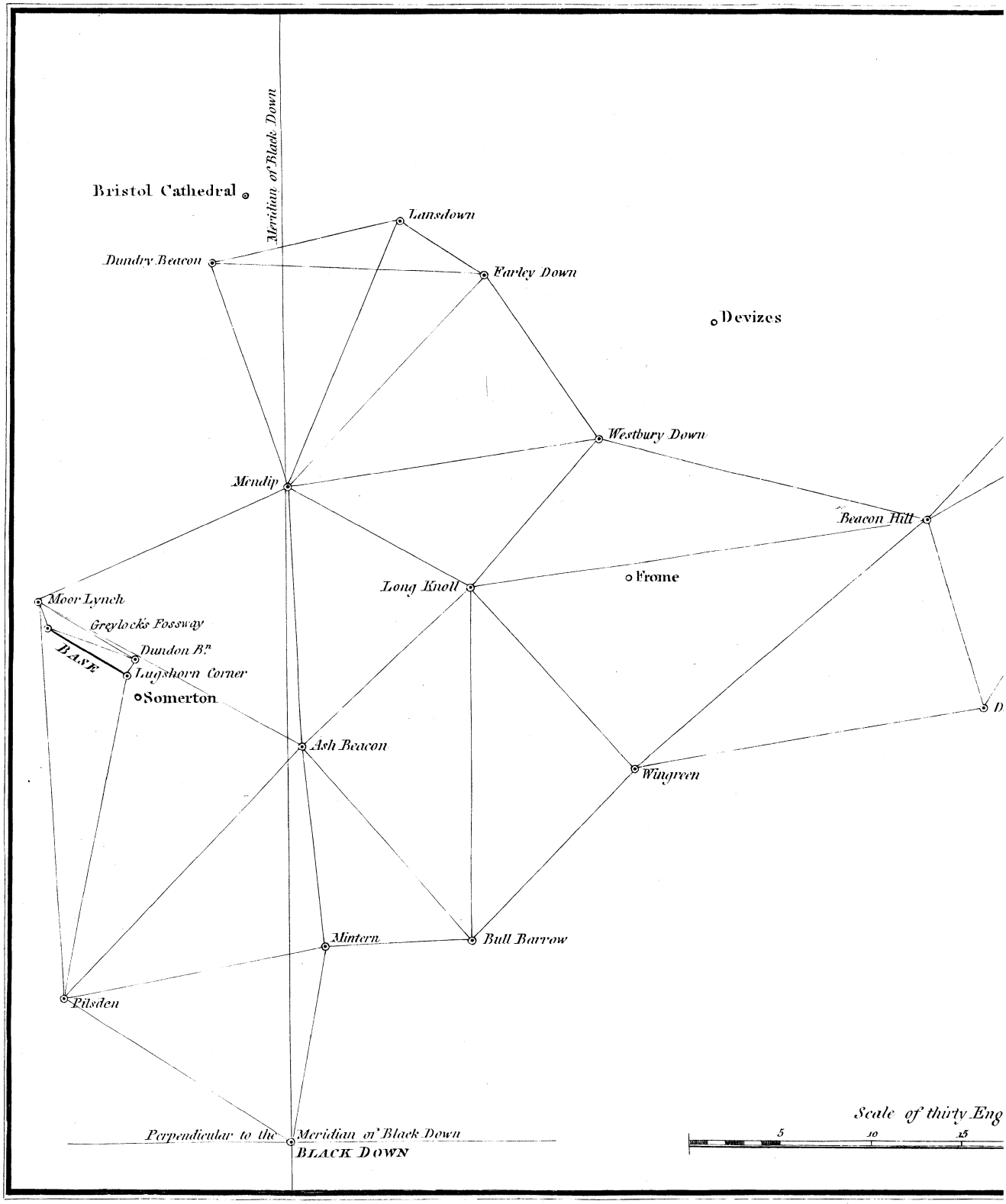
OOR *with the* BASE LINE *measured thereon.*




Compton Dundon
NE
East End
Langhorn Corner

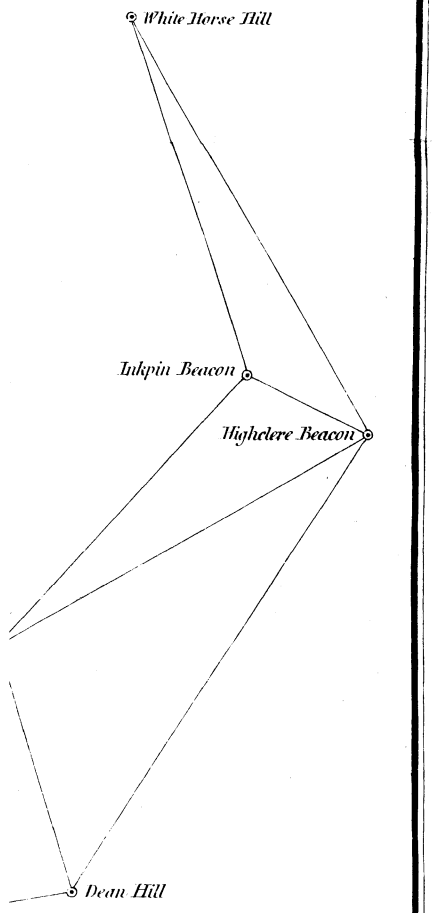
PLAN of the Principal Triangles in the TRIGONOMETRICAL SUR

Pla



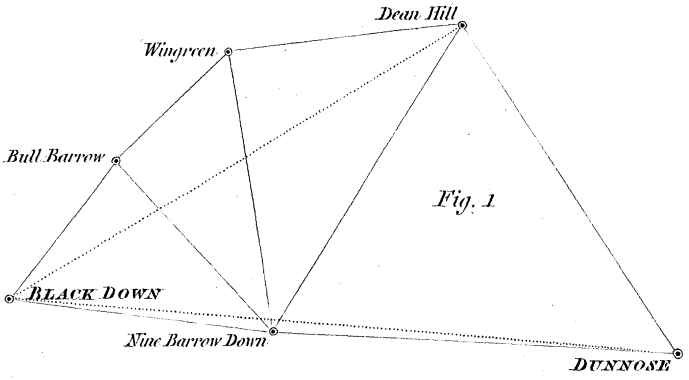
SURVEY, 1798.

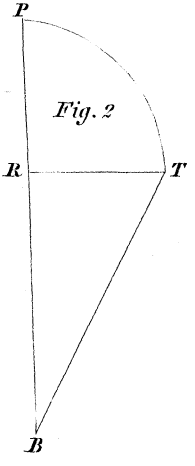
Philos. Trans. MDCCC. *Plate* XXIX. *p.* 738.

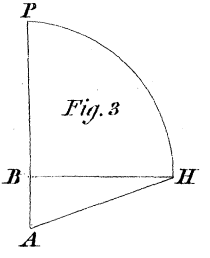


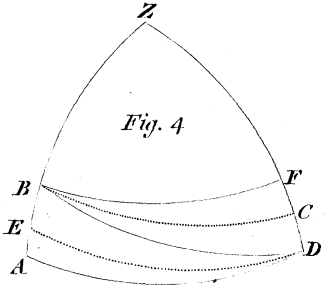
hirty English Miles

15 20 25 30

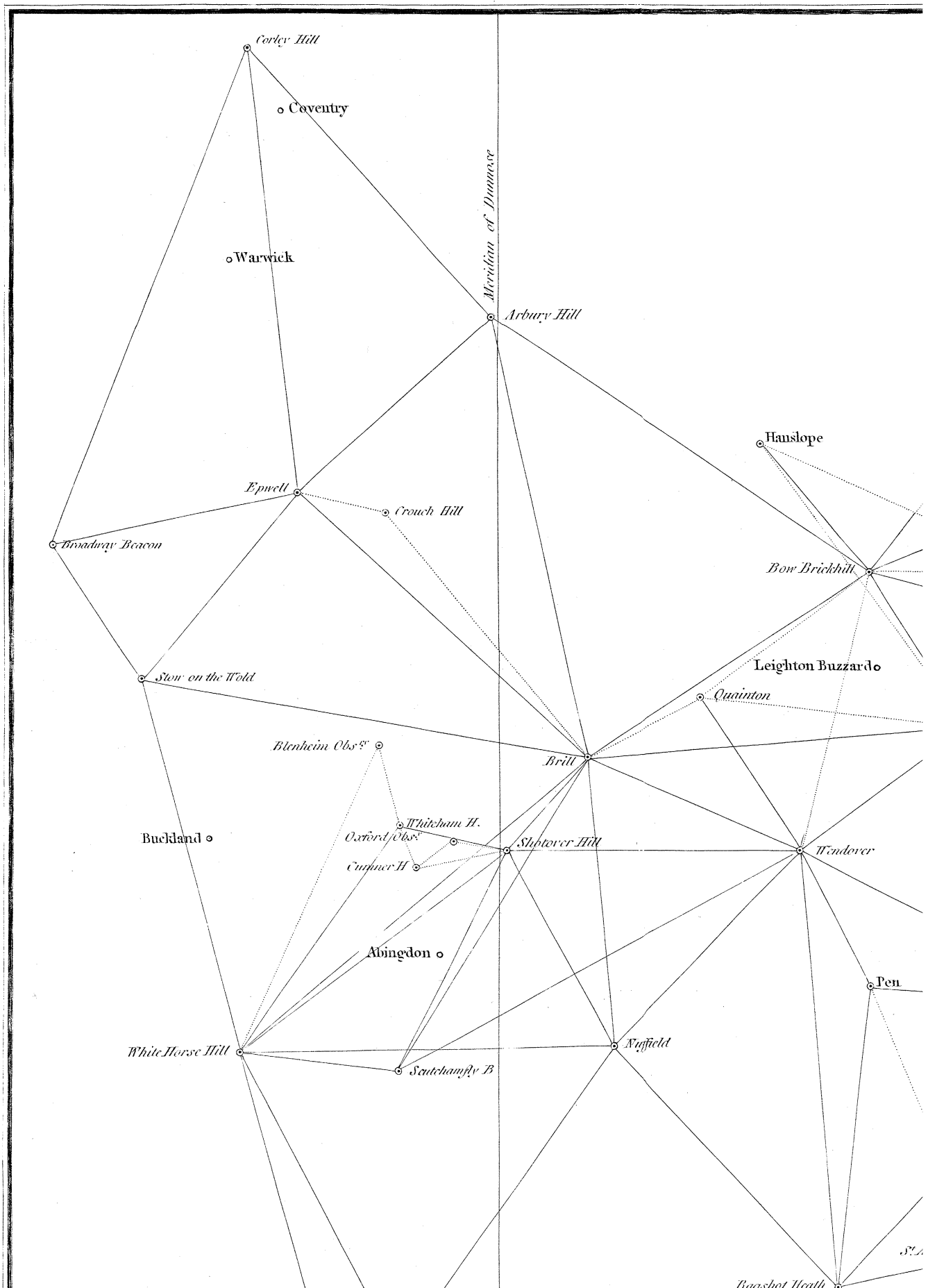

Dean Hill
Wingreen
Bull Barrow
Fig. 1
BLACK DOWN
Nine Barrow Down
DUNNOSE

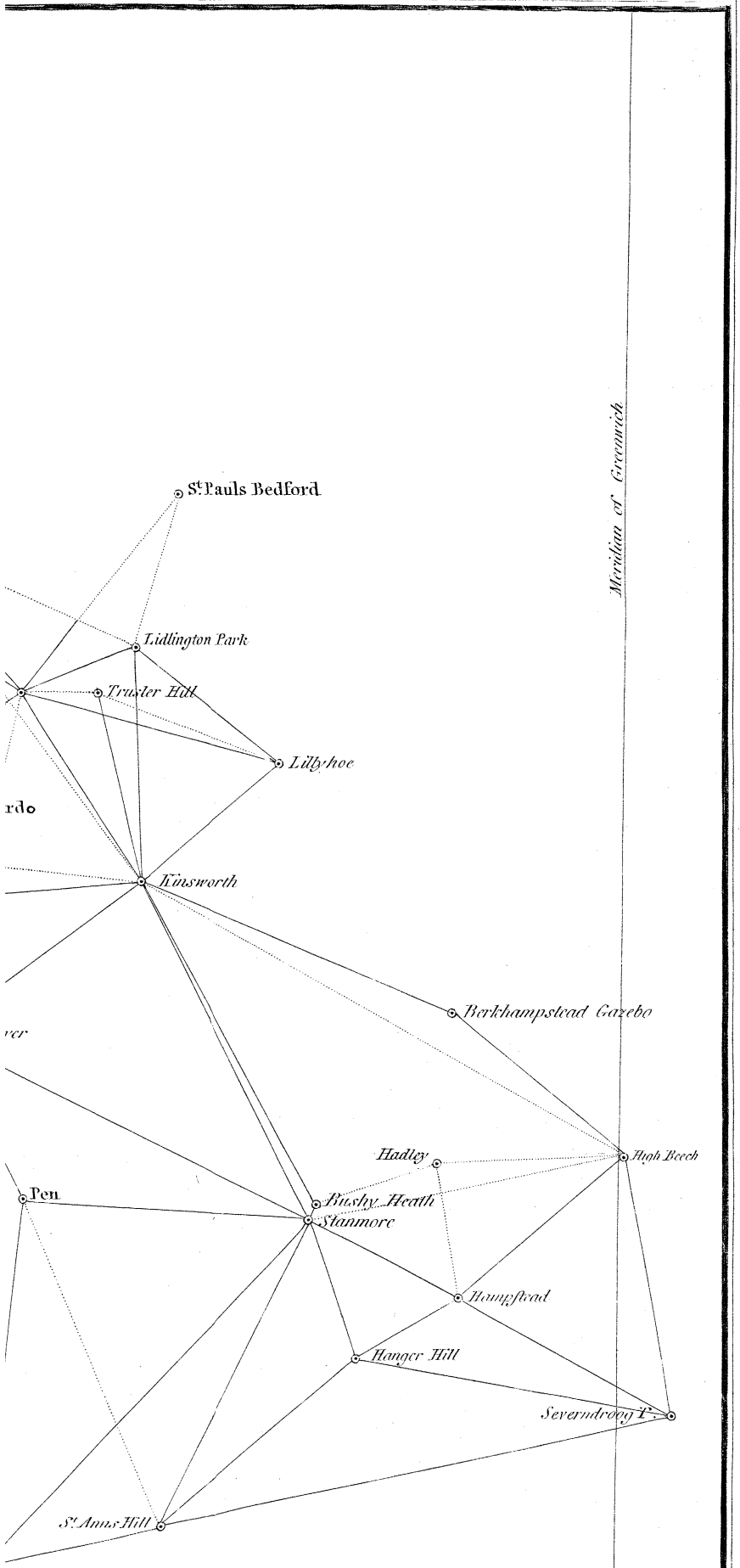

P
Fig. 2
R
T
B

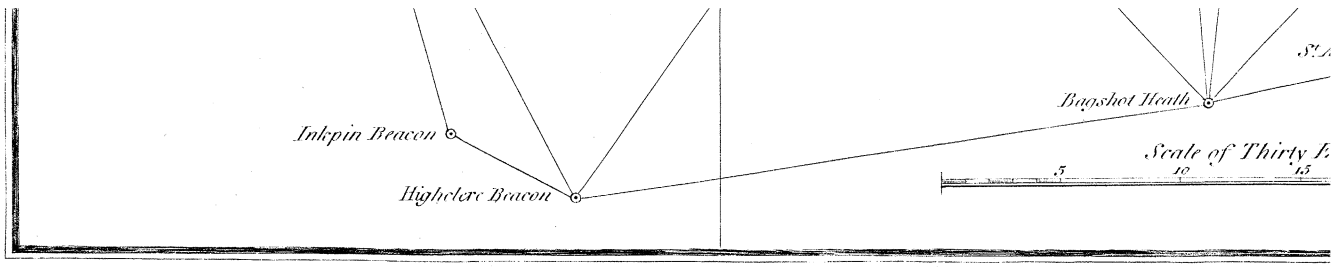

P
Fig. 3
B
H
A

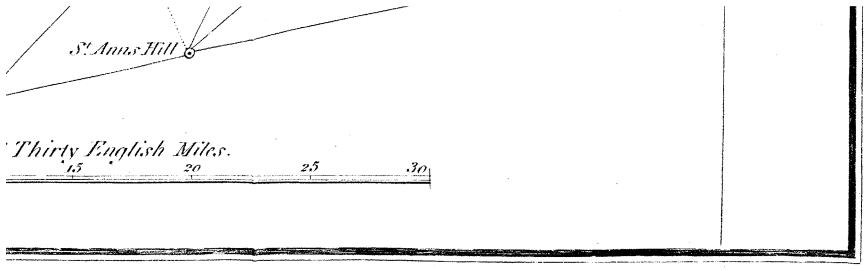

Z
Fig. 4
B
F
C
E
D
A

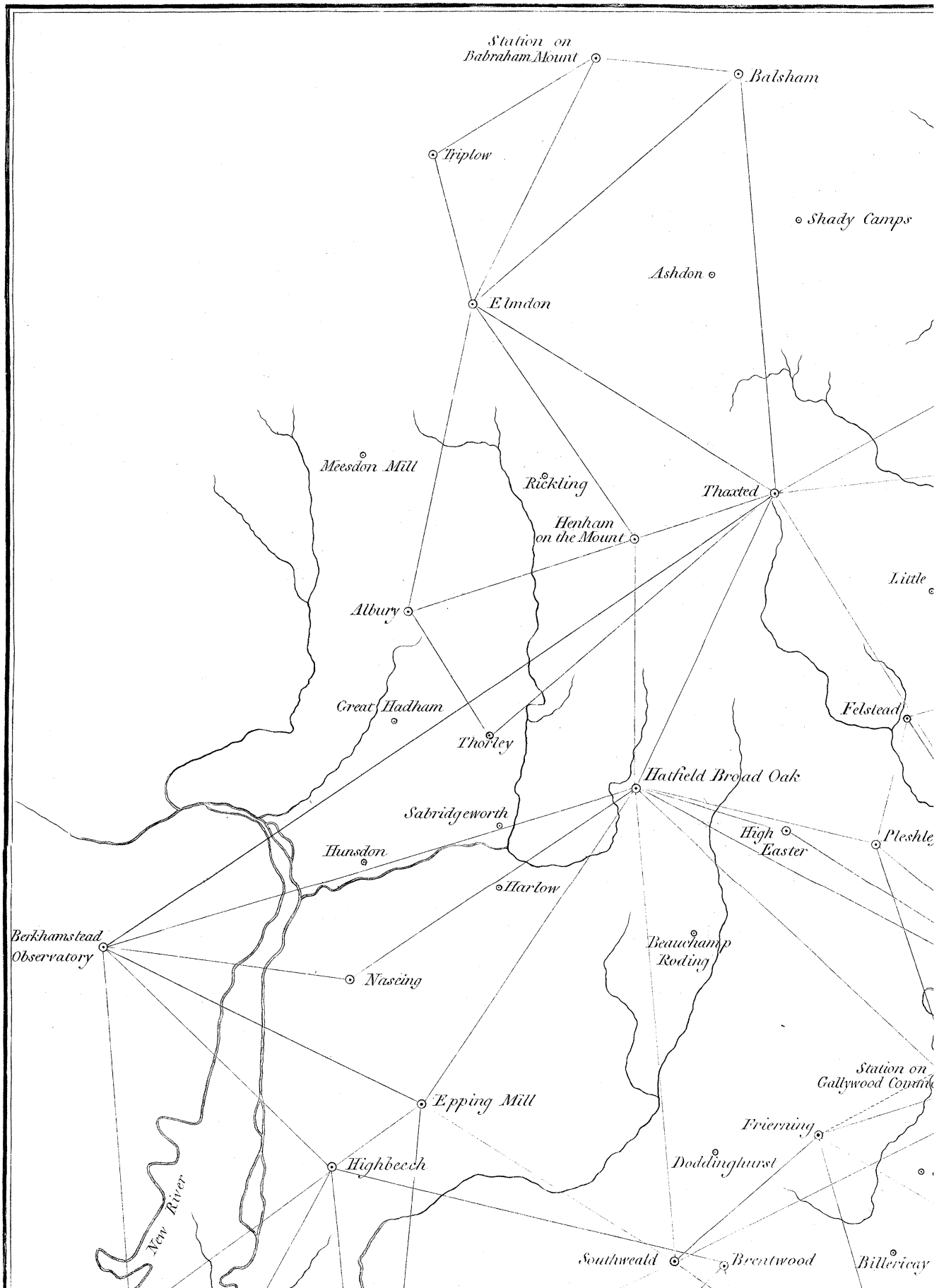
PLAN of the PRINCIPAL TRIANGLES in the TRIGONOME

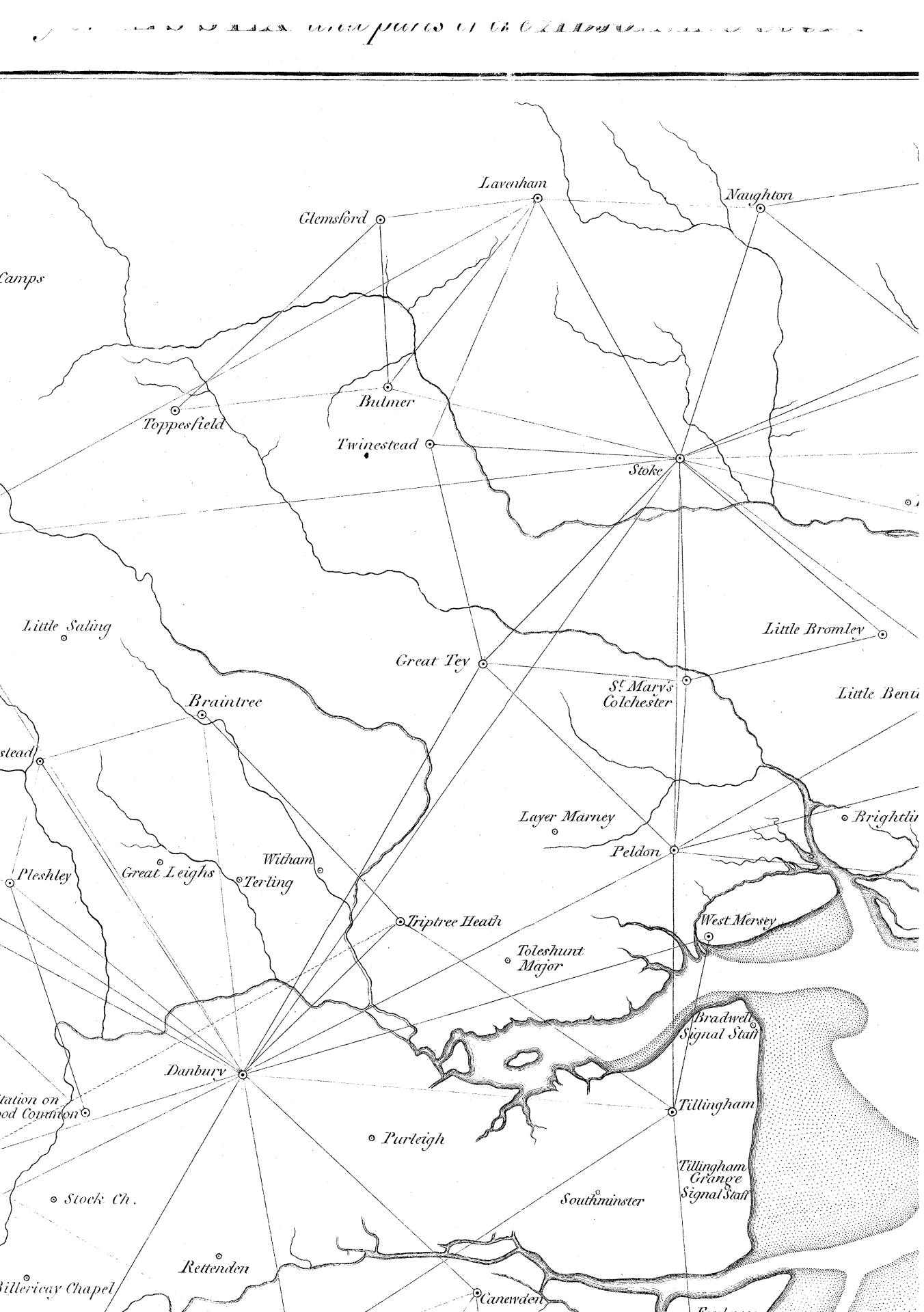


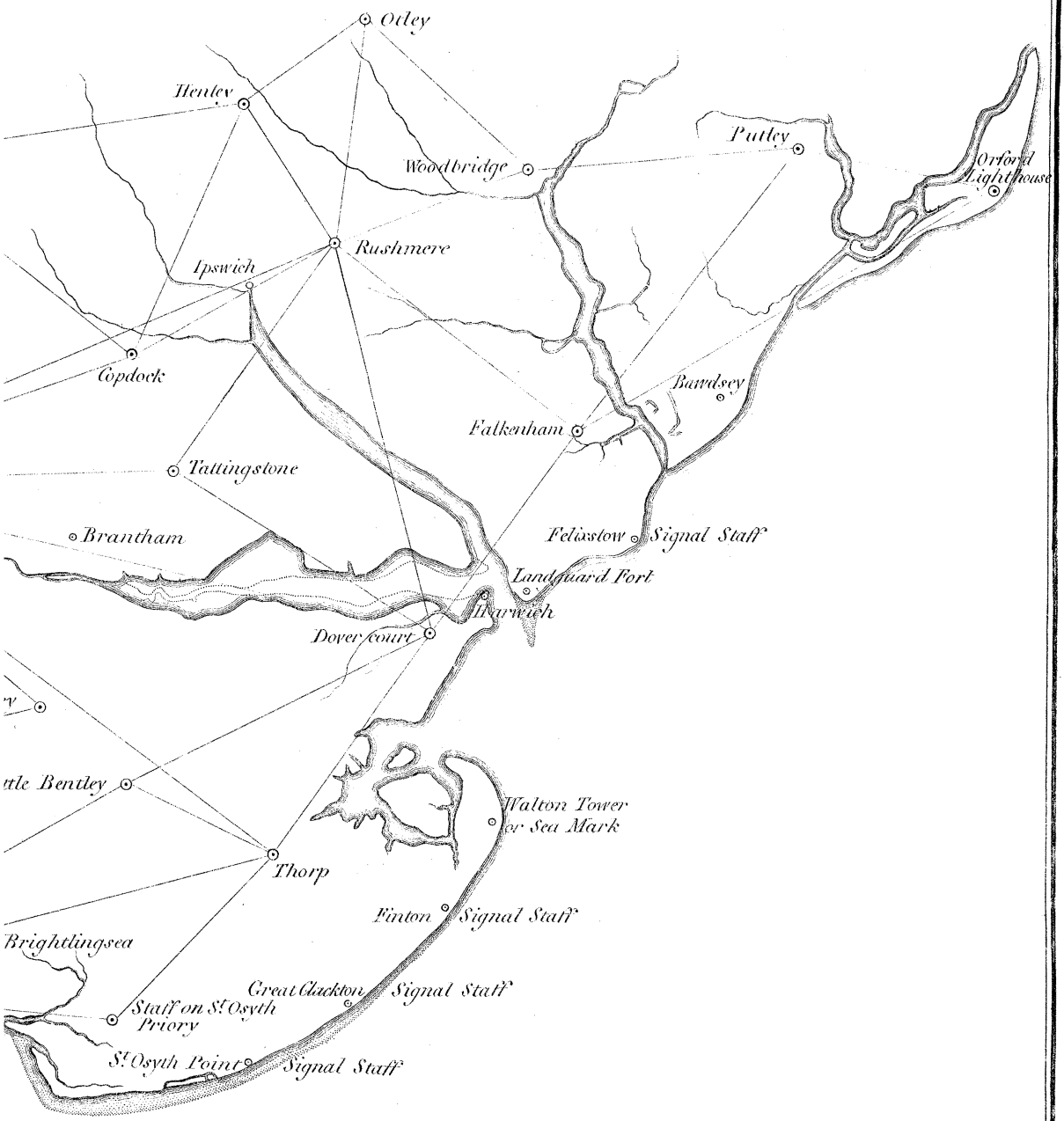

Meridian of Greenwich
St Pauls Bedford
Lidlington Park
Tinsler Hill
Lilleyhoe
rdo
Kinsworth
Berkhampstead Gazebo
ver
Hadley
High Beech
Pen
Bushy Heath
Stanmore
Hampstead
Hanger Hill
Severndroog
St Anns Hill

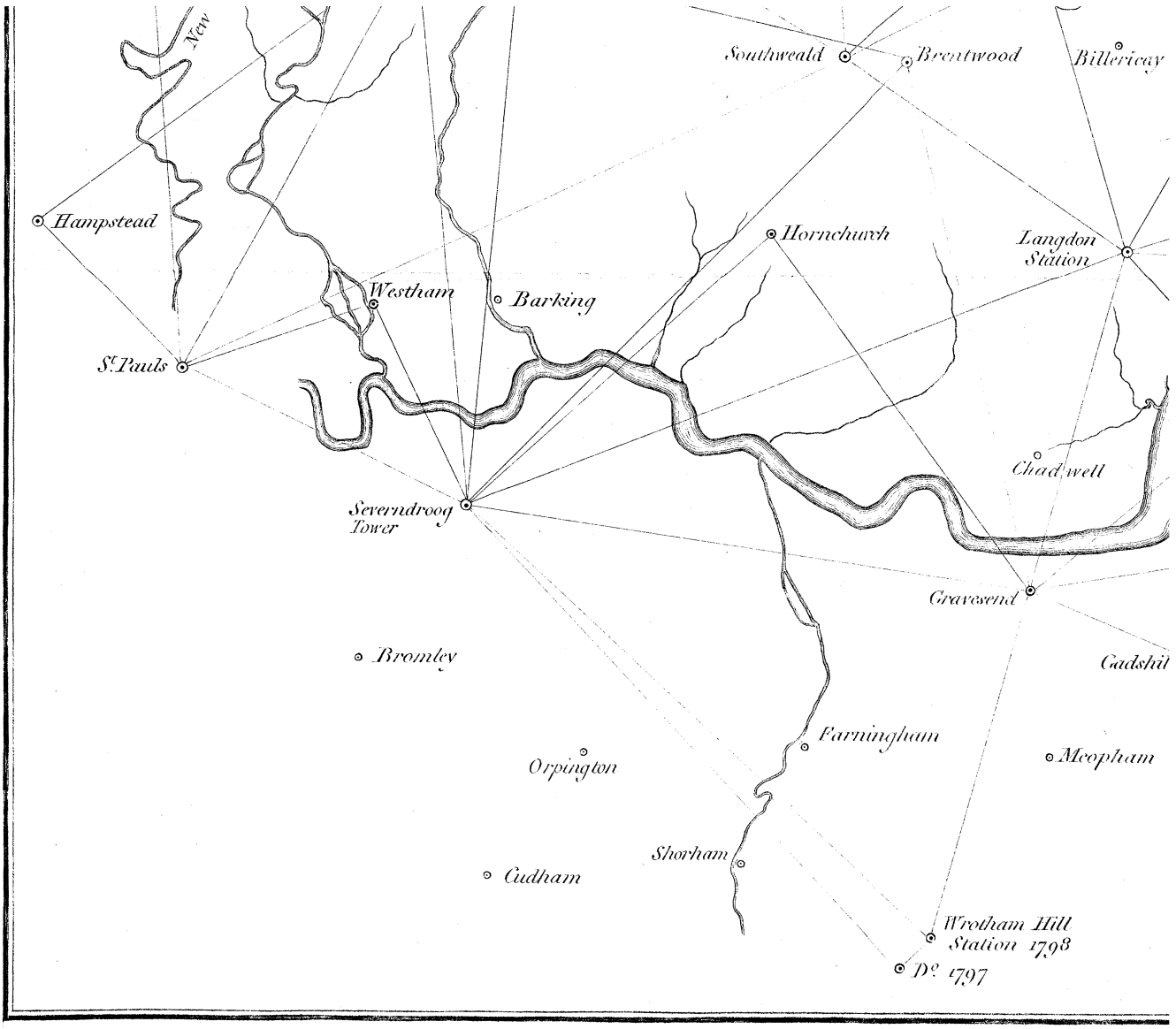

Inkpin Beacon
Highclere Beacon
Bagshot Heath
Scale of Thirty
5
10
15

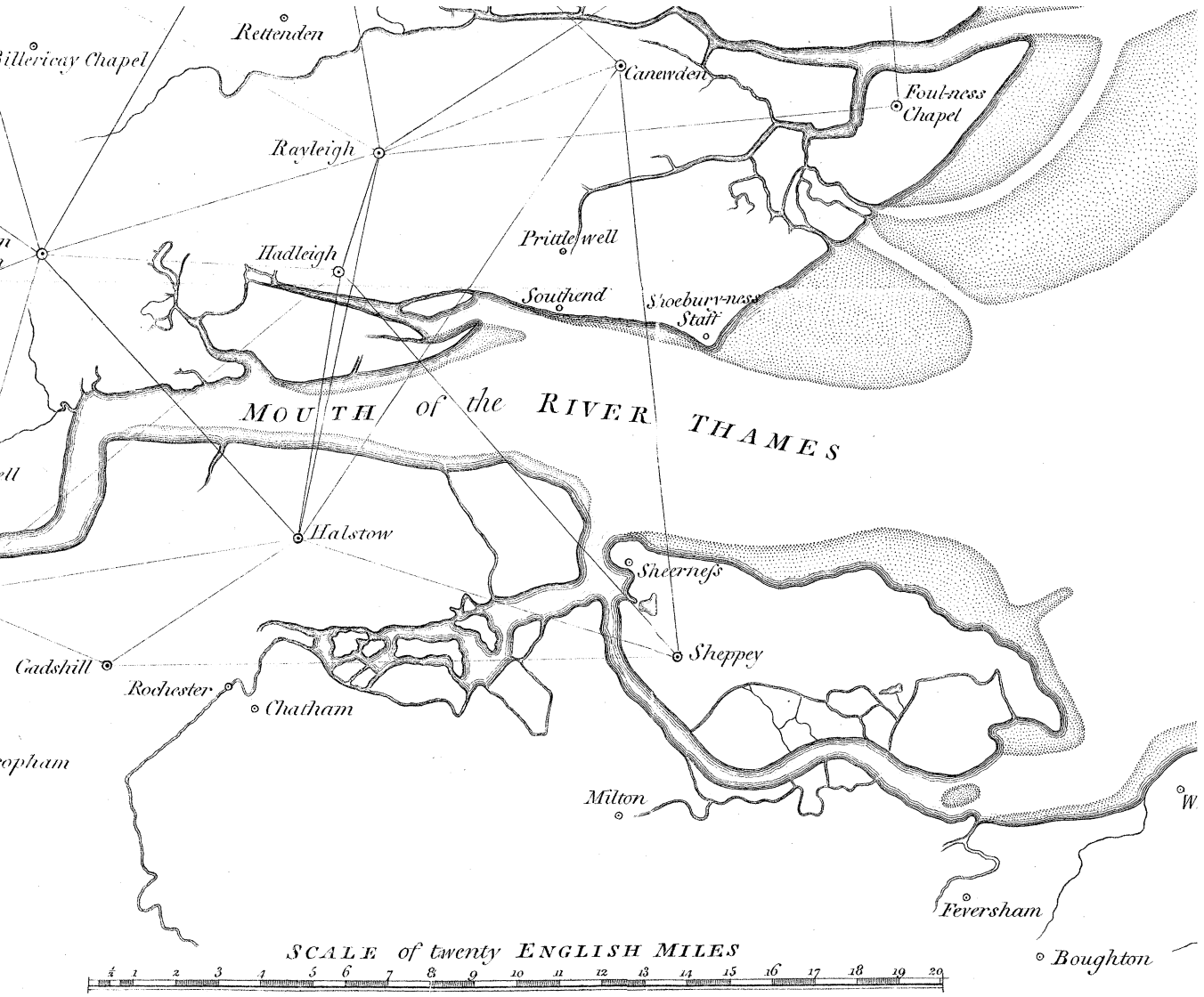

St Anns Hill
Thirty English Miles.
15
20
25
30

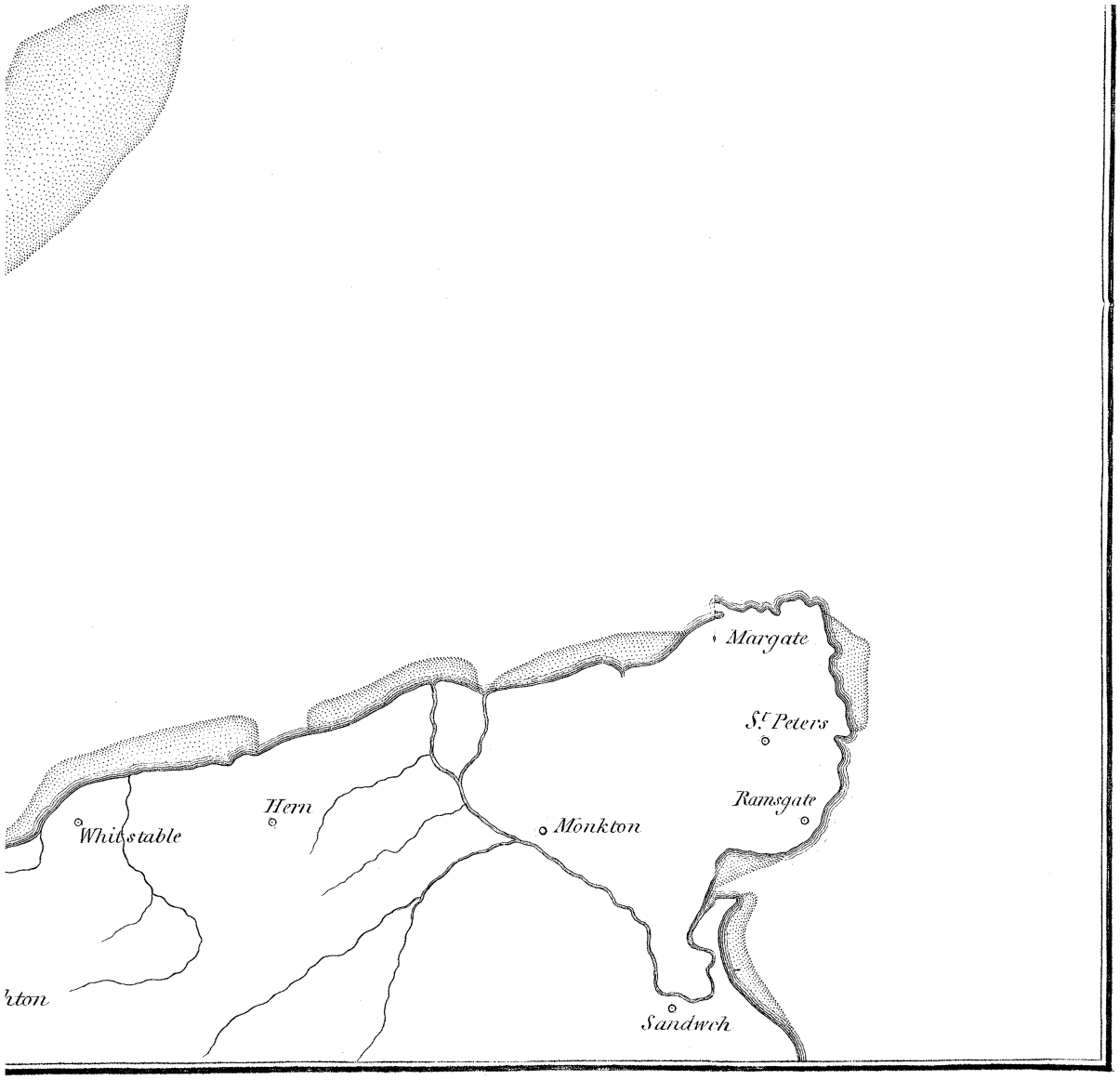

Station on
Babraham Mount
Balsham
Triplow
Shady Camps
Ashdon
Elmdon
Meesdon Mill
Rickling
Thaxted
Henham
on the Mount
Little
Albury
Great Hadham
Thorley
Felstead
Hatfield Broad Oak
Sabridgeworth
High
Easter
Pleshley
Hunsdon
Harlow
Berkhamstead
Observatory
Beauchamp
Roding
Nasing
Station on
Gallywood Comm
Epping Mill
Friemning
Highbeech
Doddinghurst
New River
Southweald
Brentwood
Billericay


Lavenham
Naughton
Glemsford
Camps
Budmer
Toppesfield
Twinestead
Stoke
Little Saling
Little Bromley
Great Tey
St Mary's
Colchester
Braintree
Layer Marney
Peldon
Pleshley
Great Leighs
Witham
Terling
Triptree Heath
West Mersey
Toleshunt
Major
Bradwell
Signal Staff
Danbury
Tillingham
Purleigh
Tillingham
Grange
Signal Staff
Stock Ch.
Southminster
Rettenden
Canewden

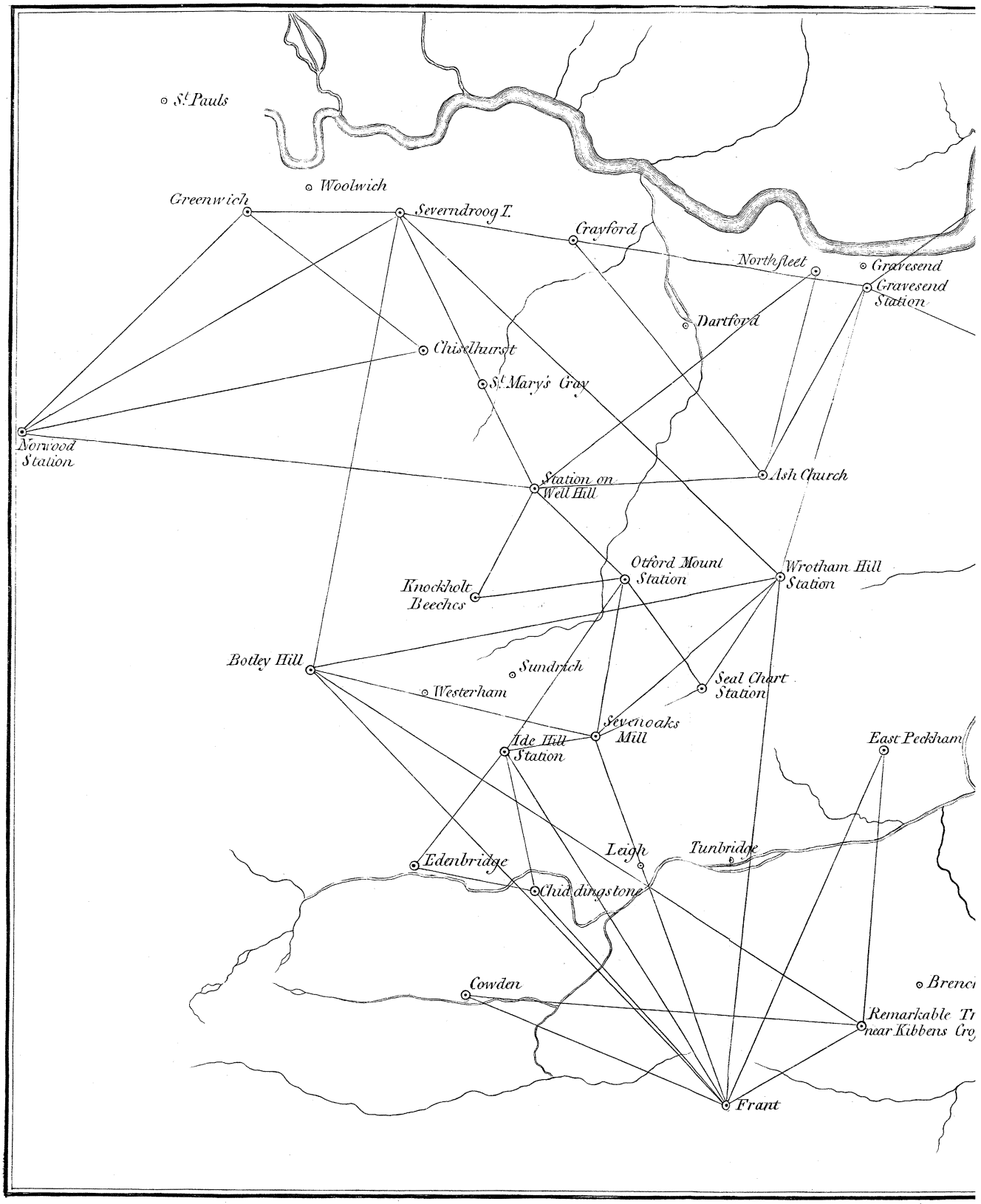

Otley
Henley
Woodbridge
Putley
Orford Lighthouse
Rushmere
Ipswich
Copdock
Bawdsey
Falkenham
Tattingstone
Brantham
Felixstow
Signal Staff
Landguard Fort
Harwich
Dovercourt
tle Bentley
Walton Tower
or Sea Mark
Thorp
Finton
Signal Staff
Brightlingsea
Great Clacton
Signal Staff
Staff on St Osyth
Priory
St Osyth Point
Signal Staff


New
Southweald
Brentwood
Billericay
Hampstead
Hornchurch
Langdon
Station
Westham
Barking
St Pauls
Chadwell
Severndroog
Tower
Gravesend
Bromley
Farningham
Orpington
Meopham
Shorham
Cudham
Wrotham Hill
Station 1798
Dº 1797

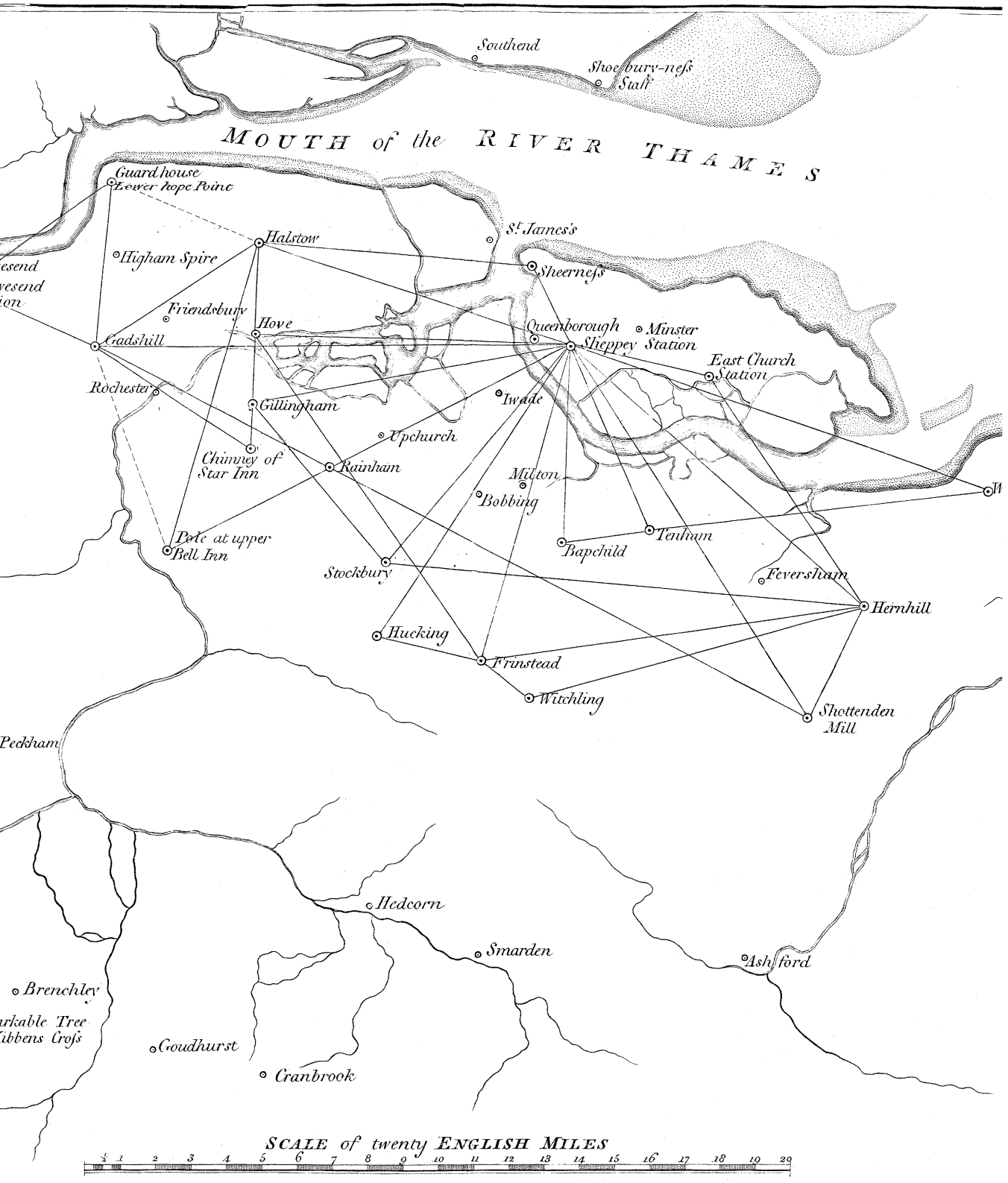

Rettenden
Canewden
Foul-ness Chapel
Rayleigh
Hadleigh
Pritlewell
Southend
Shoebury-ness Staff
MOUTH of the RIVER THAMES
Halstow
Sheerness
Sheppey
Gadshill
Rochester
Chatham
Milton
Feversham
Boughton
SCALE of twenty ENGLISH MILES
4 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

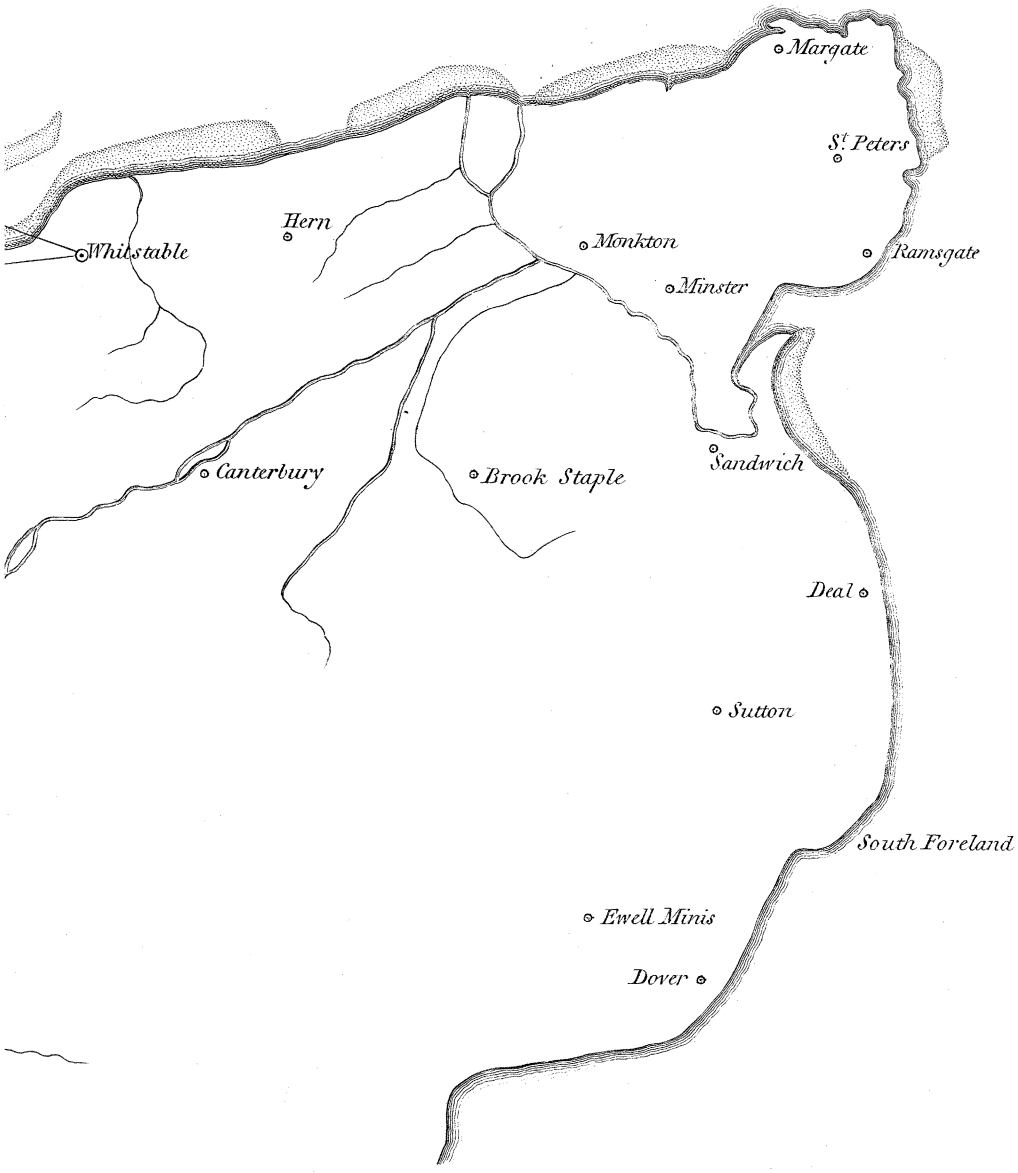

Margate
St. Peters
Ramsgate
Monkton
Hern
Whitstable
Sandwch

TRIANGLE


St Pauls
Woolwich
Greenwich
Severndroog T.
Crayford
Northfleet
Gravesend
Gravesend Station
Dartford
Chiselhurst
St Mary's Cray
Norwood Station
Station on Well Hill
Ash Church
Otford Mount Station
Wrotham Hill Station
Knockholt Beeches
Botley Hill
Sundrich
Westerham
Seal Chart Station
Sevenoaks Mill
Ide Hill Station
East Peckham
Leigh
Tunbridge
Edenbridge
Chiddingstone
Cowden
Brenc
Remarkable Tr
near Kibbens Cro
Frant

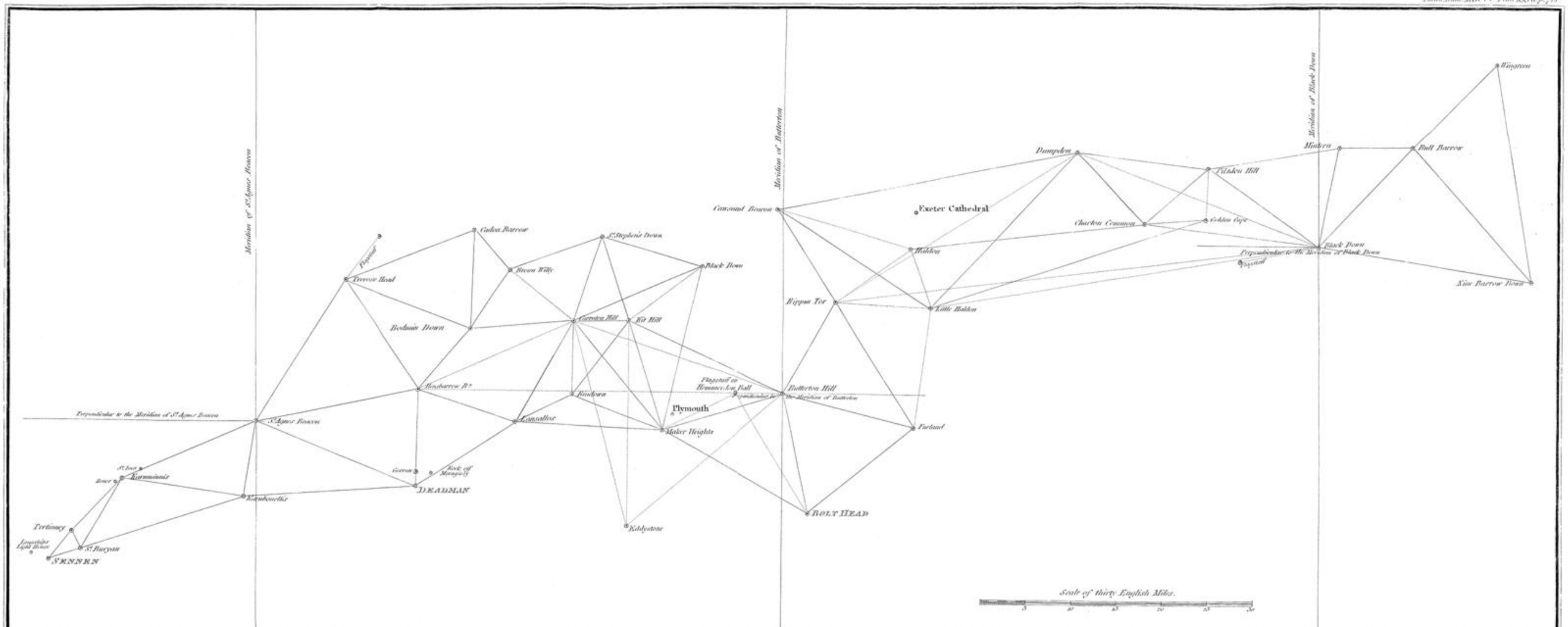
GLES for the Survey of the Northern & Western parts of KENT




Margate
St. Peters
Hern
Whitstable
Monkton
Ramsgate
Minster
Canterbury
Brook Staple
Sandwich
Deal
Sutton
South Foreland
Ewell Minis
Dover

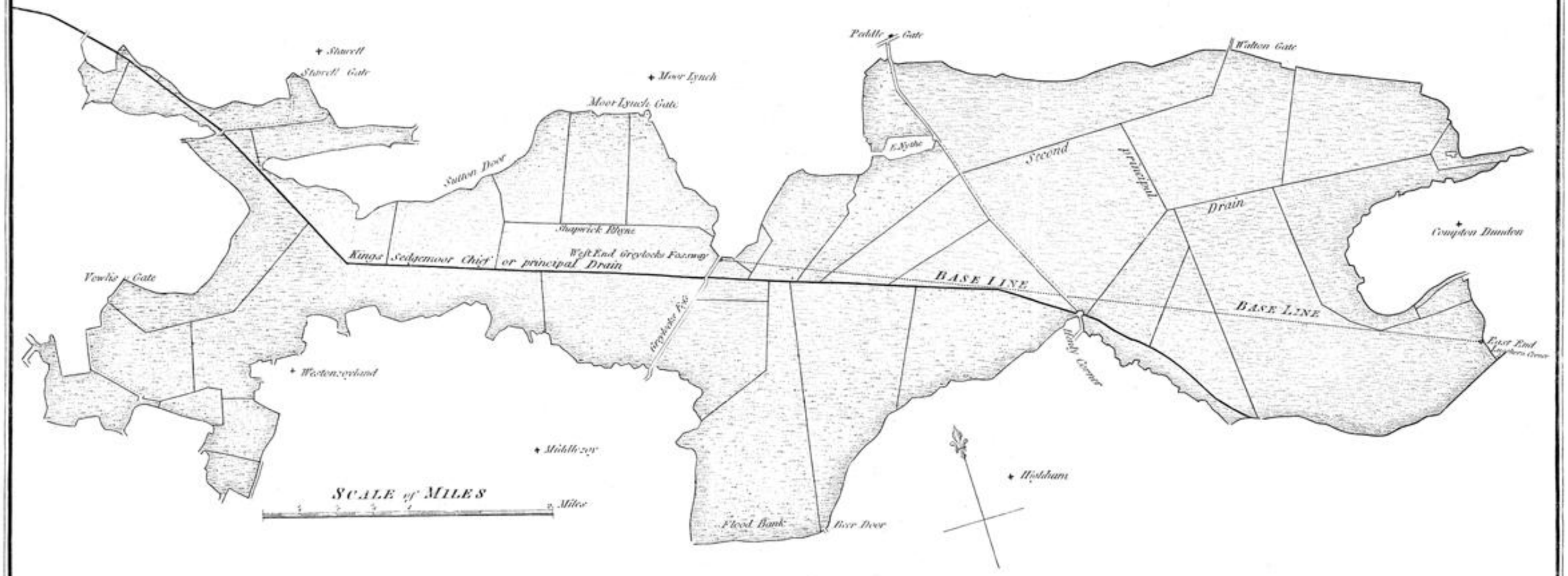
PLAN of the PRINCIPAL TRIANGLES in the TRIGONOMETRICAL SURVEY, 1795. 1796. 1799 shewing the DIRECTIONS of the MERIDIANS at BLACK DOWN, BUTTERTON and ST AGNES BEACON.

Philos. Trans. MDCCC Plate XXVII p. 373



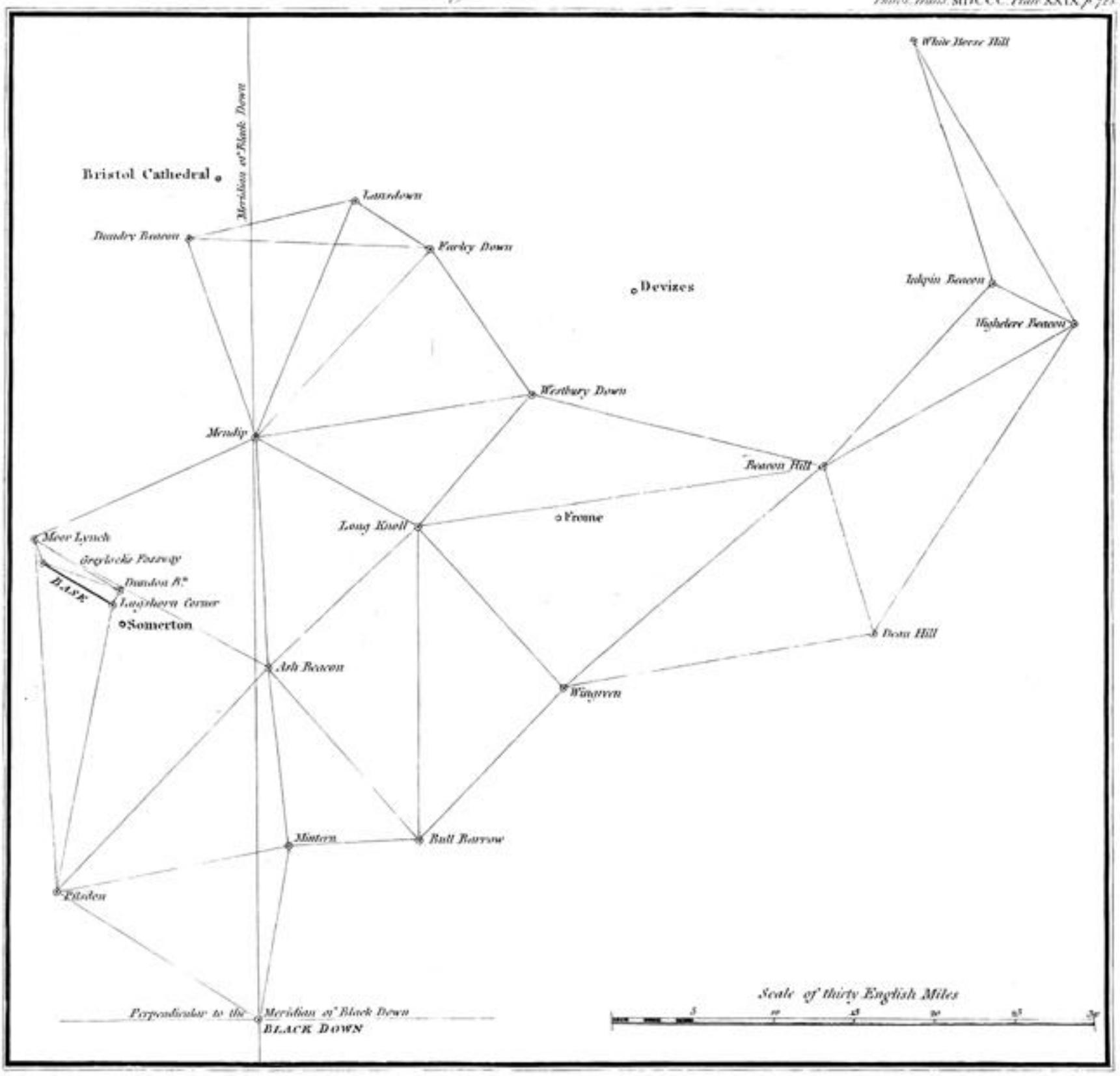
A Plan

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



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

Phil. Trans. MDCCC. Plate XXIX. p. 725



PLAN of the PRINCIPAL TRIANGLES in the TRIGONOMETRICAL SURVEY, 1799.

Philos. Trans. MDCCC. Plate XXXI. p. 748.

Corley Hill
Coventry
Warwick
Meridian of Dunnose
Arbury Hill
St Pauls Bedford
Hanslope
Epwell
Crouch Hill
Lidlington Park
Bow Brickhill
Tinsley Hill
Lilly hoe
Meridian of Greenwich
Leighton Buzzard
Quainton
Kinnaworth
Stow on the Wold
Blenheim Obs.y
Brill
Whitcham H.
Oxford Obs.y
Cuttsow H.
Shotover Hill
Windsor
Berkhampstead Gazebo
Buckland
Abingdon
Hadley
Bush Heath
Pen
Bushy Heath
Shannore
White Horse Hill
Southampton H.
Nuffield
Hungsford
Hanger Hill
Severndroog Y.
St Anns Hill
Bagshot Heath
Inkpin Beacon
Highclere Beacon
Scale of Thirty English Miles.

Station on Babraham Mount
Balsham
Triplow
Shady Camps
Ashdon
Elmdon
Meesden Mill
Rickling
Henham on the Mount
Thaxted
Albury
Great Hadham
Thorley
Hatfield Broad Oak
Sabridgeworth
Hunsdon
Harlow
Berkhamstead Observatory
Nazeing
Epping Mill
New River
Highbeech
Beauchamp Roding
Glemsford
Lavenham
Tiptofield
Bulmer
Twinestead
Stoke
Little Saling
Braintree
Felstead
Great Leighs
Witham
Terling
Pleshley
High Easter
Triptree Heath
Danbury
Station on Gallywood Common
Frierning
Doddinghurst
Stock Ch.
Rettenden
Billericay Chapel
Southweald
Brentwood
Hampstead
Hornchurch
Westham
Barking
St Pauls
Langdon Station
Severndroog Tower
Chadwell
Gravesend
Cudham
Orpington
Farningham
Meopham
Woolwich Hill Station 1798
Dc 1797
Naughton
Little Bromley
Great Tey
St Mary's Colchester
Little Bentley
Layer Marney
Peldon
West Mersey
Tolesbunt Major
Bradwell Signal Staff
Tillingham
Purleigh
Tillingham Grange Signal Staff
Southminster
Canewdon
Foulness Chapel
Rayleigh
Hadleigh
Prittlewell
Southend
Shoeburyness Staff
Halstow
Sheerness
Sheppey
Queenborough
Rochester
Chatham
Milton
Faversham
Boughton
Ipswich
Copdock
Tattingstone
Braintham
Bentley
Woodbridge
Rushmere
Orford Lighthouse
Falkenham
Felixstowe Signal Staff
Landguard Fort
Harwich
Dover Court
Walton Tower or Sea Mark
Thorp
Brightlingsea
Great Oakley Signal Staff
Staff on St Osyth Priory
St Osyth Point Signal Staff
Hern
Whitstable
Monkton
Margate
St Peters
Ramsgate
Sandwich
MOUTH of the RIVER THAMES
SCALE of twenty ENGLISH MILES

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

Philos. Trans. MDCCC. Plate XXXIII. p. 718.