took the trouble to calculate the length of the whole line, by increasing each portion computed from the sides of the triangles by the difference between the chord and its arc, and that the result only exceeded the former computation by about two and a half feet.

The whole length of the arc, from Dunnose to the paral­lel of Clifton, was found to be 1,036,337 feet; from Dunnose to the point over which the sector was placed at Arbury Hill, 586,319∙5 feet; and, consequently, from the parallel of Arbury Hill to that of Clifton, 450,017∙5 feet.

The geodetical part of the operation being completed, it still remained to determine the amplitude of the celestial arc. The instrument employed for the purpose was a zenith sector, contrived and executed in greater part by Ramsden. A description of this superb instrument would here be out of place ; but it may be proper to state the general principle of its construction. The object being to measure the zenith distances of stars which pass near the zenith (in order to diminish the effects of refraction), the sector is constructed by suspending a telescope nearly vertical, and in such a manner that its axis shall have a motion in a vertical plane, extending to only a few degrees on each side of the vertical. From the axis of motion, which is placed very near the top of the telescope, a plummet is suspended by a very fine wire ; and on the lower end of the telescope a scale is placed in the plane of the motion, and directly before the plummet. Now, it will be obvious, that as the telescope carries the scale along with it when it is moved in the vertical plane, while the plummet remains at rest, the angular deviation of the axis of the telescope from the vertical will be measured on the scale. It is necessary that the instrument be capable of being turned half round in azimuth, for the sake of reversion. When in use, the plane of the sector is placed in the meridian at one ex­tremity of the arc, and the zenith distances of some stars at their meridian passage observed. It is then transported to the other extremity, and the zenith distances of the same stars are there also observed ; and the mean difference of these distances is the amplitude of the arc, which is by this means obtained immediately and independently of the lati­tudes of the stations or declinations of the stars. The tele­scope of the sector in question was nearly eight feet long, and had an object-glass of four inches in diameter.

The sector, after some preliminary examination at the Tower, was first set up at the Royal Observatory, for the purpose of observing the zenith distances of some stars to be afterwards observed at Dunnose, in order to determine the latitude of that station. It was then, in the spring of 1802, removed to Dunnose, where it was set up, at a dis­tance of about six and a half feet from the station where the azimuth had been observed in 1791. The whole number of stars observed was twenty-seven ; and a sufficient num­ber of observations having been obtained by the end of June, the sector was then transported to Clifton, where seventeen of the same stars were observed. Subsequently, in the same year, the instrument was set up at the station at Arbury Hill, which is very nearly at the middle of the arc, and where twelve of the stars which had been seen at Clifton were observed. In October the party returned to London, and it was found, on examination, that the sector was in as perfect a state as when first sent into the field, so that no error was to be apprehended from derangement or injury during transportation to the different stations.

On computing the observations, the final results were found to be as follows (Measurement of an Arc of Meridian, Trigonometrical Survey, vol. ii. p. 107):

Mean amplitude of the celestial arc between Dunnose and Clifton 2° 50'23''·38

between Dunnose and Arbury Hill I 36 19 ∙98 between Dunnose and Greenwich 0 51 31 ∙39

For the deductions from those amplitudes combined with the above geodetical measures relative to the degree of the meridian, we refer to the article Figure of the Earth, p. 563. It is however to be remarked, that since the publi­cation of that article, a paper by the celebrated astronomer Bessel has appeared in *the Astronomische Nachrichten* (vol. xiv. No. 336), in which an error is pointed out in the de­termination of the celestial arc. It appears that one of the stars (*α* Aurigæ), observed at all the stations, was incor­rectly reduced to the beginning of 1802 ; and that the error (which probably arose from applying the correction tor nu­tation with a wrong sign) amounted to 18". On correct­ing this error, and deducing the mean result by a more exact method of reduction, Bessel finds the amplitudes to be respectively as under :

Dunnose to Clifton 2° 50' 23"∙497

to Arbury Hill 1 36 20 ∙398 to Greenwich 0 51 31 ∙667 Adopting the above amplitudes as corrected by Bessel, and assuming (according to the measurement) the distance between Dunnose and Clifton to be 1,036,337 feet, the length of a degree of the meridian at the latitude of the middle point (5’2° 2' 26") will be found — 364,925·25 feet, or 60,820∙88 fathoms of the scale to which all the measures given in the survey are referred. General Mudge states this distance to be 60,820 fathoms. The length of the de­gree at the middle point of the arc between Dunnose and Arbury Hill being found in like manner, gave 60,864 fa­thoms, exceeding the above by forty-four fathoms. But as this latitude is farther to the south, the length of the degree ought, on the supposition of the earth’s compression, to be less by about nine or ten fathoms. This anomaly, presented by the measurement, is usually ascribed to a deflection of the plumb-line of the sector, occasioned by local attraction.

The third volume of the Trigonometrical Survey ap­peared in 1811, under the joint names of Colonel Mudge and Captain Colby. It contains an account of the progress of the survey from 1800 to 1809 inclusive, and, when taken in connection with the accounts previously published, com­prises the survey of almost all England, the south of Wales, and a part of Scotland. The volume embraces a great va­riety of interesting topographical matter. It gives the angles observed with the great theodolite at the principal stations ; the calculation of the sides of the triangles, amount­ing in number to 281 ; the elevations and depressions of the stations, as seen from each other; a description of the situ­ation of the stations ; an account of the measurement of a new base on Rhuddlan Marsh, near St Asaph, in North Wales ; and the prolongation of the arc of meridian from Clifton northward to Burleigh Moor in Yorkshire. It like­wise contains the computed altitudes of the stations, and of many other remarkable hills, and also the latitudes and longitudes of all the principal places in the country.

The base on Rhuddlan Marsh was measured in October 1800, with the apparatus so often referred to in the preced­ing statement. After the necessary reductions were applied, its true length at temperature 62° was found to be 24,514·26 feet. The ground was a flat about four miles north-west of St Asaph, and its mean height above low-water mark being only twenty-five feet, no reduction was requisite for height above the sea. In proof of the agreement between the pre­sent and the former measurements, the following instances are given. Computing from the base on Misterton Carr, the distance between Castle Ring and Weaver Hill (two stations in Staffordshire) was found to be 111,144∙1 feet; the same distance deduced from the triangulation proceed­ing from the new base in Rhuddlan Marsh was 111,148·4; whence the difference between the two results in a line ex­ceeding twenty-one miles is only 4∙3 feet. Again, the dis­tance from May Hill to the station on Malvern Hills, de­pending on the Hounslow Heath base, was found = 82,260