the operations from this point into the north of Devonshire until a new base had been measured, the triangles at pre­sent being dependent upon those made in Cornwall in the previous year.

In 1798 a series of secondary triangles was observed for completing the survey of Kent and Essex ; but the princi­pal operation of this year consisted in the measurement of a new base of verification on King’s Sedgmoor in Somer­setshire. This new measurement was conducted in the same manner, generally, as those of the former bases ; but on account of the irregularity of the ground, which was cut up in all directions by numerous ditches and large drains, it was thought expedient to have a new chain of fifty feet ; and accordingly one was prepared by Ramsden, similar in construction to the two 100 feet chains used at Hounslow Heath and Salisbury Plain. This new chain was not used for the whole of the measurement, but only in a few cases when the handles of the 100 feet chain would have had their places over ditches, or in situations in which there would not have been the means of correctly placing the register heads under the handles. The measuring chains were compared with the standard, not before the measure­ment commenced, but after it had considerably advanced, and again at the end of the operation ; and it was assumed that the length of the standard chain had remained unal­tered since its last determinadon by Ramsden. The re­duced length of the base was 27,680 feet, or nearly 5¼ miles; and it was supposed by General Mudge that the error can­not exceed nine inches.

The next account which we have of the survey is con­tained in a paper which was read before the Royal Society in June 1804, entitled “ An Account of the Measurement of an Arc of the Meridian, extending from Dunnose in the Isle of Wight, to Clifton in Yorkshire, by Major W. Mudge.” This forms part of the second volume of the Survey. The measurement of an arc of the meridian was contemplated from the commencement of the survey, but had been delayed for some years on account of the zenith sector, with which the celestial arc was to be determined, not having been completed by Mr Ramsden, whose health was then declining, and who in fact died before the instru­ment was entirely finished.

For the purpose of determining the figure and dimen­sions of the earth by the measurement of meridional arcs, it is important that the arc be of considerable length, in order to diminish the influence of any error in the deter­mination of the difference of the latitudes of its extreme points. On looking at the map of Great Britain, it will be seen that the longest meridional line contained in it, is one which passes from Lyme in Dorsetshire, northward into Scotland, and terminates at Aberdeen, comprehending an arc of nearly 4° 47'. This line, therefore, presented itself as the most eligible ; but, on a closer examination, it was found that the arc would run through a country abounding in hills of considerable magnitude, and consequently that no advantage would probably be gained from observing the zenith distances of stars at any of the intermediate stations, on account of the irregular local attraction. General Mudge therefore selected the meridional line passing from Dunnose to the mouth of the Tees, as being the freest from ap­parent obstructions, and of sufficient length. The choice of Dunnose as the terminal station likewise presented a considerable advantage; for that station having been con­nected with the Royal Observatory by the previous opera­tions, the astronomical observations made there would serve to correct the latitudes of the places formerly determined. The point selected for the northern extremity was Clif­ton, a small village in the vicinity of Doncaster, nearly on the meridian pf Dunnose ; and a level of sufficient extent for the measurement of a base of verification was found at Misterton Carr, in the northern part of Lincolnshire. The two extreme stations were connected by a chain of twenty- two triangles, lying nearly in the direction of the line to be measured. Of these triangles, eleven, extending from Dunnose to Arbury Hill, near the middle of the line, had been already observed, and their sides computed from the Hounslow Heath base. The angles of the remaining ele­ven were observed in the years 1811 and 1802, and the distances computed from the new base.

The base on Misterton Carr was measured in the sum­mer of 1802, by the same apparatus, and exactly according to the same methods as had been employed in the three former bases, on Hounslow Heath, Salisbury Plain, and Sedgmoor. Previously to the commencement of the opera­tions, the measuring chains (the hundred feet and fifty feet ) were both compared with the standard chain ; and a similar comparison was made after the work was completed. It was assumed that the length of the standard chain was the same as when it had been compared by Mr Ramsden ; an assumption which was subsequently proved to be correct (within very small limits) by a new comparison of the stand­ard chain with Ramsden’s brass scale. The extremities of the base were marked by two large blocks of oak sunk into the ground, having each a square hole in its upper surface, into which lead was cast, and ground to a smooth plane ; and the diagonals of the holes being drawn on tl>e lead, the intersections of the diagonals formed the terminal points. After making the necessary reductions for temperature, the wear of the chains, ,&c. the true length of the base at tem­perature 62° was found — 2G,342∙7 feet. No reduction was made for height above the sea, the altitude of the ground on which the base was horizontally measured being only thirty-five feet above the surface of the sea in the mouth of the Humber at *half tide.* As the correct determination of this base was of great importance, every precaution was taken in the course of the operations, and General Mudge was of opinion that the error of the measurement in excess or defect could not exceed two inches.

On computing the first eleven triangles, beginning at Dunnose, the distance between the stations at Corley and Arbury Hill, near the middle of the arc, was found to be 117,463 feet ; and this depended on the bases on Hounslow Heath and Salisbury Plain. On computing directly from the measured base at Misterton Carr, the remaining eleven triangles, the same distance between Corley and Arbury Hill was found to be 117,457·1 feet. The difference, there­fore, falls short of six feet; but this cannot be regarded, as great, when it is considered that the distance between the two stations is rather more than twenty-two miles, and that the whole line from Dunnose to Clifton is nearly 200 miles. Had the computation been carried on from Dunnose all the way to Clifton, the length of the base on Misterton Carr, deduced from those of Hounslow Heath and Salisbury Plain, would have been found to be about one foot greater than its measured length.

The whole terrestrial distance between the parallels of the two stations was computed by the method of parallels and perpendiculars, with reference to the meridians of both the extreme stations. The bearings of certain sides of the triangles from the meridian of Dunnose were deduced from the observed angles ; and the sides being respectively mul­tiplied into the cosines of the bearings, gave the distances on the meridian ; the sum of which distances, of course, was the length of the meridional arc, or rather the sum of the twenty-two chords deduced from the sides of the tri­angles. This method proceeds on the supposition of the earth’s surface, to some distance on both sides of the line, being plane ; but as the triangles ran nearly north and south, and most of them were intersected by the meridian, and, moreover, as the distance between the meridians of the two extreme stations was only a few feet, the supposition leads to no sensible error. General Mudge states that he