using the chains, five coffers were arranged in a straight line and supported by courses of bricks ; the chain was then placed on the coffers, and stretched with a weight of fifty- six pounds. The method adopted for bringing the marks denoting the two extremities of the measuring chain suc­cessively over the same point was this. In any position the chain was supported by a post at each end : that at the preceding end carried a pulley, over which passed the rope sustaining the weight which stretched the chain, while that at the following end supported a screw apparatus, by means of which the chain could be drawn back against the weight. Another post at each end, not connected with the former or with the chain, supported a scale. Now, the chain be­ing in one of its positions, the scale at the preceding end was moved by means of screws, until one of its divisions co­incided exactly with the mark on the handle of the chain. This scale remaining in its place, the chain was then car­ried forward into its next position, and adjusted by means of its screw apparatus, until the mark on its following end coincided exactly with that division of the scale with which the mark on the preceding end had coincided. After thirty-eight chains had been measured, one of the chains was laid aside, on account of one of the links appearing to be a little bent, and the remainder of the base measured with the other ; the former, after the defect had been repaired, being kept as a standard. Experiments were carefully made for determining the comparative lengths of the two chains, and also the rate of expansion ; and in the actual measure­ment five thermometers were laid close by the chain in the coffers, and suffered to remain till they all indicated nearly the same temperature. The time required for this was in general from seven to fifteen minutes. The two chains were again compared after the measurement, and it was found that the working chain had been lengthened, through the rubbing and wearing of the joints, to the extent of 9∙7 di­visions of the micrometer, corresponding to ∙0373 of an inch. The whole base was divided into thirty hypothenuses, but of unequal lengths, and each was reduced to the horizon by calculation. After the measurement was com­pleted, the lengths of the steel chains were ascertained by Ramsden, by comparison with a 40-inch brass standard scale. All reductions being made, the length of the base, by the new measurement, at the standard temperature of 62°(but not reduced to the level of the sea), was found to be 27,404·3155 feet, being about 2¾ inches greater than was found from General Roy’s measurement with the glass rods. We shall afterwards see, however, that the glass rods and steel chains were not referred to the same standard, and that there is consequently reason to suspect a considerably greater discrepancy. The mean of the two results, or 27,404∙2 feet, was assumed as the true length of the base in the future calculations.

Of two operations which agree so closely in their results, it can hardly be said that the one is in point of fact better in any respect than the other. The practical difficulty in measurements of this kind, is to form correctly the contacts or coincidences of the extremities of two contiguous rods or chains ; and in this respect the chain has unquestionably an advantage, because, on account of its greater length, there are fewer coincidences to be made. Nevertheless, when it is considered that the chain is not uniformly supported at every point, and that notwithstanding the weight by which it is stretched, some doubt must remain whether all its points are in a straight line when brought into its position in the coffers, and also the liability to irregular wear from the stretching, we are inclined to think, that a measurement by means of rigid rods is to be preferred to one by a flexible chain.

After the measurement had been completed, the terminal points of the base were permanently marked, by removing the wooden pipes and sinking iron guns into the ground, in

such a position that the axis of the cylinder was placed ex­actly in the same vertical line with the terminal points. the muzzles were left above ground, and iron caps were screwed over them to protect the cylinders from the rain.

In prosecuting the survey, it was resolved, in the first in­stance, to carry a series of triangles from the base southwards, for the purpose of determining some of the principal sta ­tions on the sea-coast, and also because this would afford an opportunity of connecting the series with the triangles of General Roy, and of thereby testing the accuracy of both operations. Another object of importance to general science, was to determine the length of a degree of longi­tude, by measuring the distance between Beachy Head on the coast of Sussex, and Dunnose in the Isle of Wight, two stations lying nearly east and west of each other, above sixty-four miles distant, and visible from each other in clear weather, so that they could be made the angular pointe of a large triangle. In the early part of the spring of 1792 the ground was examined, and the stations fixed upon ; and the great theodolite having undergone some improvements by Mr Ramsden, and a moveable observatory having been erected for its reception, the triangulation was begun in the summer of that year. Most of the angles were observ­ed more than once. When the stations were not more than about fifteen miles distant, staffs were erected for signals, in which case the angles were repeated till their truth be­came certain. For the more distant stations lamps and white lights were employed. In the use of the latter, it was not always possible to repeat the measures ; but every precaution was taken to place the lights in the proper posi­tions, and the charge and firing of them were committed to soldiers selected for their steadiness. The angle was taken when the light was going out. In order to preserve the exact positions of the points over which the axis of the instrument had been placed, large stones from a foot and a half to two feet square were sunk in the ground, generally two feet under the surface, having a hole of an inch square made in each of them, the centre of which marked the pre­cise point of the station.

In the course of the summer of 1792, the instrument was carried to twelve different stations, commencing with Han­ger Hill, and ending with Chanctonbury Ring, about six miles north-west of Shoreham. Early in the spring of the following year the operations were resumed ; and the prin­cipal object of this year’s business was to determine the di­rections of the meridians of Dunnose and Beachy Head, for the purpose of ascertaining the length of the degree of lon­gitude. The method employed for obtaining the meridian, was that of observing with the theodolite the distance be­tween a terrestrial object and the pole-star upon each side of the pole when the star is at its greatest elongation. This observation gives the double azimuth nearly, without any corrections for the star's apparent motion ; and as the mo­tion in azimuth when the star is near its greatest elonga­tion is slow, the time was shown sufficiently near by a good pocket watch. In this manner the angle made by the arc of the great circle joining the two places with the direction of the meridian, was observed at both stations ; and as the distance between the stations would become known from the triangulation, all the elements were obtained for de­termining the length of the degree of longitude on the ter­restrial spheroid at that latitude. After the observations at those two places were concluded, the instrument was taken to a few stations in the neighbourhood of Salisbury, and the operations of the year terminated at Highclerc.

The greater part of the summer of 1794 was consumed in the measurement of a base of verification on Salisbury Plain. The measurement was effected in the same manner as at Hounslow Heath, one of the steel chains being used for measuring the different hypothenuses, and the other kept as a standard. The working chain was compared with