

minor triangulation prevents this by affording the surveyor a fresh starting and closing point every two or three miles. This localizes the error between these points; and, as the limit of error allowed is 8 links to the mile, it is manifest that if a traverse survey were honestly done, and a clear record kept of the actual measurements and their reductions, it would always be easy to reproduce the survey on the ground within very narrow limits of error, should the sectional-survey marks become obliterated and the boundaries be challenged.

The necessity for accuracy is not only that the Crown lands, which are sold at from 5s. to 40s. an acre, may be handed over to the purchaser to an exact perch, but that the boundaries may be re-established from independent points whenever necessary. Triangulation furnishes these points; its accuracy, therefore, is of the greatest importance; and this is tested by a comparison of the initial and verification bases—that is, the surveyor measures one side of the initial triangle—generally $1\frac{1}{2}$ or 2 miles in length—or breaks down from the side of a major triangle, and then by angular measurements carries a network of triangles over the country, finding the lengths of all the sides by computation at the outer limit of the work, which may be 25 or more miles distant from the initial base. One of the computed sides is measured on the ground, and the degree of accordance between the computed and measured distance proves the character of the work. With a 5-inch theodolite, a close of 2 links to the mile is good work. The closes reported during the year are all under that limit, except in two cases, in which the discrepancy was 3 links; but that was in a mountainous country, where the altitudes of trig. stations varied sometimes as much as 3,000 feet in the same triangle, and the close was on two different surveyors' work.

Minor triangulation, with a closing error under 2 links to the mile, is, for practical purposes of settlement surveys, a very safe basis. It is due to the surveyors who have accomplished these works to acknowledge the skill and care exercised by them; an acknowledgment is also due to Messrs. Troughton and Simms, London, for the excellent 5-inch theodolites they supply to surveyors.

The triangulations are, as has been already fully explained in former reports, each on the true meridian of the astronomical station of the meridional circuit within which it is situate. Thus the triangulations, although primarily designed for the settlement surveys, become as they close up parts of a well-compacted framework on which to map the country.

This has always been kept steadily in view as one of the ultimate objects of the triangulation, and there are now only one or two gaps remaining between North Cape and Stewart Island, which will be filled in during the current year. The principal gap is between the North Island and the Middle Island; but that is nearly disposed of, as Mr. A. D. Wilson, who has been conducting a triangulation on the Marlborough side, reports that he has had preliminary observations from two of his stations to two stations across Cook Strait on the Wellington side. As soon as these connections are made, and the difference of longitude of one or two exterior main stations determined by exchange of telegraphic signals, the department will be in a position to publish a correct map of the country, with all the latest topographical information added.

SETTLEMENT SURVEY.

Of rural and suburban land, 925,838 acres have been surveyed into 6,628 sections, at an average cost varying from 10 $\frac{3}{4}$ d. to 1s. 7d. per acre for each land district except Taranaki, where the cost is 2s. 10d. per acre. In that district the surveys are all in bush, and during last year were nearly all in the country behind Mount Egmont, where there is much rain. Notwithstanding these drawbacks, the surveys are exceedingly well done, and the cost under the circumstances is not unreasonable.

As the aggregate cost of the settlement surveys is much the heaviest item of the Survey expenditure for the year, it will be as well to point out that fully 700,000 acres were arrear surveys—that is, surveys of land sold in former years on the system of selection before survey. In Canterbury, for instance, almost all the surveys were of that order during the past year, and comprised 404,726 acres. In all the other districts except Taranaki and Otago, much the greater part of the