

Mr. A. D. Wilson, a very pushing and energetic officer, began and completed the whole of the extensions throughout the Marlborough circuit. During the season he established 49 main and 43 reference stations; the closes on his own work were never more than a few seconds out. His checks and closes on the Nelson and Amuri meridians we cannot pronounce upon, as the longitudes of the initial meredional stations of circuits have yet to be determined.

In Westland Mr. G. J. Roberts, under the very great difficulties of a bush country and a wet climate, which laid him up for a time, extended bearings on from Koiterangi, Geodesical Station to Geodesical Station, Ahaura. Simultaneously, under the direction of Mr. Mueller, he observed the triangles of a major-triangulation, which binds together with indisputable accuracy all the survey points north from Hokitika to Ahaura. The computation of convergence between the meridians of the two initial stations, determined astronomically respectively by Messrs. Adams and Browning last year, differs only 10" from the observed difference by Mr. Roberts.

In Taranaki Mr. Humphries and his assistants, Messrs. Bird and Skeet, jun., completed the selection and observation of a line of standard stations through the forest from Waitara, east of Mount Egmont to Hawera and on to Carlyle. They also extended the meridional line on to the Waingongoro River; but at this point had to desist on account of Native opposition.

This standard work is the most technical branch of the department, and a report of it cannot be of much interest, except to a few; but it is due to those gentlemen who have been engaged on it, and whose skill and enthusiasm in their profession have secured such excellent results so far, that their labours should not pass unnoticed or unrecorded.

The object of the work is to afford starting and closing points for the triangulation to follow, and to have the range or bearing of the lines of all surveys within a circuit referable to the same true meridian, and so secure, with the aid of triangulation, that the surveys of the colony, even in their most isolated and fragmentary parts, will be recordable as we proceed, and that ultimately as the interspaces are filled in, we shall have one harmonious whole, with neither overlaps nor gaps to perplex the settler or the Government. The standard bearings were observed with eight, nine, and ten inch theodolites and have been extended nearly as much as will be required for many years. Two parties at this class of work will suffice for the current year.

Trigonometrical and Topographical Surveys.

Under this general designation an area of 5,422,735 acres has been surveyed, of which 1,249,440 acres is major triangulation extended partly over the mountainous bush country on the East Coast, Poverty Bay, by Mr. Barnard, and partly from Waikato triangulation, towards Taupo, by Mr. Cussen; the latter work had to be stopped, owing to the opposition of the Natives, who destroyed stations, and drove the survey parties off. These works will be resumed and completed on the next favourable opportunity. Their object is to afford a groundwork for the survey of large Native blocks, which, so far as the work done has allowed, have all been properly based on and connected to the trig. points.

The minor triangulation in Auckland has also been principally in the interests of Native surveys, and for the most part has been a breakdown from the major triangles covering the same ground.

The minor triangulation in the other parts of the Colony has proceeded independently from bases measured specially for the several surveys. A considerable proportion of this work in Canterbury and Otago has been done by contract, and with very satisfactory results. Triangulation, from the very nature of the work, is very difficult to check while the work is proceeding, and it can only be safely entrusted to surveyors of well known established skill and probity. The operation consists of the measurement on the ground of an initial base of two or three miles, and from it the extension over the country of a series of triangles, all the sides of which are computed successively the one from the other. It is manifest that, if in any portion of the angular work errors should arise, it will be propagated on through all the part that succeeds, and the computed distances will be erroneous. The most efficient field check on this is the measurement on the ground of a side of one of the triangles remote from the initial base. If the work has been correctly done, the computed length of this, the base of verification, should, theoretically speaking, agree with the distance as measured on the ground. In practice, however, there are errors which cannot be eliminated, and a limit of error has to be allowed. In the specification for the Canterbury work this was fixed at two links per mile. Each contractor, towards the completion of his work, had to declare the computed length of one of his lines; these, afterwards measured by the Inspector, Mr. Kitson, with a Chesterman's steel tape, standardised to the chain length laid down at the Christchurch office, the corrections for slope and temperature being made, the following results were reported:—

Contract Surveyor.	Declared Distance Links.	Measured Distance Links.	Diff. Links.	Accumulated Rate of Error Per Mile.	Area Triangulated Acres.
T. Maben ...	19785.26	19783.97	1.29	4 inches.	192,640
J. A. Connell ...	19982.2	19983.92	1.72	5.4 inches.	413,518
J. E. F. Coyle ...	22190.4	22190.05	0.35	1.0 inch.	306,000

Comparing the distances of the sides common in adjacent triangulations, there is from the Opihi to the Waimakariri a continuous line of minor triangulation, stretching over the Canterbury plains for 90 miles. This comprises the work of Messrs. Sealey, Coyle, Maitland, Kitson, and Maben, established on five independent bases. The errors reduced to any one of these bases as a common base vary from one-third of a link to two links per mile. Mr. Connell's work is detached from any of these triangulations, and cannot yet be compared with them.