

far west; so that, in reality, the coast-line is given distorted. As is well known, the Admiralty surveyors only made a running sketch survey of the West Coast north of Milford Sound; no great accuracy, therefore, can be expected. In furtherance of the Crown lands surveys, a triangulation, extending 200 miles along this coast, has been executed within the last three years. This has all been checked and connected into one series; and, by the two independent Ray-traces across the Middle Island from Canterbury and Nelson, with the connection across Cook Strait, the department has now got the information from which to deduce the latitudes and longitudes of many points in the Middle Island relative to the Survey Observatory, Mount Cook, Wellington. The longitude of it is in harmony with that of Pipitea Point, one of the most reliable positions of the Admiralty survey, and which has been verified by independent observations.* In correcting the longitudes of maritime positions of a country, it is important to have them all referred to one recognized position. In this way no confusion can arise, as would inevitably be the case were longitudes referred to several points independently determined. The longitude of Pipitea Point is $174^{\circ} 47' 53''$ E. of Greenwich, and from this, as origin, the longitude of Cape Egmont Lighthouse was recently computed for Marine Department as $173^{\circ} 46' 10''$. In a similar manner will other positions be given to that department as the computations are made.

SETTLEMENT SURVEY.

Under this head are classed rural, suburban and town surveys. During the year 4,932 sections of rural and suburban land, comprising 474,991 acres, have been surveyed, and 1,409 acres of town lands into 2,658 sections. Of the rural and suburban, 184,000 acres were arrear surveys of Crown lands which had been bought in years previous. The department has been labouring under the disadvantage of having to dispose of a large accumulation of back work. There still remained for disposal 254,000 acres on the 1st July last. Portions of this could be held over without much inconvenience to the purchasers, but in other cases the department is pressed to complete the surveys. The arrears have at length been brought within manageable limits, and should be much reduced during the current year. The great hindrance to the rapid execution of this work is the perplexing discrepancies of the old surveys and the meagreness of their records. Before the surveyor can survey the unoccupied intervening portions of land, he has to re-define boundaries of prior surveys, and reconcile as best he may the conflicting data which frequently presents itself. It will be a relief to the department when this back work is done, for it is very costly and troublesome.

The sectional surveys have been much improved in accuracy during late years by the steel tape superseding the chain in lineal measurements, and in bush traverse surveys the correction of bearings by observation of the greatest elongations of circumpolar stars. This means of correcting bearings has been much availed of by Mr. Humphries in his direction of the extensive bush surveys in the Taranaki District. The observation of an elongation is one of the simplest in practical astronomy. From the given latitude of the nearest trigonometrical station the latitude of point of observation is deduced. The computation is then easy, the resulting bearing, corrected for convergence, gives the true bearing of the meridian on which the survey is conducted. Under this system errors in bearing are localized and eliminated. The surveyor proceeds with confidence in miles of intricate bush traverse, feeling assured that his instrumental work will close within assigned limit of error when he completes connection with trigonometrical point or standard line. As will be seen from Mr. Humphries' report the errors in closing in no case exceeded 2 links per mile, nor $1' 30''$ in bearing, a degree of accuracy very rarely attained in bush surveys, and which vouches for the skill and care exercised by the field surveyors in their work.

NATIVE SURVEYS.

Sixty-one blocks, comprising an area of 710,737 acres, were surveyed for the Native Land Purchase Department, and 213 blocks, covering a total area of 94,441 acres, to the order of the Native Land Court. The surveys of latter class are for

* See Supplement to *New Zealand Gazette*, 1878, No. 46, page 635.