

It will be noted that approximately 60 per cent. of the salary expenditure of the staff is devoted to work for other Departments of State.

The summary does not include the cost of a large number of surveys carried out by private practising surveyors under contract from the Department the cost of which has been met by the Department requiring the survey.

#### *Map Sales*

The restriction on the sale of departmental maps during the war period, coupled with the decline in civil activities, is reflected in the number of maps disposed of. The only maps available for disposal are the cadastral 1 mile to an inch series and territorial maps. All topographical maps have been entirely withdrawn from sale.

No maps subject to royalty payment have been published by private organizations during the year.

### SPECIALIZED ACTIVITIES

#### *Standard Traverses*

No new work or revision has been carried out under this heading. New standard traverses are urgently required throughout the Dominion for the control of land surveys, but will have to be held in abeyance until the post-war period, when it is hoped that staff will be available for the purpose.

#### *Triangulation*

*Geodetic Triangulation.*—The party engaged on this work completed all terrestrial angular observations during the 1939-40 season. Arrangements had been made with the Colonial Office prior to the outbreak of war for the use of base-line-measuring equipment to be employed in the measurement of the three new base-lines in the South Island and the remeasurement of at least one of the old North Island bases.

However, as it was not possible to obtain certificates of comparison for the invar bands to be employed, the base measurements have been held in abeyance until the post-war period. It is hoped that this work can be completed at an early date, thus finalizing operations that were commenced in 1910 in accordance with the recommendations made by Major Palmer to the Government in 1875.

It is estimated that the field observations for the geodetic triangulation can be completed in under two years, the remaining work being base-line measurements and observations at a few stations for longitude, latitude, and azimuth. In addition to the value of the work for land surveys, it will have a scientific value in the field of geodesy and other allied sciences.

The existing work has been employed for the purpose of providing provisional values for military mapping, particularly in the Otago-Southland area, where the original circuit co-ordinates were unsatisfactory.

In order to correct discrepancies in this district a limited amount of second order triangulation was put in hand towards the end of the year.

#### *Tidal Analysis*

For the purpose of tidal predictions carried out for the Marine Department, analyses of tide-gauge records of the years 1926, 1929, 1932, 1935, and 1938 for the Port of Auckland were completed by the Computing Branch.

The automatic tide-gauges operated by the Harbour Boards at Wellington and Lyttelton were inspected during the year.

The tidal predictions for the seven standard ports carried out annually by the Tidal Institute, Liverpool, from harmonic constants supplied by the Department had not come to hand by the end of the year.

#### *Precise Levelling*

The only work being carried out under this heading is a traverse of precise levels required by the Public Works Department in the Canterbury District.

The continuation of this work will prove of great value for the co-ordination of engineering levels.

#### *Topographical Mapping*

At the outbreak of the war in September, 1939, the Department set aside certain routine work to undertake topographical mapping for the Army Department. Except for a few isolated areas mapped during the Great War, the only maps available for military operations were the territorial and cadastral map series issued by the Department.

It was therefore necessary to put into operation a programme of mapping to meet the essential requirements of the Army. In 1935, in consultation with the Army, the Dominion was subdivided into a mile to an inch map series on a predetermined grid.

Prior to the war the mapping of these series from aerial photographs supplied by the Royal New Zealand Air Force was being carried out by a small staff at Head Office. Two Barr and Stroud precise stereoscopes were employed for the plotting of these maps from the photographs, height control and identification having previously been supplied by a field staff. The first map of this series was published in March, 1939.

It was decided on the outbreak of the war to cease work on this series and concentrate on the mapping of vital fortress areas on a scale of 1/25,000 (approximately 32 chains to an inch). The Royal New Zealand Air Force were unable to make aircraft available to supply the aerial photographs required as a basis for mapping on the scale selected. Contracts were therefore issued to the New Zealand Aerial Mapping Co., Ltd., Hastings, by the Army Department, and by November, 1939, mapping was commenced in the Auckland District.