VI. REPORT OF THE GOVERNMENT ASTRONOMER.

Hector Observatory, Wellington, N.Z., 2nd September, 1918.

This report covers the period from the 20th June, 1917, to the 31st August, 1918.

Staff.

On the 29th September, 1917, Relieving Cadet John Wilbur Nissen resigned. On the 8th April, 1918, Relieving Cadet David Leslie Grant reported for duty at the Observatory.

Professional Cadet.—The sad news was received of the death in action in France on the 12th April, 1918, of Professional Cadet Norman Shrimpton. The vacancy in the professional staff has not yet been filled, but steps are being taken to do so.

Time Service.

Transit Instrument.—As in the past, transit observations of clock stars and of the sun have been taken for the determination of the clock-error. The transit instrument has an objective of 3 in. aperture and 36 in. focal length. It is fitted with a convenient reversing-gear, and has a hand-driven micrometer. Many observations for clock-error have been made on stars in daylight, and observations have only been made to the sun when owing to weather conditions it was not possible to observe stars. It has been found that stars as faint as the third magnitude can be easily observed at noon, provided they are south of the zenith. The usual practice in observing is to reverse the transit instrument on each star, as by doing so the collimation-error is eliminated.

Collimators.—Two collimating telescopes, of 3 in. aperture and 36 in. focal length, have been erected. Owing to the small size of the transit-room it was necessary to erect the collimators on piers outside the transit-room. Each pier was accordingly made double, the outer being hollow and acting as a cover to the inner solid pier. The piers are of brick, and the outer pier carries a ventilated double cover of iron. In this way it is hoped to keep the inner pier and telescope at a fairly uniform temperature. The piers are carried down to the solid. It is expected that many valuable results will be obtained from the collimators as soon as the necessary staff is available to make the observations and discuss the results.

Meridian Marks.—Temporary meridian marks are established both on the north and south horizons, and designs for permanent marks in concrete have been prepared. The south marks are nearly two miles distant, and for night use an electric light is provided. This shines through a hole ½ in. in diameter, and makes a good reference mark.

It was found that one of the city street lights near the south marks was visible in the field of the transit instrument, and by permission of the City Engineer a screen has been erected on the lamp-post, with a small opening in it, to reduce the intensity of the light. This makes another useful reference mark, and is available when the other light fails.

When conditions return to normal again there will be excellent opportunities to study the relative motions of the collimators and meridian marks, and of a number of marks visible on the intervening ridges between the horizon marks and the Observatory.

Clocks and Chronometers.—The Observatory is dependent on three Dent astronomical clocks for the time service. The clocks have zinc and steel compensated pendulums, and are in ordinary cases open to the air. One is a sidereal clock, and is situated in the transit-room, so it is subject to considerable variations of temperature when the transit-room is opened for observing. The other two are mean-time clocks—one is in the adjoining room to the transit-room, and is also subject to variations in temperature; and the other is in the cellar, where the temperature is controlled by a thermostat. The clocks were fitted with seconds contacts on the escape-wheel, of the usual form supplied by Dent. But troubles developed if by any chance the contact-points became fused together—this converted the two light independent springs into a rigid structure which either stopped the clock or interfered with its rate; consequently it was decided to substitute on the sidereal clock a form of contact similar to that used at the National Observatory of Besançon. In this contact the teeth of the escape-wheel act on a lever, the other extremity of which carries one of the contact-points. This brings the contact-points away from the escape-wheel, and they can be placed clear of the clock, so that they can be readily cleaned and adjusted; and if by any chance the contact-points stick together there is no interference with the clock, for in this case the other end of the contact-lever is lifted clear away from the escape-wheel. The new contacts have performed satisfactorily.

As the mean-time clocks are required to synchronize the signal-clocks, a different form of contact is used to give a contact lasting approximately for one second. A very light horizontal rod about 9 in. long is attached at its middle point to the top of the pendulum, and the ends of the rod are turned downwards and dip into mercury-cups, so that at each oscillation of the pendulum contact is made through the mercury-cups, and by adjusting the height of the mercury in the cups the duration of the contact can be controlled. By having two cups, one on each side of the pendulum, the rod is balanced, and the contact from either side can be used as required.

The two signal-clocks are synchronized by the mean-time clocks. Each pendulum of the signal-clocks carries an armature at the bottom of the weight, and at the end of its swing the armature passes over an electro-magnet fitted to the clock-case towards the right-hand side of the case. The electro-magnet, of about 120 ohms resistance, is energized by a current from three Leclanché cells, through the mercury contacts of the standard clock, and experience has shown that this method of synchronizing the signal-clocks is reliable. The signal-clocks are kept