

Non-automatic time-signals: (1) To ships in Wellington, by telephone, on application to the Observatory; (2) the Observatory time-signals sent to the General Post Office are distributed by telegraphic hand-signals to some 2,300 telegraph and telephone offices distributed all over New Zealand at 9 a.m. daily, except on Sundays and holidays; (3) similar hand-signals are also sent to all railway telegraph-offices in New Zealand at 9 a.m. daily, except Sundays and holidays; (4) the Wellington Telephone Exchange distributes time-signals by telephone to exchange subscribers, generally to the nearest minute of time: the clock in the exchange is checked by comparing it with the Observatory automatic time-signal, but the Observatory is not responsible for the accuracy of these time-signals.

*Additional Work.*—Additional responsibility and work have been thrown on the Government Astronomer and the Observatory staff by the provision of a daily wireless time-signal. This new service was started on the 1st May, 1922, and has been regularly maintained since then. The signals are sent every day except Sundays and Government holidays, at 11 hours G.M.T. (= 10.30 a.m. N.Z.T.). In addition to these signals other wireless time-signals are sent on Tuesday and Friday evenings at 21 hours G.M.T. (= 8.30 p.m. N.Z.T.).

This broadcasting of the time-signals by wireless is much appreciated by officers of ships and by the numerous radio amateurs all over New Zealand. The longest distance reported to the Observatory is 4,320 miles for the wireless time-signal received by the s.s. "Tainui." The s.s. "Waimana" reported the reception of the time-signal at a distance of 3,638 miles.

*Reception of other Wireless Time-signals at the Observatory.*—The Observatory has been equipped with a single-valve wireless-receiving outfit. With this outfit the time-signals from Pearl Harbour (NPM), Hawaii, and from Bordeaux (LY), France, have been heard.

*The Total Solar Eclipse of the Sun.*—The Astronomer (Dr. Adams) was present at Wallal, Western Australia, for the observation of the total eclipse of the sun during September, 1922. Through the courtesy of Dr. Campbell the equipment of the Lick Observatory Expedition was available for use by the Astronomer. The hospitality extended to the visiting scientists by the Commonwealth and State Governments of Australia was much appreciated.

*Seismology.*—The Milne Seismograph No. 20 has been in use during the year. The boom is in the meridian with the pointer to the north. The levels mounted on the concrete pier of the seismograph are read every day, and frequently show evidence of the tilting of the ground. A further improvement has been made in the lighting of this seismograph. A small lens has been mounted on the end of the boom, with the result that a very fine line is obtained on the record. The new Milne-Shaw Seismograph No. 13 is a much-improved instrument, well designed and well made. It is the standard instrument recommended by the Seismological Committee of the British Association for the Advancement of Science. It differs in three important respects from the old Milne seismograph—(1) The boom is electro-magnetically damped; (2) the magnification of the ground movement is very high, about forty times greater than the older machine; and (3) the seismograph can also be used to measure the tilt of the ground, as the sensitivity to tilt is from ten to twenty times greater, according to the pendulum period adopted. The new machine affords means of obtaining accurate measures of the ground-movement, which information is of considerable importance to engineers and architects in the design of buildings to resist earthquake-shocks. Steps were taken to provide accommodation for the seismograph at the Observatory by extending the cellar. It was possible to utilize the existing exterior walls, and in this way a room about 9 ft. by 24 ft. is available. Two piers for the Milne-Shaw seismograph have been built, one on the meridian and the other at right angles thereto. The seismograph No. 13 is mounted with the boom pointing to the west, so that the north-south component is registered. This seismograph is at right angles to the Milne seismograph. At the request of the Palmerston North Borough Council an illustrated public lecture was given by the Government Seismologist at Palmerston North on Friday, 7th July, 1922, on "Earthquakes."

*Observatory Board.*—On the invitation of the Minister, the Hon. Mr. Downie Stewart, Dr. W. W. Campbell and Dr. J. H. Moore were present at the meeting of the Observatory Board held at the Observatory on Monday, 31st July, 1922. Dr. Campbell gave an account of the establishment of the Lick Observatory Southern Station at Santiago, Chile, in 1901, and urged the necessity for more Southern Hemisphere observations to supplement the Northern ones. Dr. Campbell stated that for an Observatory a quiescent atmosphere is required, with a small diurnal range of temperature, with freedom from fogs, both storm and quiescent, and that comfortable conditions for living are very desirable. He approved and supported the French proposals for the determination of longitudes by wireless telegraphy, in which New Zealand is to be the Southern Hemisphere station. He recommended that the precision clocks should be placed in a well or at the end of a tunnel, so that the temperature may be kept constant.

*Publications.*—The following bulletins have been published during the year:—

No. 46, "Ephemeris of a Comet," by C. E. Adams.

No. 47, "A Study of Pacific Earthquakes," by Professor G. Angenheister.

No. 48, "Report of the Government Astronomer and Seismologist" for 1922.

No. 49, "Earthquake Reports, New Zealand": Register from the Observatory, Apia, Samoa, for the year 1921, by C. J. Westland.

No. 50, "List of the Most Important Earthquakes registered at the Observatory, Apia, Samoa, from 1913-1920," by Professor G. Angenheister.

As in past years, the Observatory is again indebted to individuals and to institutions for valuable gifts of publications. Some of these are presented in exchange for the bulletins.