

in level are present. Seismological researches, while recording their location, duration and intensity, seek to determine particular causes. They ascertain the physical properties of the earth's crust and interior as revealed by the peculiarities of the recorded waves after their passage through the earth. Instruments as developed by seismological research for the better recording of earth tremors are being used commercially in many ways, not the least important being for the mapping out of underground densities in order to locate minerals and oil without frequent and expensive borings.

During the years for which records are available, Canada has been but slightly affected by earthquakes. Historically, a record shows that the St. Lawrence valley was shaken by a great quake in 1663. In 1899, a great disturbance occurred in Alaska at Yukatat bay, very close to Canadian territory. Slight shocks are very occasionally experienced in British Columbia and along the drainage system from the Great Lakes to the sea, but no damage to property or loss of life has been caused within the past century. It may be said that no active fault lines of any importance are found in Canada.

At present five seismological stations, all maintained by the Dominion Government, are in active operation in Canada, and are situated at Halifax, Ottawa, Toronto, Saskatoon and Victoria. Two of these—at Toronto and Victoria—are under the Meteorological Branch of the Department of Marine and Fisheries, while the three remaining stations are controlled by the Dominion Observatory Branch of the Department of the Interior, with the assistance and co-operation of the universities at Halifax and Saskatoon.

The records for Toronto and Victoria are published from Toronto, whence monthly bulletins are issued to seismological observatories interested, giving full details of all quakes as registered. The records for Ottawa, Saskatoon and Halifax are published from Ottawa. Monthly bulletins are issued to about 230 seismological observatories interested giving full details of the quakes as registered. These are supplemented yearly by a publication giving the location of epicentres of all earthquakes of which any trace is registered at Ottawa. Data are gathered from all the reporting seismological stations of the world.

Regular research work in seismology is carried on at Ottawa where the full time of two seismologists is given to the work of earthquake study alone. The reports are issued in the publications of the Dominion Observatory, Ottawa.

The natural and instrumental data for each station are as follows:—

*Halifax.*—Lat., 44° 38' N.; Long., 63° 36' W.; Alt., 47.3 m. Substrata, carbonaceous slate. Equipment:—Small Mainka Pendulum Seismograph, Mechanical registration. Components N.S., E.W. Mass of each 139.3 kgm. Period of each, 10 sec. Damping ratio of each, 6:1. Magnification of each, about 60. Time is checked automatically each hour by signal from Western Union Telegraph and is to be depended on to one or two seconds.

*Ottawa.*—Lat., 45° 23' 38" N.; Long., 75° 42' 57" W.; Alt., 82 m. Substrata, boulder clay over limestone (Ordovician). Equipment:—(1) Bosch Horizontal Seismographs. Photographic registration. Independent components, N.S., E.W. Mass of each 200 gm. Period of each, about 5.5 sec. Damping ratios, N.S., 2:1. E.W., 18:1. Magnification of each, 120. (2) Milne-Shaw Horizontal Seismographs. Photographic registration. Independent components, N.S., E.W. Mass of each, 1 lb. Period of each, 12 sec. Damping ratio of each, 20:1. Magnification of each, 250. (3) Wiechert Vertical Seismograph. Mechanical registration. Mass, 80 kgm. Period, 6 sec. Damping ratio, 20:1. Magnification, about 160. (4) A deformation Instrument. Photographic registration. Components, N.S., E.W. Mass of each, about 20 gm. Period of each, about 36 sec. Undamped. Used for determination of tilt. The time service at Ottawa is that of the Dominion Observatory and the registration on the record is kept correct to within 0.2 sec.

*Toronto.*—Lat., 43° 40' N.; Long., 79° 24' W.; Alt., 115.5 m. Substrata, sand and gravel on boulder clay to a depth of about 15 m. then shale over crystalline rock (Laurentian) to a depth of about 335.5 metres. Equipment:—(1) Milne Seismograph. Photographic registration. E.W. component. Mass, 0.23 kgm. Period, 18 sec. No damping. (2) Milne-Shaw Horizontal Seismographs. Photographic registration. Independent components, N.S., E.W. Mass of each, 1 lb. Period of each, 12 sec. Damping ratio of each, 20:1. Magnification of each, 150.