

ART. XXIX.—*A Note on East Coast Earthquakes (N.Z.), 1914–17.*

By GEORGE HOGBEN, C.M.G., M.A., F.G.S.

[Read before the Wellington Philosophical Society, 12th December, 1917; received by Editors, 31st December, 1917; issued separately, 24th June, 1918.]

BETWEEN February, 1914, and November, 1917, about thirty earthquakes (not counting shocks of intensity I or II, Rossi-Forel) were recorded at places on or near the east coast of New Zealand. The chief of these were the earthquakes of 6th–7th October, 1914; 28th October, 1914; 22nd November, 1914; and 5th–6th August, 1917. All the shocks came from a region to which in a former paper* I have referred the earthquakes of 9th August, 1904; 9th March, 1890; and 17th February, 1863.

The most marked effects of the first three earthquakes (October and November, 1914) appear to have been noted at Tokomaru and other places a little to the south and south-west of East Cape; but they were sharply felt from Timaru and Greymouth to Auckland. Their intensity was sufficient to throw down chimneys in the Tokomaru district, and to stop some clocks in Wellington and other places.

The movements originating the vibrations appear to have taken place in each of these cases beneath the sea-bed, probably both at the north-east and south-west ends of the three lines *Aa*, *Bb*, *Cc*, beginning at the north-east point, *A*, *B*, or *C*, and ending at the south-west point, *a*, *b*, or *c*; suggesting the existence of three fault-planes whose position is shown by the lines on the map. These conclusions rest on the instrumental records from Wellington and Christchurch (Milne seismographs), and from Apia, Riverview (Sydney), and Batavia (Wiechert instruments), and a large number of memoranda from telegraph officers in New Zealand, forwarded to me by the courtesy of the New Zealand Post and Telegraph Department—which it would take too long to discuss here. (It is quite possible that better records would have made the three lines *Aa*, *Bb*, and *Cc* coincide.)

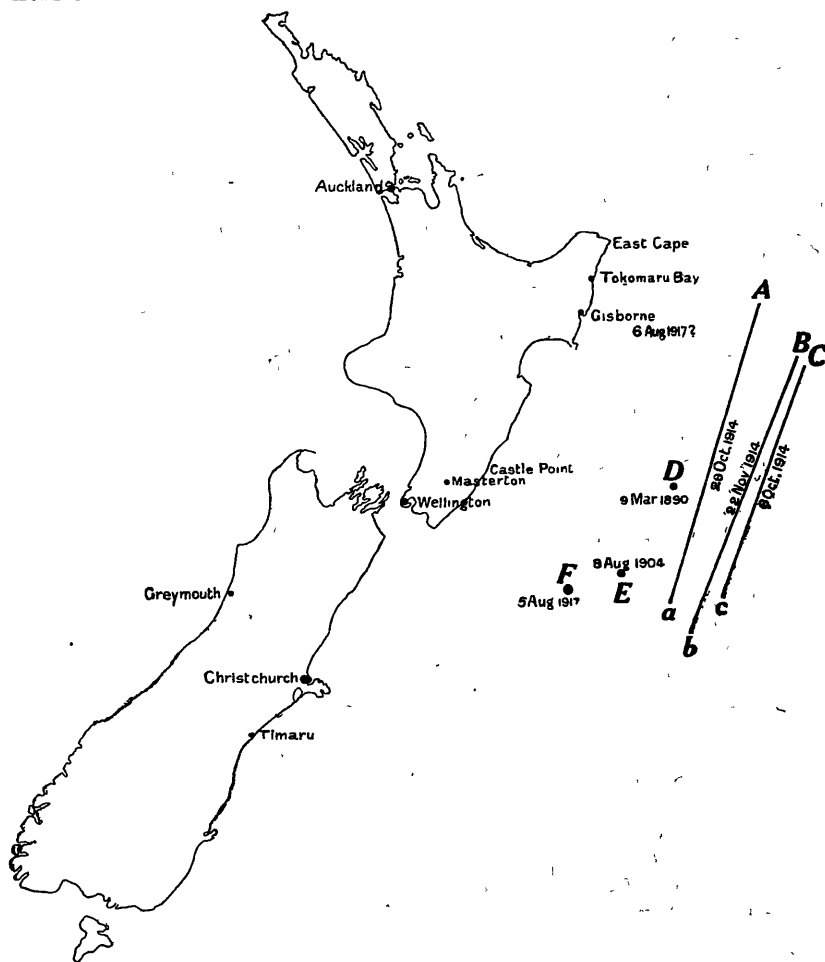
A fact worth noting is that the Milne seismograms of the 6th October at Christchurch and Wellington both showed a considerable tilt of the ground down on the eastern side (7 mm. at Wellington, 5·4 mm. at Christchurch, or 2·28 and 1·76 seconds of arc respectively). This might have been attributed to instrumental causes were it not that a Milne-Ewing duplex pendulum at Wellington, set up on an independent column about 9 ft. from the column on which the Milne seismograph was placed, showed a tilt of corresponding amount nearly towards the south-east. (The needle of the duplex pendulum is, of course, free to move in any direction horizontally, whereas the Milne seismograph records only the E.-W. component of the motion.)

The earthquake of the 5th–6th August, 1917, was most severely felt in the district between Masterton and Castle Point, especially at the former place†—probably because of the alluvial character of the ground on which the town is built. The epicentral area is near *F*, in lat. 42° 41' S., long. 178° 12' E., which is not far from the origin of the earthquake of

* G. HOGBEN, Notes on the East Coast Earthquake of 9th August, 1904, *Trans. N.Z. Inst.*, vol. 37, pp. 421–24, 1905.

† Probably the intensity at Masterton may be described as between VII and VIII on the Rossi-Forel scale.

8th August, 1904. A day later (6th-7th August, 1917) a sharp shock, though not so severe, was felt in the region from Gisborne to the East Cape, evidently from the east or east-south-east. It is quite possible that the latter was from the north-east end of a fault-line of which *F* marks the south-west end. *F* is about 185 miles from Wellington, and 285 miles from Christchurch.



Earthquake origins east of New Zealand.

The times relied upon for the determination of *F* were those of the first phase ("preliminary tremors") at Apia, Samoa, 15 h. 56 m. 27 s. (*Wiechert*); Riverview, Sydney, 15 h. 55 m. 11 s. (*Wiechert*); Christchurch, N.Z., 15 h. 51 m. 24 s. (*Milne*); Wellington, N.Z., 15 h. 51 m. 6 s. These, with a velocity of propagation of 9.17 km. sec., show the time at the origin to have been 15 h. 50 m. 34 s., G.M.C.T., 5th August, 1917 (3 h. 20 m. 34 s., N.Z.M.T., 6th August). The respective distances of the four places named from *F* are: Apia, 3,235 km. (chord); Riverview, 2,538 km. (chord); Christchurch, 456 km.; Wellington, 296 km.

The times and other observations forwarded from New Zealand telegraph-offices, while less exact, afforded a general confirmation of the result obtained from the instrumental observations.