Note on the Diagram of the Earthquake of June 7, 1904.

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With Plates I and II.

1. The earthquake of June 7, 1904, whose time of occurrence in Tokyo was 5h 19m 29s p.m., had a wide area of disturbance, having been felt nearly along the whole Pacific coast of Japan, that is to say, from Nemuro on the north-east to the Shikoku Island on the south-west. Judging from the duration of the preliminary tremor at Tokyo and from the isoseismal lines (Pl. I), the origin of the earthquake was at a distance of about 460 km to the N 55° E of Tokyo, namely, at *lat.* 38° N and *long.* 144°¼ E. The ordinary seismograph observation at the Central Meteorological Observatory was as follows :—

Total duration. 5 minutes.

Maximum horizontal motion. Double amplitude = 1.6 mm ; complete period = 1.0 sec.

Direction of max. hor. motion. SWS-NEN.

Intensity. "Weak."

Character. Gentle.

REMARK. The earthquake began with gentle shakings and the preliminary tremor lasted 56 sec. The above mentioned maximum motion occurred 6 sec. after the commencement of the principal portion. The vibrations were more or less active for about 1 m.

2. *Horizontal Pendulum Observation at the Seismological Institute.* Pl. II shows the earlier portion of the EW component diagram of the

earthquake obtained at the Seismological Institute (Hongo, Tokyo) by means of a horizontal pendulum, whose multiplication was 15 and whose free period of oscillation was 62 sec. In the following description of the seismogram, $2a$ denotes the range, or the double amplitude, of a vibration.

The preliminary tremor, whose duration was 58 sec., began with a vibration, whose period was 6.2 sec.,* and whose two displacements were as follows:—

1st motion.....0.37 mm, toward W;
2nd motion.....0.57 mm, toward E.

Then there followed 7 nearly equal vibrations, which together lasted 45 sec. and had an average period of 6.4 sec.; the maximum $2a$ being 0.63 mm. These were superposed by quick vibrations of macro-seismic character, whose maximum $2a$ was 0.43 mm.

The principal portion began with a displacement of 1.2 mm toward W, followed by a counter motion of 3.2 mm toward E. The next vibration, which occurred 1m 0s from the commencement of the earthquake, was a maximum motion and had the greatest $2a$ of 3.7 mm. The next 5 vibrations, whose average period was 6.7 sec., gradually diminished in amplitude; the max. $2a$ of the superposed quick vibrations being 0.93 mm. At 1m 47s after the commencement of the earthquake, there occurred another maximum, which had the absolutely greatest $2a$ of 4.2 mm, the period being 6.8 sec. The 3rd and 4th maximum vibrations, whose $2a$'s were 3.7 and 2.7 mm, occurred respectively 2m 5s and 2m 46s after the commencement of the earthquake; the period in the later part of the principal portion being 6.4 sec.

The average periods deduced from two successive series each of 50 vibrations, between 6s and 11m 6s after the commencement of the earthquake, were respectively 6.4 and 6.8 sec.; the period thus remaining practically constant throughout the earthquake.

3. What is here to be particularly noted is that the seismogram

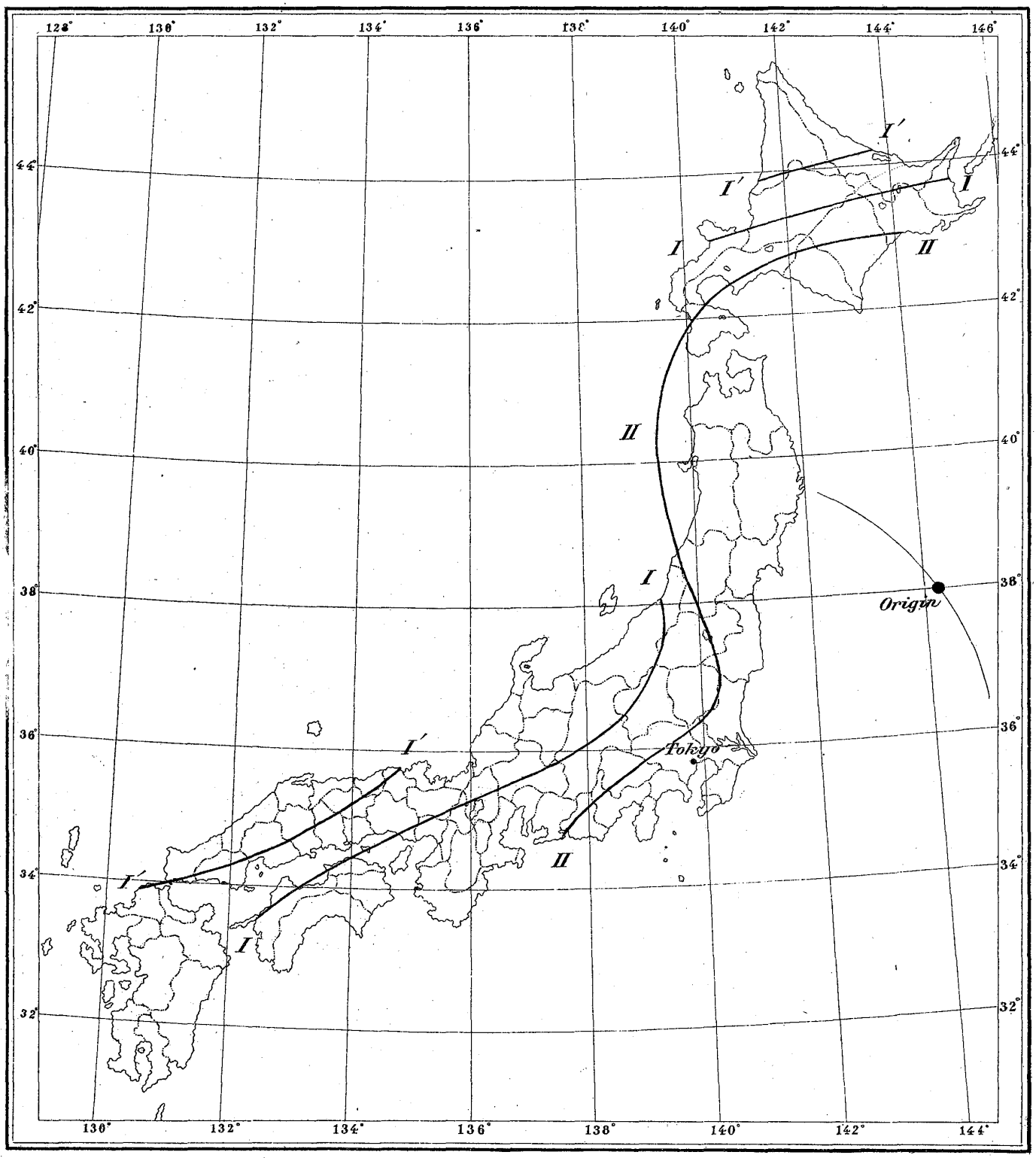
* The term "period" is always used in the sense of the "complete period."

clearly indicates the occurrence of a slow vibration at the very beginning of the earthquake; quick movements of macro-seismic nature appearing a few seconds later on. Similar characteristic is to be seen more or less distinctly in earthquakes, which are not quite local. This fact may be taken as indicating that the smallest and quick-period vibrations do not necessarily possess the highest velocity of propagation. On the contrary, the very first vibration of the earthquake motion must probably be of a nature similar to the pulsatory oscillation; the latter being the predominating component in the preliminary tremor of the distant earthquake motion.

Tokyo. Jan., 1905.

Earthquake of June 7, 1904; 5h 19m 29s p m.

I′ I′ .....Boundary of area of slight *unfelt* motion.
I I ..... „ „ "slight" motion.
II II ..... „ „ "weak" „



Boundary of provinces.

Earthquake of June 7, 1904; 5^h 19^m 32^s P.M.

EW Component. Multiplication=15. Observed at Hongo, Tokyo.