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Observations of the Earthquake at the Student's Observatory (Plate I and II). A.O. Leuschner.

OBSERVATIONS OF THE EARTHQUAKE At The Student's Observatory (Plates I and II). A. O. Leuschner.

The observations consist of instrumental and personal records. The instrumental records are given and discussed in the report of the Sub-committee on "State Instrumental Records." These records were secured with a Ewing three-component seismograph and a Duplex instrument. The first heavy shock put the Ewing Seismograph out of action and the only valuable record secured with it is the one of the maximum vertical displacement, reproduced on plate II. The time and driving-clocks were disarranged at the start so that with this instrument no time record was secured and the smoked glass disc failed to revolve, the friction driving-wheel being forced into the relieving notch by the vertical action. The E-W and N-S pendulums swung beyond their range and off the plate, which indicates that the maximum horizontal displacement of the ground exceeded the range of the instrument which at the time of the earthquake was for E-W and for N-S. The vertical component of the motion of the ground did not, however, exceed the range of the instrument and the record shows that the maximum amplitude of vertical vibration was

The Duplex record is reproduced on Plate I, Figure I, on a scale of 8.5 times the actual motion of the ground. The instrument itself magnifies 4.3 times. In Figure 2, the trace of the pen is reproduced from its initial point B until it becomes lost in the confusion of lines. The directions given on Plate II are chosen so

as to indicate the actual motion of the ground. The pen itself traces a record in the same direction as the ground moves but in reproducing the original record the latter has been turned through 180 degrees on the N-S line, so that W on Plate II represents easterly motion of the ground, and has been so inserted. The record clearly shows that the horizontal vibrations exceeded the range of the instrument which is confined within an ellipse passing through the boundaries of the record. Where the record is bounded by a straight line the pen frequently went off the plate.

The Mean Time Clock of the Observatory stopped at 5h 12m 39s P.S.T.

The personal records consist chiefly of observations of the various phases of the disturbances by members of the Observatory staff, andare [sic] included in the data given by Professor Marvin in his "Primary Discussion of Stopped Clock Data", and in Professor Reid's "Discussion of the Times Reported in Response to the First and Second Circulars." Attention is called, however, to the following facts:

The only reliable record of the beginning of the feeble motion was secured by Dr. S. Albrecht and is given by him as 5h 12m 6s, P.S.T. Dr. B. L. Newkirk, on the other hand, was the only observer who took pains to note

the last sensible motion, for which he gives 5h 13m 11s. The total duration resulting from these observations is 65s. This is possibly not more than 5s in error.

According to my own observations, the earthquake consisted of two main portions. They are based on counting seconds while carrying my small children out of the house. The earthquake came suddenly and gradually worked up to a maximum which ceased more abruptly than it commenced. This lasted for about 40 seconds and was followed by a comparative lull which was estimated at about 10s. The vibrations

then continued with renewed vigor reaching a greater intensity than before and subsiding after about 25s. According to these estimates the total duration of the disturbance was 75s. It is, however, safe to assume that I counted seconds too rapidly in the excitement of the moment and this duration may easily be 10s too long. The total duration of the sensible motion at Berkeley was probably close to 65s.

Dr. Albrecht reports that while he observed several severe shocks, the strongest occurred about 30s to 40s after the beginning.

Dr. Albrecht observed the direction of motion to have been mostly from N.W. to S.E.

To me personally, the most remarkable feature of the earthquake aside from its intensity was the sensation of rotary motion which it produced. While during the heaviest motion my residence, a two-story frame structure, located on the slope of a hill (at 2333 Cedar Street) seemed to be violently rocking in a N.S. direction, the less intense phases of the motion produced the sensation as though the house was settling with circular oscillations, much as the last water in a stationary washstand leaves the basin. The difference of the effect of the earthquake was very marked on the three floors of the house. On the basement floor nothing was disturbed. On the next higher, the main floor, only about 8 feet above the ground, practically no damage was done beyond a few cracks in an east and a south wall, and a few broken dishes. (The house faces south and is one story higher on the front, south, than on the north side. The ground slopes from N.E to S.W.). But several heavy objects on highly polished tables and sideboards were displaced exactly three inches in a South-Easterly direction (S 40° E). Among these was a very top-heavy lamp with a loose glass globe, 10 inches in diameter and 20 inches above the base. Other objects were heavy silver dishes. On the

next, the bed-room floor, considerable havoc was wrought. Every piece of furniture was moved about. A bureau, on which the south-west leg was without a castor, standing against a south wall, was turned from the wall about this leg some 40°. In the study with open book-cases on the north and east walls, practically every book was thrown from the shelves on the north wall and every object thrown off the top, including an electric lamp with a marble base, 6 inches square and weighing 10 pounds. Comparatively few books were thrown from the shelves on the east wall.

Professor Crawford reports that in his residence (2011 Bancroft Way) on alluvial soil) he was fascinated by watching a heavy bureau dance around the room owing to the rotary motion (as well as the bed from which he observed it). An oval picture, 12 and 14 inches in diameter, on a wire two feet long, hanging on a south wall swung clear off the wall and remained hanging with the face toward the wall. These incidents are cited to justify the general description of the earthquake which popularly was designated as a "twister."

At the Student's Observatory nothing was displaced, and no damage was done. But for the havoc wrought with the seismographs the earthquake left no trace in the Observatory, although Mr. Einarson, the assistant, who sleeps in the Observatory, reported a rocking of his bed, which, however, was not very severe.

It has been frequently observed that earthquakes are very much less noticeable at the Observatory, which rests on a rocky eminence 318 feet above sea-level, than in its immediate neighborhood.

The Ewing Seismograph was put in fair working order with all possible dispatch and the first after-shock was secured with it at 9h 51m 55s A.M. P.S.T.