LETTERS TO THE EDITOR.

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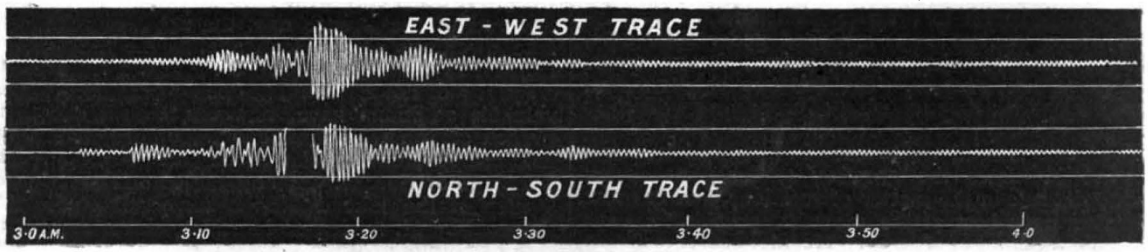
Seismograms of the Earthquake of January 23.

WITH reference to the article on "Recent Earthquakes" in NATURE of January 28, the accompanying records of the earthquake of January 23 may perhaps be of interest. These are from negatives printed from the original curves taken with the Milne twin-boom seismograph at the new magnetic observatory at Eskdalemuir, Dumfries-shire, of which Mr. G. W. Walker is superintendent.

The interval between the breaks in the curve (not shown in the accompanying reproduction) is one hour, and the hour mark near the commencement of the earthquake



corresponds, as nearly as could be ascertained, to 3h. 5m. a.m., G.M.T., January 23. The natural period of both booms is 18·6s., and the sensitivity is such that 1 mm. = 0″·44.

The east-west is clearer than the north-south trace, and a short piece of the latter is omitted, as it is not possible to reproduce it with certainty from the negative.

R. T. GLAZEBROOK.

The National Physical Laboratory, Teddington, Middlesex, February 1.

The Italian Earthquake.

THE able article in NATURE of January 7 (p. 277) by "R. D. O.," and the useful notes appended thereto, have no doubt been read with interest by students of physical geology all the world over. I should like to add a few remarks, which may perhaps be also found useful.

Thanks to the masterly teaching of the veteran geologist Prof. Suess, of Vienna, as first outlined in his smaller work, "Die Entstehung der Alpen," and to the teaching of the Swiss school, we have learned in the last two decades to trace a clearer causal connection between disturbances of this sort and the local architectonic structure of the lithosphere. The essential factor of such phenomena would seem to be the local weakness of the crust, resulting in its yielding, in this area or in that, to variations of stress in those potentially molten portions of the lithosphere, which, while practically rigid under the rapid rotatory motion of the earth (see my letter to NATURE, May 4, 1905, on "The Rigidity of the Earth's Interior"), exist under planetary pressure at temperatures above the solid-liquid critical temperature of the mineral masses of which they are composed.

The variations referred to (whether from cosmic or terrestrial causes) compel portions of the overlying crust, of course, to adjust themselves under the influence of gravitation to the altered mechanical conditions. Such adjustments may, and generally do, occur on lines of ancient "faulting," and may be classified as positive and negative. The former we should expect to occur as downward movements under the direct action of gravitation where faulting occurs in a synclinal flexure, the tendency of the bed-rock being to sag down, and in such cases we get a slip-fault movement. On the other hand, where any part of the force of gravity is resolved into tangential thrusts on or near axes of anticlinal flexures, the fault-movements are almost bound to be of an overthrust nature. Of these two types we may regard the San Francisco earthquake of 1906 as an instance of a slip-fault movement. The later Valparaiso earthquake, on the other hand, would appear to have been due to movement on planes of overthrust faulting in an anticline, and this alone would account for the greater and more widespread devastation witnessed in that case.

Applying this reasoning to the earthquake of December 28 last, we should expect to find that the movement was of the Valparaiso type, and this receives confirmation from the external fissuring of the ground at the surface. A reference to Prestwich's geological map of Europe throws light at once upon the problem. The Messina Strait is seen to be on the axis of an anticlinal flexure, the sea being there less than 100 fathoms deep. The 100-fathom contour is seen to approach the strait at both ends, and then to double rather sharply back, especially on the Ionian side, while the 1000-fathom contour runs in approximate parallelism to it, and much nearer to it on the Ionian side than on the Tyrrhenian side. The faulting, which Prof. Suess is reported to have sketched in the Vienna papers, seems to cut through the Archæan crystalline mass in the north of Calabria, and then to follow its western boundary for some distance further south, coinciding in part with the shore-line. Under the strait itself it seems to bifurcate "in the direction of Etna," according to Suess, but I would suggest along the southern limit of the exposed crystalline mass, which forms the high promontory of the Peloritan mountains, since Taormina appears to have escaped the effects of the earthquake. The point of bifurcation would be the weakest place, and therefore the locality in which the upthrust would be most perceptible. If this is admitted, we may discern here the true cause of the dual wave which swamped the low-lying portions of both Messina and Reggio.

Further, the steepness of the submarine gradients on the south or Ionian side of the area, as compared with those on the Tyrrhenian side, seems to indicate the existence, on a much smaller scale, of conditions which hold good in Japan, where the bed of the ocean rapidly descends to the greatest oceanic depth known on the Pacific side, the "concave" side of the "mountain-wave" (Suess), as compared with the gradients of the "convex side," the shallow Sea of Japan. Prof. Suess (one of our greatest masters) will therefore perhaps allow me to suggest that the seismic movement in the present instance occurred rather on or just outside the rim of the disc-like area of subsidence which is occupied by the Tyrrhenian Sea, an area of which the Lipari Islands with their volcanoes mark an incidental fracture-feature (as worked out years ago by Judd) rather than the centre.

In the view here put forward the minor earthquake shocks felt a fortnight or so later in the Tuscan region, at Ravenna, and other places, would follow as incidents in the more complete adjustment of the geologically young range of the Apennines to the disturbances of previous mechanical equilibrium, caused by the greater disturbance on the other side of the Tyrrhenian Sea, which has startled the world by its results. The differential results in the Messina-Reggio region would seem, further, to be accounted for by sidelong movements of the ground due to overthrust faulting, so terrible always in its effect upon buildings badly constructed and erected upon such loose and incoherent rock-materials as those which constitute the Quaternary and later Tertiary strata, upon which the low-