E layer. Such a deduction is even more probable for the frequency at which the first series of measurements described above was made, there being small possibility of electron limitation being operative so early in the night.

That this view is substantially correct appears to be shown by the remarkably close correlation found in the second series of experiments, which gave the ionisation density directly.

The relation of the results described above to those of Ranzi, which are principally concerned with the occurrence of abnormal night time increases in ionisation, is not so obvious. It seems clear, however, that in seeking an explanation of abnormal night ionisation, the possibility of horizontal movements of the ionosphere must not be overlooked. The phenomena described above strongly suggest the presence of winds at these high levels of the stratosphere.

This work is being carried out under the auspices of the Australian Radio Research Board, to which I am indebted for permission to publish this advance report.

D. F. MARTYN.

University of Sydney.
Dec. 20.

[1] NATURE, **130**, 627, Oct. 22, 1932.
[2] NATURE, **130**, 368, Sept. 3, 1932.
[3] NATURE, **127**, 402, March 14, 1931.
[4] *Phys. Rev.*, **43**, 774; 1933.

Small Sand Craters of Seismic Origin

THE small sand craters of seismic origin, described by Dr. Sheppard in NATURE of December 30 (p. 1006), as examples of unusual structures, are common results of severe earthquakes in alluvial regions. The formation of such vents and their related fissures was first explained by R. Mallet and T. Oldham in the case of the Cachar earthquake of January 10, 1869[1], and their theory was adopted later by R. D. Oldham in his description of the numerous and widely spread occurrences caused by the Great Indian earthquake of June 12, 1897[2]. Briefly, this theory postulates a certain amount of vertical movement from below, resulting in the transmission of the wave motion through layers of loose, oozy sand into the overlying, impervious and harder layers of the surface alluvium. The inertia of the latter is believed to cause a compression of the watery sub-stratum and the expulsion of part of its contents through simultaneously formed cracks above, usually as a geyser-like flow. The spurting which reliable eye-witnesses state takes place on these occasions, the return of the water when quiescence is attained and the formation of the craters with their scored sides, are all accounted for satisfactorily by this theory.

The epicentral tract beneath which the Pegu earthquake of May 5, 1930, originated, happened to form part of a vast alluvial plain in Lower Burma, and sand vents, craters and sloughs were produced over wide expanses of country as a result[3]. Similarly, after the Pyu earthquakes of December 3 and 4, 1930, in Upper Burma, many examples were noted in suitable places, for their formation demands a bed of watery sand, overlain by a thick deposit of clay[4]. In no case, so far as they were examined either by my colleagues or myself, was any evidence found to lead to a modification of the older theory, still less to adopt the belief that they originated in a subsidence of the land, followed by a restoration to its original level, as stated by Sheppard. Insufficient attention has been paid in the past to the action of gas which may be so liberated from water-bearing strata charged with decomposing organic matter in such situations, but this would in any case only intensify the known, mechanical, surface effects of the disturbances.

The suggestion that the sandstone dykes of the Tertiary formations of south-western Ecuador may have been injected during earthquakes, recalls Kendall's identical explanation of the sandstone dykes and "fossil sand blows" of various parts of the British Coal Measures[5].

J. COGGIN BROWN.
(late Superintendent,
Burma Party, Geological Survey of India).
"Dunelm", Broxbourne,
Herts.
Jan. 19.

[1] R. Mallet and T. Oldham, *Quar. J. Geol. Soc.*, **28**, 255–270; 1872. T. Oldham, *Mem. Geol. Surv. Ind.*, **19**, 46–60; 1882.
[2] R. D. Oldham, *ibid.*, **29**, 85–111; 1899.
[3] J. Coggin Brown, P. Leicester and H. L. Chhibber, *Rec. Geol. Surv. Ind.*, **65**, 253–255; 1931.
[4] J. Coggin Brown and P. Leicester, *Mem. Geol. Surv. Ind.*, **62**; 1933.
[5] P. F. Kendal, *Proc. Geol. Soc.*, Jan. 17, 1919.

The Infinite and Eternal Energy

I SHALL be obliged if any reader of NATURE can give me the reference for Herbert Spencer's statement that:

"Amid the mysteries that become more mysterious the more we examine them, we find the one certainty that we are in the presence of an infinite and eternal energy from which all things proceed."

I quote from memory of reading this statement some forty years ago. I think it was in the form of a letter on the completion of the "Synthetic Philosophy". I have failed to trace it at the British Museum or in Herbert Spencer's works, and the Herbert Spencer Trustees have been unable to find the reference for me. Prof. Wilhelm Ostwald had not heard of it, and he asked me for the reference; but I was unable to give it to him.

It was widely quoted and commented upon in the Press at the time it was published. Consequently, it is strange that there should be any difficulty in finding the reference.

DONALD MURRAY.
Villa Waitemata,
59 Boulevard de l'Observatoire,
Monte Carlo.
Jan. 17.

Tidal Bores

IN NATURE of February 3, p. 180, reference is made to a suggestion by Dr. Vaughan Cornish that a co-operative study of the Trent Bore should be undertaken by a group of students, equipped with tide-gauges, etc.

The late Mr. Champion devoted much time to observations in the Trent, using a special tide-gauge, at a large number of places. At his death we undertook to examine and collate all his material, which was presented to us by his sister. This work is nearly completed, and the results will shortly be published. The characteristic shape of the bore in detail, size, rates of travel, etc., have been deduced for a number of stations.

A. T. DOODSON.

Liverpool Observatory and Tidal Institute,
The Observatory,
Birkenhead.
Feb. 2.