LETTERS TO THE EDITOR.

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Cyclones.

MR. DEELEY'S suggestion (NATURE, January 16, p. 385) that the cyclone is caused by the high temperature of the stratosphere does not seem to me to be feasible for the following reason:—Owing to the temperature inversion, or, at least, to the cessation of the lapse of temperature with height, the boundary between the troposphere and stratosphere is, in general, perfectly definite, as definite almost as the boundary between layers of oil and water would be. If, then, any sort of sucking action—to use an incorrect but convenient expression—were exerted by the lightness of the air above the boundary, it ought to draw up the boundary itself as well as the air below it. This is exactly the reverse of what happens; the boundary bulges out downwards in the cyclone and upwards in the anticyclone.

A special case has just occurred. From January 4 to January 8 the barometer in England S.E. was exceptionally low, and observations on the upper air were obtained on January 6. The beginning of the stratosphere was found at the low height of 7·5 km.—10·7 km. is the average; the temperature of the stratosphere was 10° C. above its average for January, and the troposphere 6° below. Take the analogous case of a layer of oil floating on a layer of water; if a disc of the oil be warmed by any means it will expand outwards, and the same mass will cover a larger surface, with the result that the common horizontal boundary will rise. Conversely, if the oil be cooled, the common boundary will sink. Exactly the opposite result was found on January 6.

But if we postulate an outward radial sucking force acting horizontally on the water just below the common boundary, the water will rise from below at the centre, the common boundary will fall, and the layer of oil above will thicken, and this is just what occurs in the layers of air. I have shown elsewhere (Journal of the Scottish Meteorological Society, 1913, p. 309) that on this supposition the observed changes of temperature follow as a natural corollary, but I do not see how an outward acceleration can be applied horizontally to the layers of air near the top of the troposphere.

W. H. DINES.

Benson, January 17.

WHILE the subject of cyclones is being discussed in NATURE, I should like to direct attention to a point which I have already treated in a paper read before the Royal Society of Edinburgh in January, 1916. It is there pointed out that though the core of a cyclone is colder than the core of an anticyclone or than the surrounding air, yet the air in the cyclone is lighter than that in the anticyclone. This decrease in density is due to the air being under a lower pressure. It is shown that the lower pressure in cyclones more than compensates for their lower temperature, so that though the air in cyclones is colder, yet it is lighter than the surrounding air, and tends to ascend in the troposphere as well as in the stratosphere.

JOHN AITKEN.

Ardenlea, Falkirk, January 17.

End-Products of Thorium.

IN a letter to NATURE of May 24, 1917, Prof. Soddy states that 65 per cent. of thorium-C expels first a β- and then an α-ray, transforming into an isotope of lead, and suggests that (on the analogy of radium-D) this isotope of lead may be further disintegrated. He says that he has detected the presence of thallium in thorite in amounts that sufficed for chemical as well as for spectroscopic identification, and suggests that the lead isotope referred to may be transformed into thallium owing to an α- and β-change. If thallium were an end-product of thorium, we should expect that it would be found in all thorium minerals, unless, of course, these have been sufficiently altered to account for the removal of the products. I have lately been engaged in the examination of thorianite for Prof. Joly, the chief object of the investigation being the determination of the proportion of thallium, if any, and its relation to thorium. I have not been able to detect any thallium in the mineral, and I am confident that it does not contain even 0·005 per cent.

J. R. COTTER.

Iveagh Geological Laboratory,
Trinity College, Dublin, January 8.

COMMERCIAL AVIATION AND THE LARGE AEROPLANE.

THERE is now no doubt that every possible attempt will be made to utilise aviation for commercial purposes, and that one of the first questions to be settled is the choice of the best type of machine for such uses. While small machines of the "scout" type may be of considerable utility for the rapid transport of single passengers or small quantities of goods on special occasions, it seems certain that the representative type of the commercial aeroplane will be a large machine capable of carrying considerable loads.

Several very long flights have already been made with large aeroplanes, and particular mention may be made of Gen. Salmond's pioneer flight from Cairo to Delhi in December last, when a distance of 3200 miles was covered in 45 hours' actual flying-time. In view of such feats as this, it is obvious that the establishment of an effective mail service is well within the capabilities of existing aeroplanes, and merely awaits the necessary capital and organisation. If, however, the air is to be used as a medium for the transport of goods in considerable quantities, machines of much greater carrying capacity than any yet built will be required, and the question at once arises as to the limiting size of machine which can be satisfactorily designed.

Much has been written on the subject of the large aeroplane. An excellent survey of the development of the present giant machines appeared in *La Nature* for November 16 and 30 from the pen of Lieut. Lefranc; but the author did not commit himself as to future possibilities in the direction of increased size. Mr. Handley Page has been very successful in building large aeroplanes, and his latest machine may be taken as representative of the stage which has now been reached. This machine has a span of about 127 ft., and weighs 27,000 lb. when fully loaded. With sufficient fuel for a 500-mile flight it could carry