In the chapter on water much attention is devoted to the important question of sterilisation, and although the authors give a brief historical sketch of the subject of chlorine sterilisation, they fail to mention the pioneer work of Houston, who, so far back as 1905, was the first to apply the treatment to the whole water supply of a town when he undertook the sterilisation of the water supply of Lincoln, and who now controls the chlorination of a large part of the London water supply. The question of dose in relation to period of contact of the water with the sterilising agent seems to require some modification.

The authors show great ingenuity in finding a use for all sorts of waste materials, such as empty oil-drums, biscuit-boxes, and petrol-cans; in fact, it appears that the complete sanitary officer must not only be highly skilled in medical and sanitary science, but also have some considerable knowledge of such trades as bricklaying, carpentry, metal work, and a host of others, besides knowing something of allotment gardening and poultry farming.

The book is well illustrated with clear and well-drawn diagrams, and concludes with what appears to be a most complete and useful index.

D. B. B.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

Propagation of Sound and Light in an Irregular Atmosphere.

I SUPPOSE that most of those who have listened to (single-engined) aeroplanes in flight must have noticed the highly uneven character of the sound, even at moderate distances. It would seem that the changes are to be attributed to atmospheric irregularities affecting the propagation rather than to variable emission. This may require confirmation; but, in any case, a comparison of what is to be expected in the analogous propagation of light and sound has a certain interest.

One point of difference should first be noticed. The velocity of propagation of sound through air varies indeed with temperature, but is independent of pressure (or density), while that of light depends upon pressure as well as upon temperature. In the atmophere there is a variation of pressure with elevation, but this is scarcely material for our present purpose. And the kind of irregular local variations which can easily occur in temperature are excluded in respect of pressure by the mechanical conditions, at least in the absence of strong winds, not here regarded. The question is thus reduced to refractions consequent upon temperature variations.

The velocity of sound is as the square root of the absolute temperature. Accordingly for 1° C. difference of temperature the refractivity $(\mu-1)$ is 0·00183. In the case of light the corresponding value of $(\mu-1)$ is $0{\cdot}000294 \times 0{\cdot}00366$, the pressure being atmospheric. The effect of temperature upon sound is thus about 2000 times greater than upon light. If we suppose the system of temperature differences to be altered in this proportion, the course of *rays* of light and of sound will be the same.

When we consider mirage, and the twinkling of stars, and of terrestrial lights at no very great distances, we recognise how heterogeneous the atmosphere must often be for the propagation of sound, and we need no longer be surprised at the variations of intensity with which uniformly emitted sounds are received at moderate distances from their source.

It is true, of course, that the question is not exhausted by a consideration of rays, and that we must remember the immense disproportion of wave-lengths, greatly affecting all phenomena of diffraction. A twinkling star, as seen with the naked eye, may disappear momentarily, which means that then little or no light from it falls upon the eye. When a telescope is employed the twinkling is very much reduced, showing that the effects are entirely different at points so near together as the parts of an object-glass. In the case of sound, such sensitiveness to position is not to be expected, and the reproduction of similar phenomena would require the linear scale of the atmospheric irregularities to be very much enlarged.

June 7. RAYLEIGH.

The Drift of Meteor Trails.

IN the Astronomical Column of NATURE of May 23 there appears a note on the currents in the upper air as revealed by the direction of drift of the streaks left by meteors. Before we can say with certainty, however, that such drift represents movement of the air, we require to know the real nature of a meteor trail. The ordinary view seems to be that the trail is composed of air heated by the meteor in its flight through the atmosphere, the heating being produced not so much by friction as by the compression of the air in front of the meteor. But is it physically possible for a mass of air so heated to retain its heat so as to remain luminous for any length of time? Streaks have been seen which remained luminous for more than two hours, and though this is exceptional, yet any explanation which would account for long-enduring trails would apply also to the more transient kinds. Is it not possible that the trail is an electrical phenomenon akin to an auroral streamer, or to the patches of light seen during an aurora? The movement of both trails and streamers is usually towards the east, but both more rarely move in other directions. The movement in the case of the aurora is presumably due to the passage of electrified particles moving in the earth's magnetic field, and deflected by it. Is it possible that a meteor trail is due to the passage of electricity through rarefied air that may have been ionised by the passage of the meteor?

It is difficult to imagine that there are definite air currents in the upper part of the atmosphere. It is true that balloons have not explored the atmosphere much above twenty miles, and that meteor trails are far higher. But it is difficult to suppose that conditions are other than isothermal, in a vertical direction, above the base of the stratosphere, however high one may go. If this is so, there would be no vertical circulation; and if there is no vertical circulation, could there be any horizontal circulation? There is usually a marked falling-off of the wind as a balloon enters the stratosphere. Perhaps some of your readers more versed in dynamical meteorology, and in the question of the passage of electricity through rarefied air than I am, can throw light on the problem.

June 4. C. J. P. CAVE.