of these sections is arranged so far as possible alphabetically, so that ready reference is greatly facilitated. We thus have a concise and practical dictionary which should be found of very general utility.

Murray's Handbook of Travel-Talk. Nineteenth edition. Pp. 688. (London: Edward Stanford, 1905.) Price 3s. 6d.

THAT this little pocket-book meets the requirements of travellers is shown by the fact that this is the nineteenth edition that has been issued. The success of such a companion depends mainly on the arrangement and scope of the material which it contains, and on these points it seems difficult to suggest any improvements. This edition is divided into fourteen distinct but comprehensive groups of subjects, each one containing exclusively those words and phrases which naturally belong to each section. Great pains seem to have been taken to bring the information up to date, motoring, for example, having quite a large part devoted to it. The Britisher is equally helped in either French, German, or Italian, and such a *vade mecum* as is here presented should be found of great service to everyone who crosses the Channel.

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.*]

The Pressure of Radiation on a Clear Glass Vane.

IN NATURE, June 29, a letter from Mr. G. F. Hull appeared under the above title. In it the writer claims to have verified experimentally that the pressure upon a transparent vane is equal to the difference in the density of energy in front of and behind the vane, and reference is made to a difference of views regarding the theory of the pressure in a non-absorbing medium.

In regard to the latter point, the same result is obtained for the particular case in question whether the beam of light is considered simply as a carrier of momentum or whether the pressure due to radiation is regarded as arising from a mechanical bodily force integrated throughout the material medium in which the radiation is being propagated. Consider the latter theory for steady radiation consisting of plane polarised waves of simple harmonic period $2\pi/\kappa c$ propagated along Ox (see Larmor, *Phil. Mag.*, vol. vii., p. 578, 1904).

We have

$$\frac{\epsilon}{c}\frac{\partial Y}{\partial t}=-\frac{\partial \gamma}{\partial x};\quad -\frac{1}{c}\frac{\partial \gamma}{\partial t}=\frac{\partial Y}{\partial x};$$

where ϵ is complex if the medium is absorbing.

The mechanical force per unit volume is directed along Ox and is given by

$$F=\frac{1}{c}\gamma\ .\ (\text{true current})=-\frac{\partial}{\partial x}\left[\frac{\gamma^2}{8\pi}+\frac{1}{8\pi\kappa^2c^2}\left(\frac{\partial Y}{\partial t}\right)^2\right].$$

If all the interfaces are perpendicular to Ox, then γ and Y are continuous throughout, whether the medium vary continuously or abruptly; consequently the mean value of the mechanical force upon any slice of the medium can be expressed as a pressure per unit area upon each surface equal in amount to the mean value of $(\gamma^2+Y^2)/8\pi$ at the surface. Thus for any vane suspended in free æther (or air) the resultant mechanical force is equivalent to a pressure per unit area equal to the difference in energy-density in front of and behind the vane.

The apparent confusion arises from the usual statement that the mean value of γ^2+Y^2 can only vary along Ox in the case of an absorbing medium, but this is true only for progressive waves. For a transparent medium of refractive index n conveying progressive and regressive waves the mean value of $(\gamma^2+n^2Y^2)/8\pi$, or the mean value of the energy density, is constant; but the mean value of $(\gamma^2+Y^2)/8\pi$ varies harmonically along the direction of propagation. For a plate extending from $x=0$ to $x=h$, and subjected to a normally incident beam of mean energy-density I, it can easily be verified that the mean value of $(\gamma^2+Y^2)/8\pi$ within the plate is equal to

$$I\{(n^2+1)^2-(n^2-1)^2\cos 2n\kappa(h-x)\}/\{(n^2+1)^2\sin^2 n\kappa h+4n^2\cos^2 n\kappa h\};$$

consequently the resultant pressure is equal to

$$2I(n^2-1)^2\sin^2 n\kappa h/\{(n^2+1)^2\sin^2 n\kappa h+4n^2\cos^2 n\kappa h\},$$

or equal to $2J_0I$, where J_0 is the normal reflecting power of the plate for the radiation used.

T. H. HAVELOCK.

St. John's College, Cambridge, July 14.

An Omitted Safeguard.

IN two schemes set out in a recent issue of NATURE, one dealing with the requirements of Oxford and one with the organisation of applied science in London, there appears a noteworthy omission.

If the weather is proverbially the first topic of conversation of Englishmen, it is surely because of the influence it has on the well-being of the community.

Yet in both the schedules referred to no provision is made for research in meteorology. It is singular how tardy is the recognition of so important a factor in the national welfare. It is to meteorology that we constantly appeal for help. By its daily survey of rainfall it safeguards our water supply (now a very anxious problem, being outpaced by the ever-increasing demands of population, sanitation, railways, or manufacturing machinery). We turn to it for the comparison of localities and to study the effects of climate or fog upon health and disease, or to ascertain the relations of temperature, sunshine, or rainfall to the prosperity of the crops and fruit gardens. We look to the readings of the barometer to protect the safety of those working underground. Meteorology takes cognisance of the force of the wind for the protection of structures, or of storms likely to imperil the mariner on his voyage, and by the extension of, and the improved modes of, forecasting the weather is becoming each year of greater service to all.

Without encroaching further upon the limits of your space, sufficient has perhaps been said to show *primâ facie* grounds (while so much is proposed to be devoted to physics, geology, or botany) for the consideration of a possible chair in meteorology, or for in some other way repairing an omission of so serious a kind in the schemes lately propounded. The large amount devoted annually to meteorology in the United States shows the appreciation of its utility to all classes of the community by so practical a people as the Americans, and that the outlay is amply recouped by the value of the services rendered by it.

RICHARD BENTLEY.

The Hydrometer as a Seismometer.

IN NATURE of June 29 Mr. Bennett discusses the motion of a floating hydrometer when vertical motion is imparted to the (rigid) vessel containing the (incompressible) fluid in which the hydrometer floats. The solution offered is that the whole system moves precisely as a rigid body would move, and this solution clearly satisfies the very simple equations of motion in the problem considered. But is such motion stable? In general it is not, and I believe that Faraday studied experimentally the "crispations" of a free surface of liquid when small vertical oscillations were imparted to the containing vessel.

This hardly affects Mr. Bennett's conclusion that a floating hydrometer is an unsatisfactory form of seismometer, but perhaps it may explain the positive results which some observers have obtained; elastic yielding of vessel or hydrometer, although conceivably an adequate explanation, is not the only one open to us.

Cambridge. C. V. BURTON.