vary nearly so much as the calculated temperatures.

Our platinum temperatures for all gases so far examined vary with the mixture strengths very much at the same rate as the calculated temperatures, but they are many hundreds of degrees below them[4]. It has been suggested that this is because they require a very large correction for radiation loss. We have given many reasons for the view that our measurements (which we have always given uncorrected for radiation loss) do not require a correction of more than about 40° C. even at the highest temperatures, and indeed if they did they would be much above the sodium temperatures in the neighbourhood of the 'correct' carbon monoxide – air mixtures (see Fig. 1).

Our measurements were made during the prepressure period in gaseous explosions, and we took continuous records for a considerable time after the flame front had passed over the platinum wire, but there were no signs of increasing temperature. Indeed the temperature remained remarkably steady.

It was mainly for these reasons that we felt justified in postulating that flame gases hold a long-lived latent energy, which in flames burning at atmospheric pressure seems never to be less than about 15 per cent of the heat of combustion, and in the case of carbon monoxide flames is of the order of 20 per cent.

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[1] David and Jordan, *Phil. Mag.*, **18**, 228; 1934. David, *Engineering*, Nov. 2, 1934.
[2] *Trans. Faraday Soc.*, **28**, 826; 1932.
[3] *J. Amer. Chem. Soc.*, **53**, 1, 869; 1931.
[4] David and Jordan, *Phil. Mag.*, **17**, 172; 1934; and **18**, 228; 1934; and many series of unpublished results.

Stokes's Formula in Geodesy

IN NATURE of February 20, 1932, a letter appeared from Mr. B. L. Gulatee under the above heading. This was responded to by Mr. Walter D. Lambert in the issue for June 4, 1932.

Mr. Gulatee showed me his letter before he sent it off, we discussed it together, and on the whole I agreed with it; but during the past year I have given much attention to the application of Stokes's method to the determination of the earth's figure, and a paper on the subject has just been communicated to the Royal Society.

I am now convinced that, while Mr. Gulatee's letter is generally correct in the statements made, it gives a wrong impression of the case. Mr. Gulatee said, "I believe it will never be possible to use it [Stokes's method] for getting absolute elevations". My recent studies have convinced me that it will be possible to do so.

Mr. Gulatee gave some figures showing a particular case as example in which an error of 0·01 gal in '*g*' would lead to an error of 40 ft. in geoidal elevation, and he added that "A systematic error of 0·01 in zones from 40°–100° and of − 0·01 in zones from 130°–170° would vitiate the results hopelessly", which is very true. Systematic errors are very much to be guarded against and it is essential that all possible precautions be taken to avoid them. However, a systematic error of 0·01 over the whole globe would lead to zero error of geoidal elevation; and it is artificial to suppose that systematic error should prevail over one half (nearly) of the globe and then reverse its sign for the other half, as suggested in the quoted passage. When a considerable region of the earth, such as 100,000 square miles, is to be represented by a single gravity determination, it is no doubt true that the observed anomaly will deviate from the mean value for the area; but *not* systematically. The deviation, which may be called the 'representative error', is mainly of the nature of an accidental error, due to irregularities in the earth's crustal density; and so the combined effect of such errors in each of some 2,000 elementary areas of quadrature should be very different from what was suggested by Mr. Gulatee.

In my paper, alluded to above, I have gone carefully into this matter. I find that, with 1,700 stations evenly spaced over the earth's surface, combined with 100 stations suitably distributed locally, the probable error of geoidal elevation at a point will be ± 34 ft.; while the probable error of tilt, found from a derived formula, will be ± 0·35 in.

It is to be noted that 34 ft. is only $1{\cdot}6 \times 10^{-6}$ of the earth's mean radius, and such precision is of the same order as, though smaller than, the lowest estimates of probable error of the earth's mean radius. For fixing the elevation of the origin of a large survey, which is a practical requirement, the accuracy is ample in relation to the standard of accuracy of the survey; and there is every justification for making the necessary gravity determinations to enable the calculations of geoidal rise and tilt to be carried out.

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Three-fold Magneto-ionic Splitting of the Radio Echoes reflected from the Ionosphere

THE phenomenon of reflection of radio waves from the ionosphere and the observed echo patterns has received satisfactory explanation from the magneto-ionic theory, first put forward by Appleton[1].

It is well known that a dispersion formula can be easily obtained from the generalisation of Lorentz's treatment of the problem of the propagation of the electromagnetic wave in a magnetic field. For vertical propagation, when damping is negligible, it has been shown that

$$\mu^2 = 1 + \cfrac{2}{2\alpha - \cfrac{\gamma_T^2}{1+\alpha} \pm \sqrt{\cfrac{\gamma_T^4}{(1+\alpha)^2} + 4\gamma_L^2}} \quad . \; . \; . \; . \; (1)$$

where

$$\alpha = -\frac{n^2 m}{N e^2} - a\,,\ \gamma_T = \frac{n\,h_z}{eNc} \text{ and } \gamma_L = \frac{n\,h_x}{eNc}$$

Reflection occurs when μ is equal to zero. From formula (1) we can plot a dispersion curve for various values of N, the number of electrons in a unit volume. It can then be shown that we get μ equal to zero for three different values of N (N_1, N_2, N_3) obtained from the conditions given below.

$$\left.\begin{aligned} 1+\alpha &= -(\gamma_T^2+\gamma_L^2)^{\frac{1}{2}} \quad . \; . \; (a) \\ 1+\alpha &= 0 \;\; . \; . \; . \; . \; . \; . \; . \; . \; . \; (b) \\ 1+\alpha &= +(\gamma_T^2+\gamma_L^2) \;\; . \; . \; . \; (c) \end{aligned}\right\} \quad . \; . \; . \; . \; (2)$$

From these conditions it appears that there will be