

## LETTERS TO THE EDITOR.

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## Visibility of Interference Fringes and the Double Slit.

THE writer has found the following simple arrangement well adapted for the study of the visibility of fringes arising from a double slit and a "source" slit of variable width. A double slit, ruled without any special care on a piece of old photographic negative, was placed on the table of a spectrometer after the usual adjustments had been made. With this arrangement and a sodium flame (Mecker burner) as the source of light, no difficulty was experienced in observing the disappearance and reappearance of the fringes, with gradually decreasing visibility, some seven times.

In the experiment as ordinarily performed (V. Mann's "Manual of Advanced Optics," p. 27) the source slit is at such a distance from the double slit as to render the experiment impracticable, or at least very inconvenient, in many laboratories. Ordinarily, too, a strong source of light is used, whereas the above arrangement permits the use of a monochromatic source. It provides, further, a very simple experiment by means of which the student beginning the study of advanced optics may obtain concrete ideas on the somewhat difficult subject of visibility. With a little practice, estimates of the visibility at successive stages may be made, and the corresponding visibility curve plotted.

To make quantitative measurements, a graduated wheel was attached to the slit of an ordinary Wilson spectrometer, and afterwards calibrated by the aid of a travelling microscope. By this means the width of the slit corresponding to the places of disappearance of the fringes or to any stage of visibility could be read off directly, and in a short time a complete set of measurements taken. The following readings will give an idea of the quantitative value of the experiment:—

Width of double slit ( $b$ ) ... .. = 0.903 mm.

Focal length of lens of collimator ( $f$ ) = 166 "

Mean value of increase in slit width ( $w$ ) for successive orders of zero visibility ... .. = 0.107 "

From which  $\lambda = \frac{bw}{f} = 0.000582$  mm.

The quantity  $w$  is accurate to about 1 per cent. A more accurately calibrated spectrometer slit than was at the disposal of the writer would permit doubtless of greater accuracy in the measurements.

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## Relations between the Spectra of X-Rays.

KOSSEL has found the following relations between the frequencies of the X-ray spectra:—

$$L_{\alpha} = K_{\beta} - K_{\alpha} \quad \dots \quad (A)$$

$$M_{\alpha} = L_{\gamma} - L_{\alpha} \quad \dots \quad (B)$$

As the result of recent measurements, it is known that all these series consist of many more lines. According to T. Malmer the relation (A) of Kossel must take the form:—

$$L_{\alpha_1} = K_{\beta_1} - K_{\alpha_2} \quad \dots \quad (1)$$

Adopting the values for the wave-length given by

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M. Siegbahn (*Jahrb. d. Radioakt. u. Elektr.*), we have, moreover, instead of (B),

$$M_{\beta} = L_{\gamma_1} - L_{\beta_4} \quad \dots \quad (2)$$

$$M_{\gamma_1} = L_{\gamma_2} - L_{\beta_1} \quad \dots \quad (3)$$

I will here also remark that the following relations hold very exactly through all the elements:—

$$\left. \begin{aligned} L_{\alpha_2} - L_{\beta_2} &= L_{\beta_1} - L_{\gamma_1} \\ &= L_{\beta_3} - L_{\gamma_2} + \Delta \end{aligned} \right\} \quad \dots \quad (4)$$

where  $\Delta$  is a constant.

In order to account for these relations, especially (4), Bohr's theoretical formula should be modified as follows:—

$$\nu = \nu_0 \left\{ \frac{(N - C_1)^2}{(n_1 + \mu_1)^2} - \frac{(N - C_2)^2}{(n_2 + \mu_2)^2} \right\}$$

$N$  being the atomic number,  $n_1$  and  $n_2$  certain integers. It should be supposed that  $N - C_1$  and  $N - C_2$  represent the numbers of electric quanta contained in the "effective" nucleus charge. The curve in Moseley's diagram shows further that  $\mu_1$  and  $\mu_2$  are not absolute constants, but vary gradually from element to element.

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## METEOROLOGY AND AVIATION.

A RECENT lecture by Lord Montagu of Beaulieu to the Aeronautical Society has directed attention to the possibility after the war of conveying mails and passengers, and perhaps goods, from place to place by aeroplanes. In suitable weather such transit should present no difficulty save that of expense, provided that landing places can be found in such positions that the stages may not be too long, but it is obvious that the weather is, and must remain, a very important factor for many years to come.

Since the foundation of the Meteorological Office under Admiral Fitzroy a large part of its business has been the issuing of storm warnings at certain selected coast stations for the benefit of shipping; and there is no doubt that such warnings during the fifty years or so in which they have been issued have been of great use, and indeed are so still. But the gradual displacement of sails by steam and the increase of size, with the greater trustworthiness of the engines, have rendered vessels far less dependent upon the weather than they were in Admiral Fitzroy's time, and in these days it is seldom that any regular passenger boat fails to make its passage, though it may be more or less delayed by bad weather. The case is likely to be different with aeroplanes if they are to take the place of mail steamers, and a heavy responsibility will be thrown upon the Meteorological Office or upon whatever body undertakes to issue forecasts for their guidance.

The kinds of weather inimical to aviation are too much wind, low cloud, and fog, and of these fog is perhaps the worst, as it is also in the case of shipping. The ways in which wind affects an aeroplane are various. There is the difficulty of starting and landing, but the days on which this is serious are not numerous, even in a windy country like England. But still there are days when landing is unsafe, and it is the misfortune