LETTERS TO THE EDITOR.

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Effect of a Magnetic Field on Spectra of Helium and Mercury.

THE Department of Natural Philosophy in this University has recently acquired, through a fund provided by the liberality of the Bellahouston Trustees of Glasgow, a fine echelon grating of twenty-six plates made by Hilger, London. The instrument has excellent definition, and its great power enables it to show Zeeman effects with moderate magnetic fields. In conjunction with a new electromagnet which has been constructed for the Department by Messrs. Mavor and Coulson from the same fund, we have been able to make some preliminary observations which may be of interest to readers of NATURE. The magnet and spectroscope were shown at the recent British Association meeting, when some account of the power of the set of instruments was given. The magnet when excited by a current of only five or six amperes gave a field of about 50,000 C.G.S., and was found capable of giving still higher intensities.

We have examined the Zeeman effect for the yellow helium line D_3. The line, as is well known, is a doublet; the wave-length of the brighter component is 5875·883 Ångström units, that of the fainter 5876·206 units. The lines broaden with increasing field, till at 6500 C.G.S. the fainter is a distinct doublet. As the field is increased the components of the doublet separate farther, but we have not observed any further splitting. The brighter of the D_3 pair is not distinctly resolved till the field is 9100 C.G.S., when it appears as a triplet; it remains so in higher fields.

In a very high field, the strength of which was not observed, the green (5460) line of mercury was resolved into nine components.

We have not so far come across any previous statement of these results, though of course they may be well known to observers of magneto-optic phenomena. We are now arranging for careful measurement by photography and otherwise of displacements produced by fields of known strength, in order if possible to answer some of the outstanding questions on the subject.

ANDREW GRAY.
WALTER STEWART.

Physical Laboratory, The University,
Glasgow, November 15.

Observations of Leonid Meteors.

OBSERVATIONS were made of the Leonid meteors with the intention of determining the intensity and epoch of the shower. Unfortunately, however, owing to cloudy weather on November 13 and 14, observations were restricted to the three following nights. The annexed table gives the total number of meteors observed each night:—

	Extreme limits of the period during which observations were made.	Total duration of watches.	Number observed.	
			Leonids.	Other Meteors.
	h. m. h. m.	h.	h.	m.
Nov. 14	13 0–17 50	4¾	106	94
,, 15	11 45–17 35	5	89	89
,, 16	12 15–14 15	2	7	29
Total		11¾	202	212

During the whole of the time of observation the conditions were practically perfect, save that on the 16th there was a haze over the lower part of the sky.

The Leonids were rather less numerous during the earlier watches on the 15th than later on, but otherwise no well-defined variation in their number was noticed during the period of observation. The curious manner in which they came in groups was, however, very marked. One rather striking example of it occurred on the 15th, when three sprang out almost simultaneously, followed by another about four seconds later, and this at a time when the hourly rate was only about twenty. Their brightness varied in most cases between the 1·5 and the 3·5 magnitude, which was considerably above the mean magnitude of the other meteors. Only two meteors brighter than the first magnitude were observed, both of which were Leonids. The latter of these, which was seen on the 16th at 13h. 58m., commenced its path at 11 Monocerotis, and passing directly over μ Leporis, disappeared three degrees beyond. It left a train of irregular width, part of which remained visible for about six seconds.

No very systematic attempt was made to determine the radiant, but as far as could be judged it was at 150° + 23°, and was sharply defined at any rate for much the larger proportion of the meteors. It is, perhaps, worth mentioning that several meteors very similar to Leonids in appearance were observed to radiate from a point a little above the sickle, and it is possible that some of these, or some from other radiants, may have been recorded as Leonids. Doubtful meteors were in all cases counted with the class to which it seemed most likely they belonged.

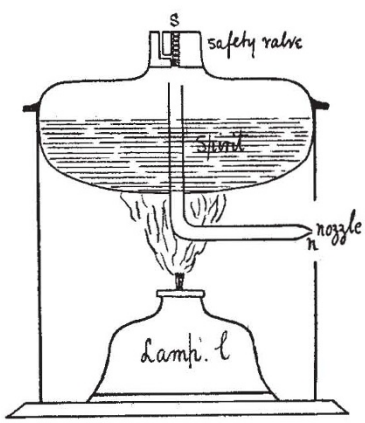
Comparing these observations with those which I made last year I should say that the shower was appreciably more intense this year on the 14th and 16th, and much more intense on the 15th. I should remark, however, that last year I recorded the maximum as occurring during the latter part of the night of the 13th, while on this occasion I have no observations for that period. For the sake of comparison, however, I may say that I consider the shower of the 14th this year about equal in intensity to that of the 13th last year. E. C. WILLIS.

Southwell Lodge, Norwich, November 18.

A Curious Flame.

FOR some time past I have shown as a lecture experiment a vibratory flame which illustrates in a striking manner phenomena similar to those to which Mr. Garbutt directs attention in your issue of October 31.

The flame (which is of the "washed-out" type) is produced by means of a common form of spirit blast-lamp, the construction of which will be sufficiently evident from the accompanying figure. If after using the blast which issues from the nozzle N,



the small subsidiary lamp L be removed from the position shown in the sketch and then placed from three to four inches in front of the nozzle, a blue flame cone will in a second or two dart back from the flame of L to N. The lamp L may now be completely removed, and the flame cone will continue—adder tongue like—to dart back and forth between N and a point three to four inches distant for hours together.

A baffle (in the form, say, of a glass tube or a knitting-needle) held in the track of the vibrating flame at a distance from N less than its normal traverse, will not permit the flame to pass it. But clearly the baffle cannot in this case *permanently* tether the flame cone. It merely curtails the amplitude of vibration without affecting materially its frequency.

If the safety-valve S be replaced by a cork carrying a U-tube the bend of which contains water, there is a rise and fall of water-level synchronising with the vibratory motion of the flame cone. The apparatus thus becomes a heat-engine producing reciprocating motion in an ideally simple manner.

If a small compound strip of ferrotype plate and zinc foil be used to baffle the flow of vapour from N, the strip curls up appreciably every time the tongue of flame licks it, uncurling again in the intervals. By including this strip in an incomplete electric bell circuit the bell may be caused to sound in synchronism with the vibrations of the flame.

Blackheath, November 11. DOUGLAS CARNEGIE.