Letters to the Editor.

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A Focusing Method for Producing Electron Diffraction Patterns.

IT is a well-known fact that divergent electron beams of uniform velocity can be focused by means of magnetic fields. This focusing device is used, for example, in cathode ray oscillographs. It has been found that the focusing principle can be applied successfully to experiments in which electrons are diffracted. The chief advantage, among others, lies in the considerable gain in intensity as compared with the usual methods.

The arrangement is illustrated by the diagram (Fig. 1.). Electrons are emitted from a short spiral filament or flat spiral *A*. A hollow metal cone *B* is placed at a short distance from the filament. This cone has a narrow hole (about 0·2 mm. in diameter) at its apex. The accelerating field is applied between the filament and the cone. *M* is the coil which produces the magnetic field and *S* the specimen under investigation, which is placed at such a distance from the coil that the field is practically zero. *P* is the photographic plate or the fluorescent screen.

The direct rays, after passing through the field coil, converge towards a point *Z* on the plate. The diffracted rays which emerge from the specimen describe a series of cones, the angular opening of which is determined by the individual spacing to which they belong. These cones intersect the plate in ellipses. If, however, the diameter *d* of the diffracting specimen is small compared with its distance *D* from the plate, these ellipses become very nearly circles. The region in which a series of identical cones intersects the plate has consequently a definite width, that is,

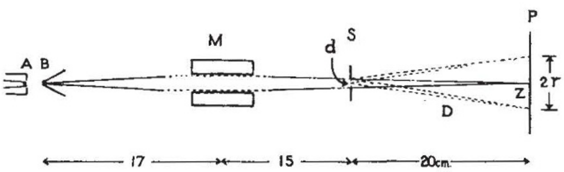

FIG. 1.

the focusing is, strictly speaking, not ideal. The width is approximately $(r/D)^2 d$ where r is the radius of the ring. In the accompanying photographs (Fig. 2), r/D is of the order of 1/10 for the largest ring and d about 5 mm. The width of the rings due to the imperfect focusing is therefore only about 5/100 of a millimetre.

The magnetising current necessary for the focusing depends for a given apparatus essentially upon the velocity of the electrons. The adjustment is so sensitive that the current can be used directly for calibration. In the present apparatus it can be read to about 1 per cent. The determination of the electron wave-length λ is further simplified by the fact that the magnetising current is simply inversely proportional to λ over a fair range.

The use of wide beams also facilitates the otherwise rather difficult preparation of the specimens. It is, for example, feasible to use fine metal gauzes for their support. Local unevenness of the samples becomes less important owing to the averaging effect of the large area exposed.

The intensity of the diffraction patterns is high on account of the large exposed area of the sample. With a single plate Wimshurst (Wommelsdorfsche Kondensatormaschine) giving about 100 microamperes at 20-60 kv., the diffraction rings from metals, salts

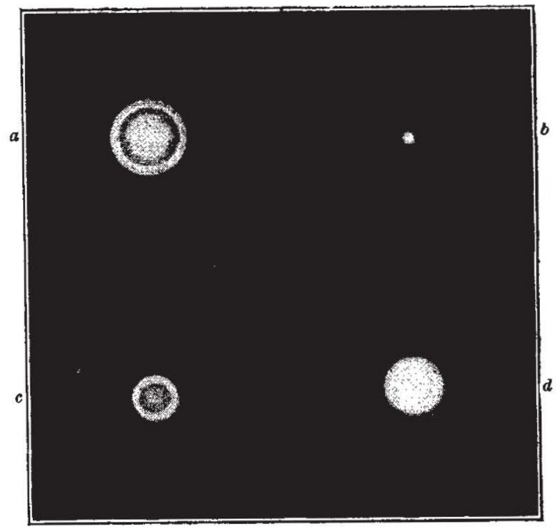

FIG. 2.—Electron diffraction patterns. *a*, Sodium chloride; *b*, gold leaf; *c*, paraffin; *d*, gold film produced by cathodic sputtering.

and paraffins can easily be observed on a fluorescent screen. The time of exposure of a photograph varies from a fraction of a second to a few seconds. The photographs accompanying this note have been obtained under these conditions. The distance specimen to plate was 20 cm.

I wish to express my deepest gratitude to Sir William Bragg for permission to do this work in the Davy-Faraday Laboratory and to Dr. A. Muller, of the same Laboratory, for constant help and valuable advice.

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Davy-Faraday Laboratory,
Royal Institution,
July 23.

Acromegaly in the Far North.

IN his letter in NATURE of Aug. 8 on the pituitristic character of Egil Skallagrimson, Prof. Seligman has brought forward a remarkable subject which made a forcible impression on myself some years ago. His opinion of the Gardariki skull confirms the existence of pituitary disorder among the viking Scandinavians, but he does not allude to the very peculiar features which distinguish Egil's case from common clinical conditions, nor to the interesting heredity which the sagas record.

Egil closely resembled his father, Skallagrim, and paternal grandfather, Kveld Ulf, in "growth, appearance, and bent of mind" (Egla S. xx., xxxi.); while the name of the latter suggests that he recalled his maternal grandfather, Ulf the Fearless, who was ancestor through a son, Hallbjorn, 'Half-Troll' (half-giant), to the equally remarkable family of Ketil Haeng, culminating in Grettir the Strong, whose bones, like Egil's, were dug up in a churchyard and admired for their astonishing size (Gretla S. lxxxiv.).

Gigantism seems to have become endemic in the