Photographs of Cross-Sections of Hollow Pencils formed by Oblique Transmission through an Annulus of a Lens

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connected with alternating currents, more particularly those relating to hysteresis losses. A simple method for carrying out a lot of operations for which the slide-rule is often used, would be to commit to memory the multiplication table up to thirty-three times thirty-three.

XXXIII. *Photographs of Cross-Sections of Hollow Pencils formed by Oblique Transmission through an Annulus of a Lens.* By Miss ALICE EVERETT.*

THESE attempts were prompted by reading an interesting paper by Prof. Silvanus Thompson on "Zonal Aberration of Lenses."

The direct rays of an arc light were allowed to pass through an annulus of a simple convex lens tilted to an angle of 45° with their direction, and placed at a distance of about twice its focal length from the arc. The remainder of the lens surface was blocked out by paper gummed on to the glass. The photographic plate was placed at right angles to the course of the beam, and a series of exposures were made at gradually increasing distances from the lens. The room was darkened, the lamp being enclosed in a box with an opening at one end.

The lens used in the first series was a plano-convex of 3'' aperture, and 16'' focus, the plane side being next the light. The free annulus was $\frac{1}{10}$ of an inch broad, and 1.1 inch mean radius.

In the second series two concentric annuli were employed simultaneously, one near the margin, the other near the centre. The lens in this case was a double convex of $4\frac{1}{2}$ '' aperture, and about 1 ft. focus.

I have to thank the Authorities of the Davy-Faraday Laboratory for the facilities for making the experiments.

* Communicated by Prof. Everett, F.R.S.