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A NEW OPHTHALMOSCOPE

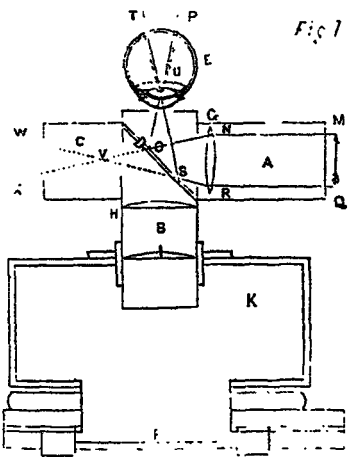
OR PHOTOGRAPHING THE POSTERIOR INTERNAL SURFACE OF THE LIVING EYE.

(From a paper read before the Canadian Institute.) By A. M. Rosebrugh, M D., Toronto.

[This paper was introduced by some remarks on the optics of the eye, showing that the blackness of the pupil under ordinary circumstances, and the invisibility of the parts behind it, depend not upon the total absorption by the choroid of all the rays of light that enter the eye, but solely upon the reflection of the rays by the dioptical media; and that a sufficient number of those rays are reflected from the fundus to be visible to an observer, were it possible for him to bring his eye in the same line with the rays of light illuminating the eye under examination, without at the same time intercepting those rays. This is impossible without some special contrivance for the purpose. It is best effected by substituting reflected for direct light with which the eye is illuminated, the observer placing his eye behind the mirror, and viewing the illuminated fundus through a small aperture in the mirror, as in Liebreich's ophthalmoscope, and simply through a piece (or rather three pieces) of highly polished plate glass with parallel surfaces, as in the instrument originally used by Helmholtz. As employed by Helmholtz, the illumination of the fundus was very feeble, and was soon superseded by the more efficient and convenient instrument of Liebreich, which is the one now in general use by ophthalmoscopists. A fuller report of this part of the paper would render the article too lengthy for our limited space. We will therefore proceed to a description of this new instrument.]

CONSTRUCTION.

The Tubes.—The instrument consists of three brass tubes (A & B, fig. 1,) two inches in diameter, having respectively 4 and 2¼ inches in length. The smaller tube C moves easily in a brass collar fitted to the aperture of the small camera K, and the latter tube A is turned toward the source of



A tube C of the same width, 1¼ inches in length, is joined to the side of the outer extremity of the tube B opposite to and in a line with tube A. The outer extremity of the tube B extends ¼ of an inch beyond its juncture with the tubes A and C, and is terminated by a thin brass diaphragm having a central circular aperture of ⅜ of an inch in diameter.

At the juncture of the tube A with B there is a circular aperture of one inch diameter, and between C and B an aperture of ¼ inch diameter, affording a communication between A and C through B.

The Plate Glass.—At the juncture of the tubes, there is placed an elliptical piece of highly polished thin plate glass with parallel surfaces, which is inclined at such an angle to the tubes that a ray of light falling upon it through the centre of the tube A from the direction M Q will be reflected at right angles to its original direction and in the same plane with the centre of the tube B, which will be through the centre of the aperture in the diaphragm. A portion of the ray will be refracted by the plate glass, and pass through the tube C parallel to its original direction.

The Lenses.—At the inner extremity of the illuminating tube A, and as close as possible to its juncture with the camera tube B, a double convex lens G is placed 1¼ inches in diameter, and having a focal distance of 2¼ inches. In the corresponding position of the tube B, or close to the plate glass reflector, the lens H is placed, convexo-plane of 5 inch focal distance; 1⅜ inches from this is another lens, I, also convexo-plane, and of 5 inch principal focal distance, and having the same diameter, viz. 1¼ inch.

The Camera.—The camera consists of a mahogany box three inches square and seven inches high, having (to secure steadiness) a base six inches square. At the aperture in the centre of the anterior side there is a brass collar fitted, through which slides the tube B containing the lenses. At the opposite side of the camera is a central aperture 2¼ inches square, behind which is a slide with a piece of ground glass 2¼ inches square. This slide moves in grooves for the purpose, and can be removed to make way for a slide containing a sensitized plate also about 2¼ inches square. The whole is contained in a case about 8 inches in height, which serves the double purpose of supporting the instrument when in use, and holding it afterwards.

PHOTOGRAPHING.

As yet I have not attempted a photograph of the retina of the human eye, but have confined my experiments to the lower animals, and have employed solar light only in order to shorten the time as much as possible; but I do not doubt that diffused light, particularly that reflected from a bright cloud, would with a longer "exposure" answer very well. In using the instrument for this purpose, a tripod, or what answers quite as well, a table of