

HAND-HELD APPLANATION TONOMETER*

BY

E. S. PERKINS

Department of Experimental Ophthalmology, Institute of Ophthalmology, University of London

FOR glaucoma screening programmes it is important to have an accurate tonometer which causes the minimum of disturbance to the patient. The Goldman applanation tonometer has all the necessary qualities for this purpose but it is not easily portable. The instrument to be described employs the same principles as the Goldman tonometer but can be held in the hand and does not require a slit-lamp microscope. It can be used with the patient upright or supine.

The prism is clipped on a counterbalanced arm mounted on a pivot to which is attached a coiled spring. A knurled wheel engages with a gear wheel on the pivot and can be turned to increase or decrease the force applied to the prism. Calibration marks show the force applied in grammes (Fig. 1 a, b).

Illumination of the prism is obtained from four miniature bulbs set at the base of a cone of perspex which surrounds the prism. The outside of the cone is painted black to minimize light scatter and the whole cone can be easily removed to give access to the prism. A ring of blue perspex at the base of the cone gives the light the necessary colour for viewing the fluorescein; another bulb illuminates the scale. Magnification is obtained with a +20.00 D lens (Fig. 2).

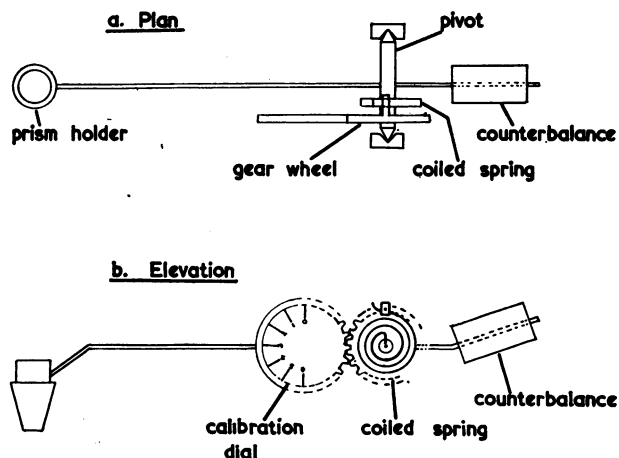


FIG. 1.—Diagram of mechanism: (a) plan, (b) elevation.

* Received for publication January 25, 1965.

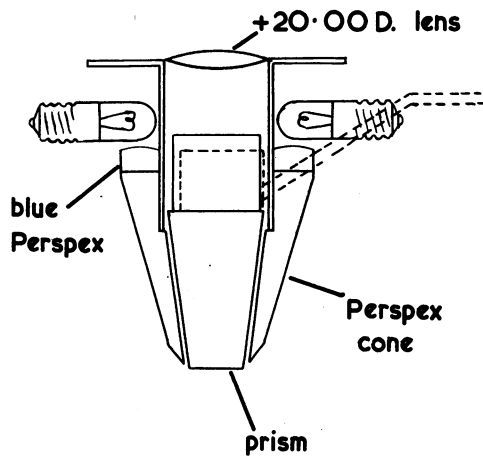


FIG. 2.—Diagram to show details of illumination, perspex cone, and magnifying lens.



FIG. 3.—The tonometer ready for use.

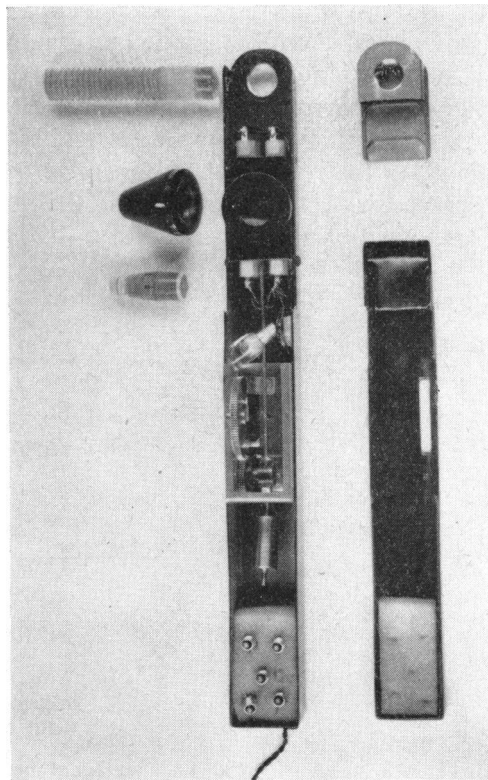


FIG. 4.—The tonometer dismantled to show component parts.

A simple, adjustable forehead rest is provided by a threaded perspex rod mounted above the prism. The instrument is illustrated in Figs 3 and 4.

The eye is anaesthetized with Novesine 0.4 per cent. (Wander) and a solution of fluorescein 0.25 per cent. applied to the conjunctival sac with a glass rod. The force on the prism is adjusted to 1 g. and the forehead rest applied above the eye. The instrument can now be rotated until the prism makes contact with the centre of the cornea and the force adjusted to give the correct reading, as with the Goldmann instrument.

TABLE I
OPEN STOPCOCK CALIBRATION WITH TONOMETER HORIZONTAL

P _o (mm. Hg)	No. of Readings	Mean Tonometric Reading	Range of Tonometric Readings	Standard Deviation
5	6	5.6	4-6	0.81
10	10	9.8	9-11	0.63
15	10	14.9	14-16	0.48
20	10	19.9	19-22	0.99
25	10	24.9	24-26	0.73
30	10	30.0	29-32	0.88
35	10	34.8	34-36	0.79
40	10	40.1	38-42	1.22
45	10	45.2	43-46	1.03

Calibrations of the tonometer in the vertical and horizontal positions were carried out, using a human cornea clamped in a perspex chamber connected to a manometer. The tonometric measurements showed good agreement with the manometric values, although the range of readings tended to be greater at the higher pressures (Tables I and II).

The apparatus has been found particularly useful for laboratory animals.

TABLE II
OPEN STOPCOCK CALIBRATION WITH TONOMETER VERTICAL

P _o (mm. Hg)	No. of Readings	Mean Tonometric Reading	Range of Tonometric Readings	Standard Deviation
5	10	5.7	5-6	0.48
10	10	10.7	10-12	0.67
15	10	15.7	15-16	0.48
20	10	20.3	20-21	0.48
25	10	25.6	25-27	0.62
30	10	30.8	30-32	0.91
35	10	35.3	34-36	0.87
40	10	40.5	39-42	1.08
45	10	45.2	44-46	0.91

Summary

A simple hand-held applanation tonometer is described, which can be used with the patient sitting or lying down.

My thanks are due to Mr. G. Tams for carrying out the calibrations and to Mr. F. H. Sheen for constructing the apparatus.