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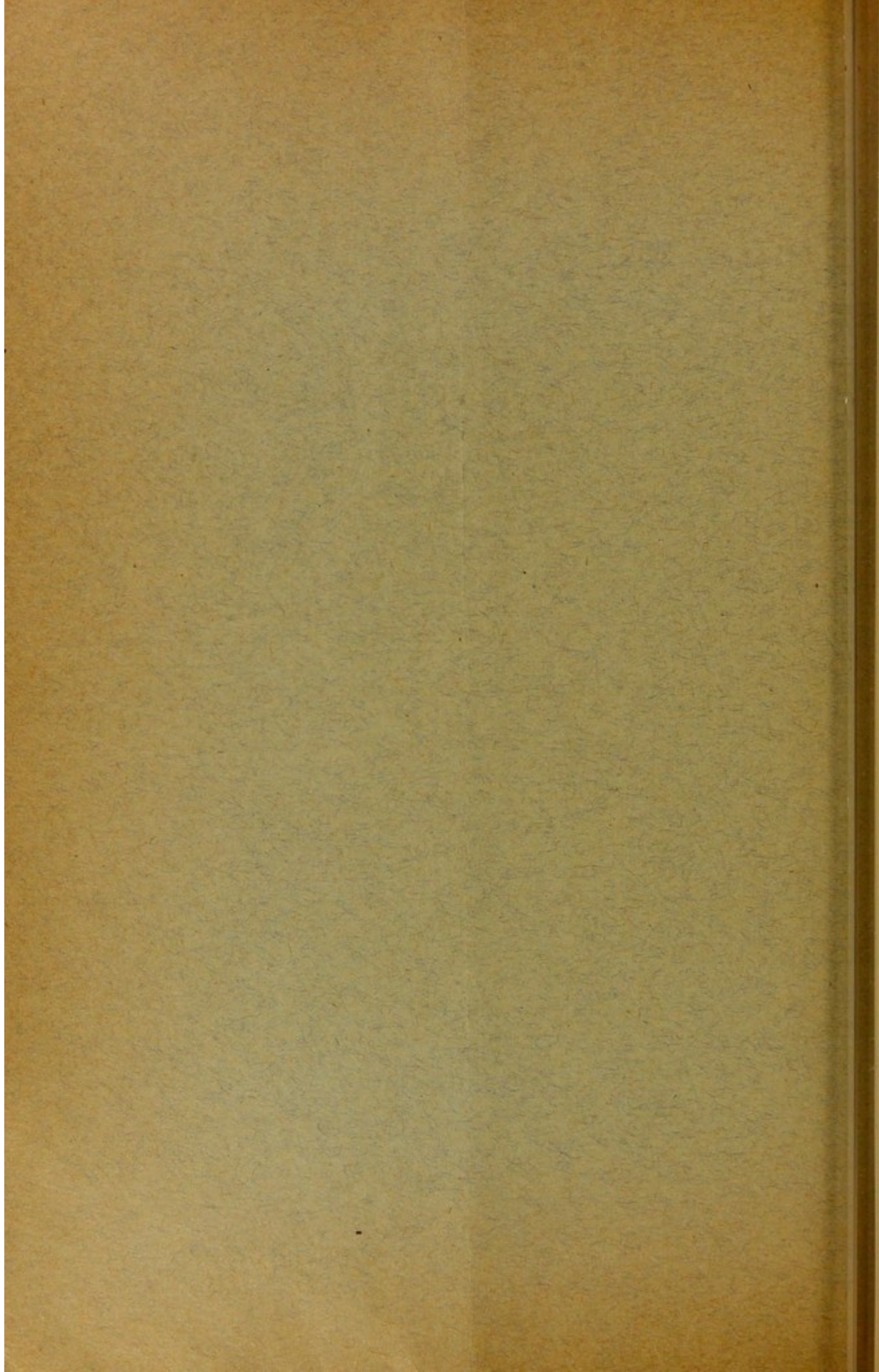
THE TANGENT CURTAIN.

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By A. DUANE, M.D., NEW YORK CITY, N. Y.

(With three illustrations in the text.)







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EIGHT years ago, I exhibited at the New York Academy of Medicine¹ and afterwards before the American Ophthalmological Society² a tangent plane for delimiting scotomata, and for mapping the double images with precision, and for other purposes. Since then the original instrument exhibited has been in continual use in my office, and its value is such that I should scarcely know what to do without it.

The original instrument was a rather rough but quite serviceable model. Two or three copies have been made for their own use by men who had worked with me, but the instrument has never been put on the market until this year, when Messrs. Gall and Lembke, following certain suggestions of mine, have produced an improved model, a description of which is here subjoined. The appliance is very much like one devised by Syms and Sinclair.³ As so often happens, these two observers and I, each working without knowledge of the other's investigations, elaborated a like conception for a like purpose.

The tangent curtain (Fig. 1) consists essentially of a curtain, black on one side and white on the other. The front or black side is made of outing flannel and this is stitched onto the rather stiff, unbleached muslin that forms the white backing. On the white side is drawn a perimetric chart consisting of a

¹ Meeting of January, 1906.

² *Trans. Am. Ophth. Soc.*, xi., part 1 (1906), p. 67. From the latter much of the present description is borrowed.

³ *Ophthalmic Review*, May, 1906.

series of lines radiating from a common center; each line forming an angle of 15° with its neighbor. The surface is further

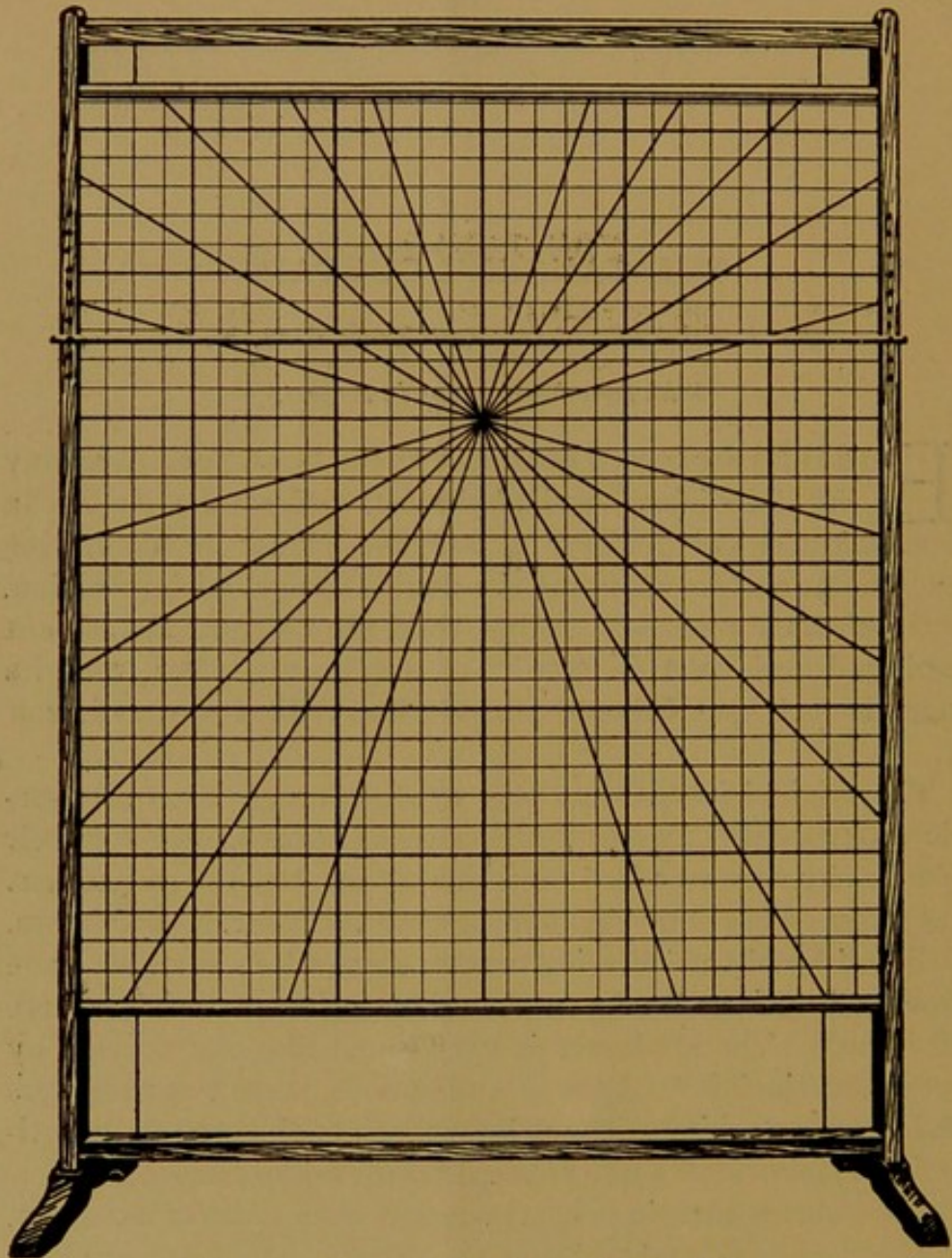


FIG. 1.—Tangent Curtain. Reverse Side.

divided by light and heavy perpendicular and horizontal lines into a checkerboard of two-inch and ten-inch (or 5cm and 25cm) squares.¹

¹ In the original model the squares were respectively two inches and one foot on a side. But in the present model, the two-inch and ten-inch squares were adopted, both because more convenient in plotting, and also because

The black surface, or front of the curtain, is marked only by a white pin indicating the exact position of the center of the perimetric chart on the white or reverse side, by a vertical and horizontal black seam representing the vertical and horizontal meridians of the chart, and by a series of short red strokes along its edge, each indicating the terminus of one of the radiating lines on the reverse side. This useful feature of the apparatus is borrowed from Syms and Sinclair.

The frame on which the curtain is stretched runs up and down in an outside frame so that the white pin, which indicates the center of the perimetric chart, can be brought just opposite the eye of a patient seated in front of the instrument. The curtain frame is raised and lowered by a pair of cords which run over little pulleys set in the outside frame and which are attached to a horizontal rod at the back of the curtain. The ends of this rod engage in a series of hooks on either side of the outside frame. By pulling on the rod the curtain is raised, and by engaging the rod in the hooks the curtain is set at any desired height.

The outside frame is 6 feet 6 inches high, and 5 feet wide. The curtain itself is 5 feet high, and 4 feet 5 inches wide, giving, if the patient is seated at 30 inches, a lateral range of 41° , an upward range of 35° , and a downward range of 52° . If the patient is seated at sixty inches, the lateral range of the curtain is 23° , the upward 20° , and the downward 33° .

The whole apparatus is strong, light, and portable, so as to be readily shifted from one part of the room to the other. It can be used advantageously as a screen to shut off a corner of the office or, when not in use, can be set against the wall.

The material of which the curtain is made is such that, no matter how often it is perforated with pins, no marring marks

the tangent curtain could thus be readily adapted to the use of those who prefer metric measurements, since, without sensible loss of accuracy, two inches equal $5cm$ and ten inches equal $25cm$ or one quarter of a meter. The original model also had a series of concentric circles representing arcs of 5° , 10° , 15° , etc., calculated for a radius of 30 inches and projected on the tangent plane. This, while somewhat facilitating the plotting, when the 30-inch distance was used, was found to be rather confusing when, as in plotting scotomata, the patient was placed at 60 inches. Hence, though retained on the record cards (see Figs. 2 and 3) the circles have been omitted from the curtain itself.

remain. My original model, used for over eight years, is still as serviceable as ever.

USES OF THE APPARATUS.

The apparatus is used regularly at two distances, 30 inches (0.75 meters) and 60 inches (1.50 meters), and corresponding to this there are two sets of record cards, shown respectively in Figs. 2 and 3. It is convenient to have a tape measure about five feet long, one side of which is marked with the tangents of arcs of 5° , 10° , etc., to a radius of 30 inches and the other side with the tangents of the same arcs to a radius of 60 inches. This can be used to measure the distance, in degrees, of the test object from the central pin. It is particularly of service when for any reason the test-object has to be carried beyond the limits of the curtain.

The curtain can also be used at any other distance, *e. g.*, one meter, provided he who uses it has a card or record blank marked for this distance. In my own practice, however, the distances given, *viz.* 30 inches and 60 inches, have proved best adapted for the various uses to which the curtain is applied.

The tangent plane is used for the following purposes.

1. *To Delimit Central and Paracentral Scotomata and Enlargements of the Blind Spot.*—For this purpose the 60-inch distance is used. The patient is seated at this distance from the curtain, the black side of which is turned toward him. The curtain is raised or lowered until the white pin representing the center of the perimetric diagram is just opposite the eye to be examined. The other eye is covered. Then directing him to look steadily at the central white pin, we carry our test-object from the periphery of the curtain to its center along each meridian in succession. The marginal strokes at the edge of the curtain help greatly in doing this, as they indicate where each meridian terminates. The points where the test-object enters the scotoma and where it emerges from it in each meridian are indicated by thrusting pins into the curtain. Different colored pins may be used to differentiate partial from absolute scotomata, or to differentiate color scotomata from scotomata for white. They may also be used to differentiate two or more records taken in succession, when for any reason

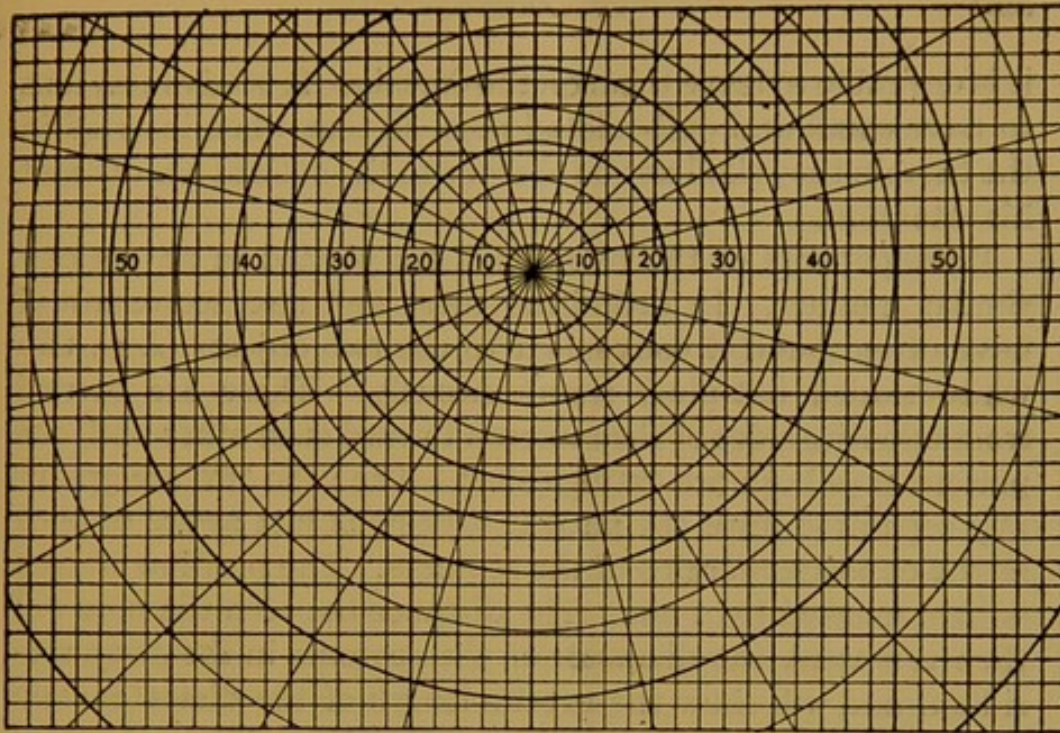


FIG. 2.—Card for taking off plot on curtain when patient is placed at 30 inches (0.75 meter). Five-eighths natural size.

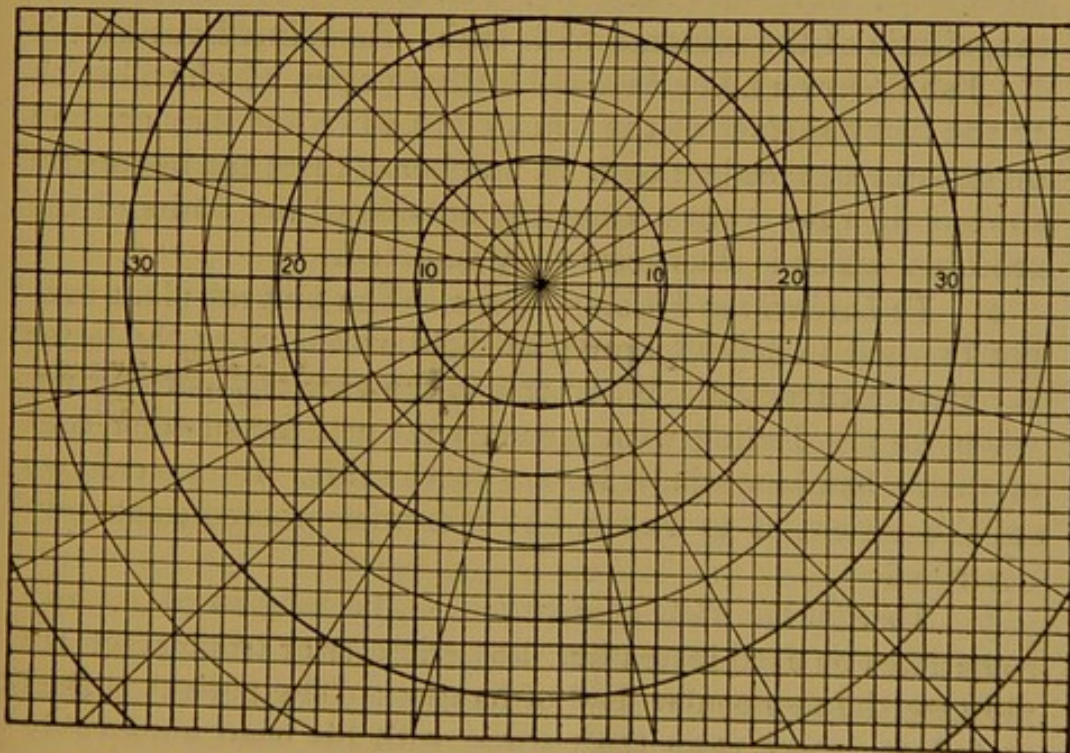


FIG. 3.—Card for taking off plot on curtain when patient is placed at 60 inches (1.50 meters). Five-eighths natural size.

it is desirable to leave them on the curtain. It is advantageous to have small and dull-colored pins, so that when inserted in the curtain they shall not be obvious to the patient nor distract his attention.

Enlargements of the blind spot are plotted in an entirely similar manner. In delimiting these and also scotomata, I have often found it convenient to use two objects (*e. g.*, two white-headed hat-pins) simultaneously. These are carried from opposite sides of the scotoma toward each other until the patient says both are extinguished. Then the two are gradually separated until the patient says he is just aware of both at the opposite margins of the scotoma. The position of each is then marked by a pin. The distance between the pins will then represent the diameter of the scotoma in the given meridian, and will show the precise length of the diameter even when the eye wavers, so that we cannot be certain just where the two extremities of this diameter really are.

All sorts of test-objects may be used, according to the character of the scotoma. Often it is useful to apply test-objects of different sizes and determine the comparative magnitude of the scotoma with each. As pointed out by the English observers, fine bits of blotting paper, which will stick to the fuzzy surface of the black cloth wherever they are laid on it, form an excellent test. A number of them can be rapidly shifted till they form a ring just outside of the limits of the scotoma, which is thus accurately depicted.

2. *To Delimit the Field of Vision.*—The tangent plane cannot be used to delimit the visual field except when the latter is pretty contracted. When this is the case and particularly when we are dealing with a somewhat contracted color field or with a hemianopsia, it is very serviceable. In this case we set the patient at 30 inches, but otherwise proceed as already described.

3. *To Plot the Field of Fixation.*—The tangent plane may sometimes be used instead of the perimeter or tropometer, for plotting the monocular field of fixation. The patient is then seated 30 inches from the curtain with his head immovably fixed and with one eye covered. The other eye should be precisely opposite the white pin and on a level with it. This eye is then made to follow the test-object (a pair of fine parallel

lines on a small card) as far as it can in each meridian. The limit of the excursion in each case, which will be signalized by the blurring and running together of the two lines, is marked by a pin thrust into the curtain. Whenever the limits of the field extend beyond the limits of the curtain, the tangent tape already mentioned may be attached to the center pin and measurement made along it in any given meridian beyond the curtain margin.

4. *To Plot Diplopia and the Field of Double Vision.*—Here again the patient is placed 30 inches from the curtain, but now with both eyes open. A red glass is placed before the right eye and the head is adjusted so that when the eyes are directed at the center pin, they are on a level with it and looking straight ahead. A small electric light is then carried over the curtain in the six cardinal directions of the gaze, viz., right, left, up and right, up and left, down and right, down and left; and the point where diplopia occurs in each meridian is noted by thrusting in a pin. The limits of the field of single vision are thus delimited. In the region in which diplopia occurs, the situation of the double images is similarly indicated. The patient sees two lights, a red and a white. The red image belongs to the right eye and the white image to the left. A black pin is thrust into the curtain at the site of the candle itself, and a light-colored pin at the site of the other image. This latter is evidently the false image and, if it is red, we know that the left eye is fixing; if it is white, we know that the right eye is fixing. In the former case, we mark the situation of this false image with a white pin; in the latter case, with a blue pin. In the great majority of cases the patient fixes with the eye not covered with the red glass; and, therefore, by shifting the red glass from one eye to the other, we can often get him to alternate fixation. In this case, too, we put in a black pin at the site of the light (indicating thus the image of the fixing eye) and mark the site of the false image by a white pin when this image corresponds to the right eye, and by a blue pin when it corresponds to the left eye. We then have on the curtain a black pin with a white pin at some distance from it in one direction and a blue pin at a greater or less distance from it in the other direction. In this case the situation of the pins indicates not only the relation of the double images and their degree of sepa-

ration, but also the change produced in the amount of diplopia by changing fixation from one eye to the other. It shows, in other words, the relation between the primary and secondary deviation.

PLOTTING THE DIAGRAMS.

In plotting the field, or the limits of the scotoma, or the situation of the double images, the diagrams, which are made by the pins stuck into the curtain, are transferred to one of the cards already referred to; to card No. 1 (see Fig. 2) if the patient was at 30 inches, and card No. 2 (see Fig. 3) if the patient was at 60 inches. The plot may be made from either the front or the back of the curtain. In the latter case we have the diagram (see Fig. 1) on the back of the curtain to aid us. It is then easy to see in which particular square of the diagram a pin protrudes and mark its situation on the corresponding square of the card. Only we must remember that as we are now looking at the back of the diagram, instead of its front, we must, when we transfer it to the card, either reverse it, putting on the right side of the card the marks that appear on the left side of the curtain, and *vice versa*; or else we transfer the diagram just as it is and mark the left side of the card "right," and the right side "left."

In plotting from the front of the curtain, we use the vertical and horizontal seams intersecting at the central pin. Along these we measure either with the tangent tape or with an inch rule, determining thus the height in degrees or inches, of each pin along the horizontal seam and its distance, right or left, from the vertical seam. We then transfer our measurements to the proper card. In doing this, we obviously do not have to reverse our plot, the right hand of the card now representing the right hand of the curtain. But, in any case, we should mark the card so as to show clearly which part of the diagram corresponds to the patient's right hand and which to his left.

However made, the card diagrams are an exact representation of the original diagrams on the curtain. Records made at different times are readily comparable and indicate clearly the progress of the case. The network of squares and circles on the cards gives us a double means of measuring and comparing

our results: the squares giving our measurements in inches or centimeters; the circles, the same results in degrees of arc.

ADVANTAGES OF THE APPARATUS.

The advantages of the apparatus are:

1. Accuracy. In this regard, it is vastly superior to the ordinary perimeter for plotting scotomata; for mapping the double images in paralysis it excels any other means that I know of.

2. Simplicity.
3. Thoroughness.
4. Rapidity.

The first part of the report is devoted to a general
description of the country and its resources.

The second part contains a detailed account of the
mineral resources of the country.

The third part is devoted to a description of the
agriculture and the state of the soil.

W. H. Miller
J. H. Miller
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