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2,744,441

OPHTHALMIC PERIMETERS

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2 Sheets-Sheet 1

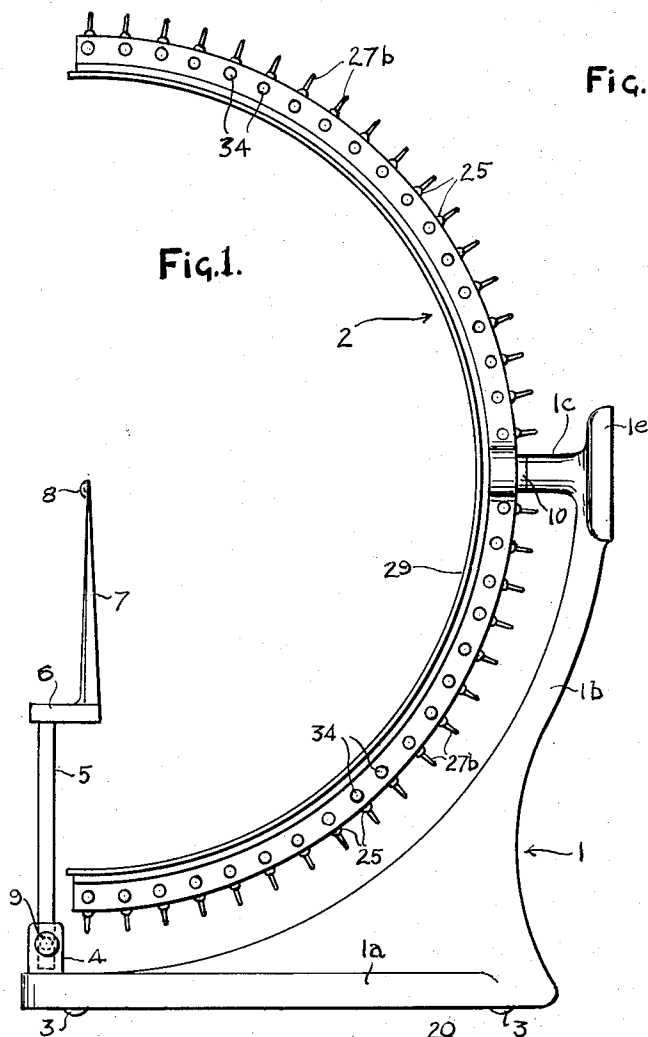


Fig. 2.

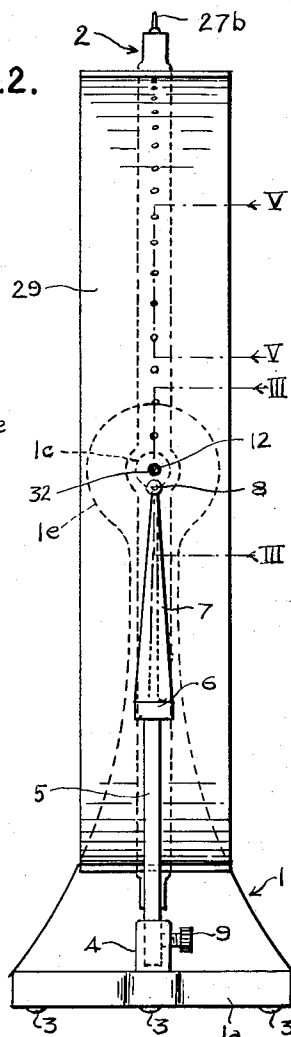
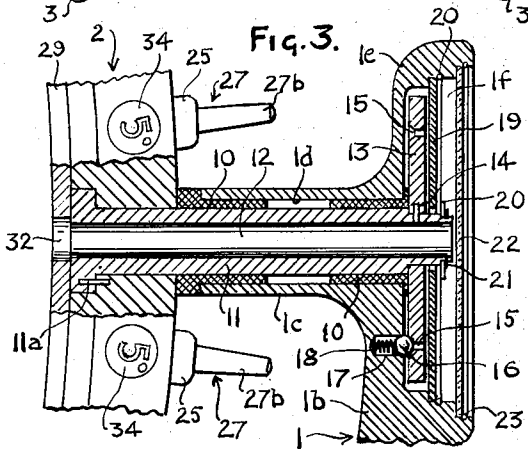
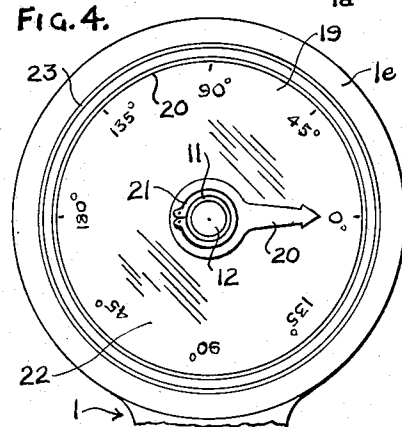


Fig. 4.



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FIG. 5.

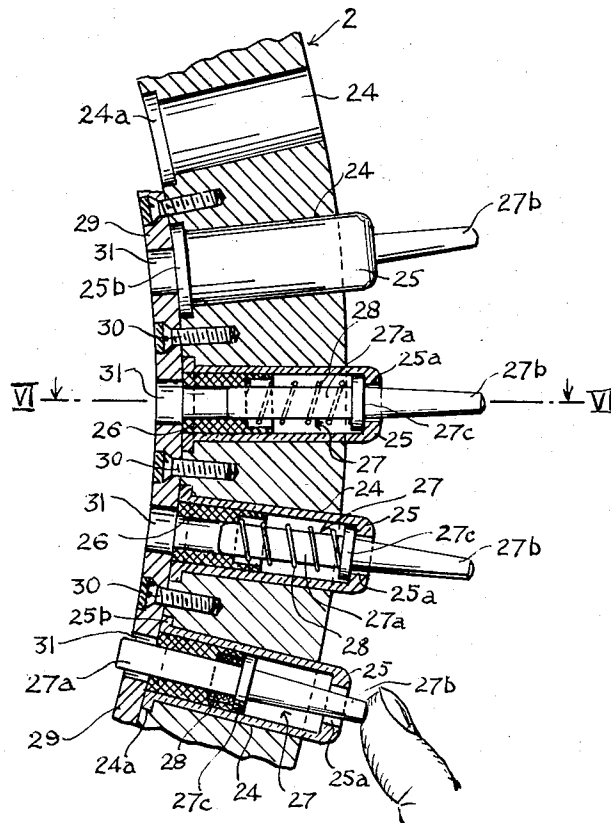
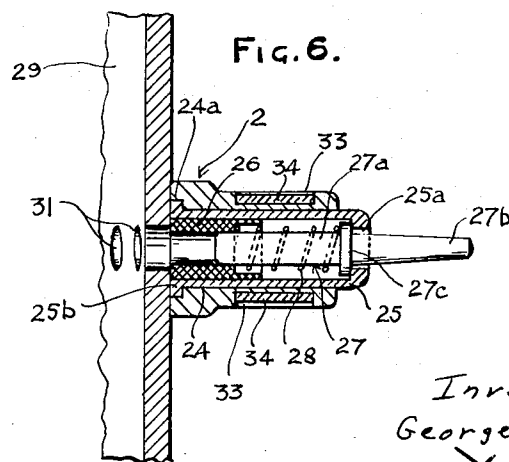


FIG. 6.



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OPHTHALMIC PERIMETERS

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9 Claims. (Cl. 88—20)

This invention relates to perimeters as used in ophthalmic practice for determining the field of vision or blind areas therein of a patient, the invention having for its object to improve upon the construction of perimeters of the kind including an arc carrying a target whose position along the arc in relation to a fixation point represents a measure of the visual field.

In instruments of this kind as normally constructed, the target is constituted by an interchangeable object which is so mounted on the arc that it can be moved along the latter by manual or mechanical means towards or away from the fixation point in response to the reaction of the patient.

By my invention I am able to construct the arc in such a way as to avoid the use of a target movable along the arc, thereby eliminating the necessity for repeatedly adjusting the position of the target along the arc until the responsive point is reached. From this, it follows that, with the aid of my invention, the procedure of measuring the extent of the visual field can be carried out expeditiously and with a substantial degree of accuracy.

Broadly speaking, according to the invention I provide a series of non-internally illuminated targets spaced at fixed intervals along the arc, the targets being so mounted that they are normally invisible or in shadow in relation to the patient, but can be selectively exposed to the view of the patient as desired.

The targets are preferably in the form of a series of plungers movable in holes formed in the arc and opening at the front face of the latter, means being provided for normally maintaining the plungers in a rearward position so that the forward extremities thereof are sunk in the holes and are thus invisible or in shadow in relation to the patient, while permitting the plungers to be selectively moved to a forward position so as to expose the said extremities to the view of the patient.

The face of the arc exposed to the patient may be treated to inhibit reflection of light and a similar treatment may be applied to the end portion of the holes corresponding to the target ends of the plungers so as to increase the shadow effect. To provide the necessary visibility when the target ends are in exposed position, these ends may be made of any desired colour or may be designed for the application thereto of variously coloured caps. Provision may be made for specially illuminating the target ends when exposed, or these ends may be treated with luminescent material.

A perimeter constructed in accordance with one embodiment of the invention is illustrated in the accompanying drawings, in which—

Figure 1 is a side elevational view of the improved perimeter;

Figure 2 is a front elevational view corresponding to Figure 1;

Figure 3 is a sectional view to an enlarged scale taken on the line III—III of Figure 2;

Figure 4 is a rear elevational view corresponding to Figure 3;

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Figure 5 is a longitudinal sectional view of a portion of the arc, the view being taken on the line V—V of Figure 2 and being drawn to a larger scale than that of Figures 3 and 4, and Figure 6 is a cross-sectional view taken on the line VI—VI of Figure 5.

As illustrated, the perimeter comprises a pedestal generally indicated at 1, and an arc supported by the pedestal and generally indicated at 2.

The pedestal 1 has a base portion 1a fitted with rubber feet 3 enabling the instrument to be stood upon a stable or other convenient form of support without fear of slipping. The pedestal also has an upwardly extending arm 1b made integrally with the base portion 1a and the upper end of which is provided with a mounting for the arc 2 as will be described hereinafter.

At its forward end the base portion 1b of the pedestal 1 is formed with an upwardly extending hollow boss 4 in which rotatably fits the lower end portion of a vertically disposed column 5, the upper end of the column being provided with a horizontally disposed arm 6 to the free end of which there is secured an upwardly extending stem 7, the stem thus being offset relatively to the axis of the column 5. The upper end of the stem 7 is formed with a protuberance 8 against which the patient places his cheek-bone at a point situated just beneath the eye-socket so as to locate the eye to be tested in relation to the fixation point. By rotating the column 5 in the boss 4, the position of the locating protuberance 8 can be varied in a horizontal plane, the protuberance then being held in its adjusted position by means of a set-screw 9 which passes through the boss 4 and engages with the portion of the column lying within the boss.

The arc 2 extends for a distance of a little over one hundred and eighty degrees and midway between its ends it is connected to the upper end of the arm 1b of the pedestal 1. To this end, the upper end of the arm 1b is formed with a sleeve 1c having a horizontally extending bore 1d (Figure 3) which opens at the forward end of the sleeve. The rearward end of the sleeve 1c is formed with an enlargement 1e in the rear face of which there is provided a circular recess 1f arranged coaxially with the bore 1d and into which the rear end of the bore opens. The bore 1d is fitted with self-oiling bushes 10 forming bearings for a horizontally disposed spindle 11 which is pinned to the arc 2 as indicated at 12 in Figure 3, and projects radially from the rear face of the arc, the spindle being located midway between the ends of the arc.

With the arrangement just described, the arc 2, while being supported by the pedestal 1, can nevertheless be rotated about the axis of the bore 1d of the sleeve 1c according to the requirements of the practitioner when making a test.

The spindle 11 extends rearwardly from the front face of the arc 2, right through the bore 1d of the sleeve 1c and part-way into the recess 1f formed in the rear portion 1e of the sleeve. The spindle is formed with an axially extending hole 12 the forward end of which opens at the front face of the arc 2, while the rearward end opens in the recess 1f. Daylight or artificial light passing through the hole 12 from the rearward end thereof to the forward end, constitutes the fixation point.

The spindle 11 is held against axial movement by means of a disc 13 which, as indicated at 14 in Figure 3, is pinned to the portion of the spindle lying within the recess. The inner face of the disc 13 is formed with a plurality of countersinks 15 arranged equidistantly and in a circle having its centre at the axis of the bore 1d of the sleeve 1c. A ball 16 is accommodated in a recess 17 formed in the upper end portion of the arm 1b of the pedestal and is pressed by a spring 18 arranged within the recess 17, so that the ball will engage fric-

tionally in any one of the countersinks 15 that has been brought into register with the ball by rotation of the arc 2 with consequent rotation of the spindle 11 and disc 13.

Adjacent the outer face of the disc 13 the recess 1f accommodates a dial 19 which is held in place by means of a spring ring 20 engaged in a groove in the circular wall of the recess, and is marked with graduations corresponding to the angular distances between the countersinks 15 and the disc 13. To the end part of the spindle 11 projecting beyond the dial 19 there is applied a pointer 20 which is secured to the spindle by means of a spring clip 21. Thus, when the arc is rotated, with consequent rotation of the spindle 11 and the disc 13 to bring any one of the countersinks 15 into a position in which it is engaged by the ball 16, the angular setting of the arc will be indicated by the position of the pointer 20 in relation to the graduations marked on the dial 19.

The dial 19 and pointer 20 are protected by a window 22 of suitable transparent material which is accommodated in the recess 1f and is held in place by means of a spring ring 23 engaged in a groove in the circular wall of the recess.

In the embodiment illustrated, there are provided eight countersinks 15 and as these are equidistantly spaced round a circle concentric with the axis of the bore 1d, the distance between any one countersink and the next corresponds to an angle of forty-five degrees, the graduations on the dial 19 being positioned and marked accordingly as indicated in Figure 4.

As indicated in Figures 5 and 6, the arc 2 is formed with a plurality of holes 24 extending radially from the front face to the rear face of the arc, the forward ends of these holes being enlarged as indicated at 24a. In each one of the holes 24 there is fitted a hollow thimble 25 the rear end portion of which projects beyond the rear face of the arc and is perforated as indicated at 25a, while the forward end is formed with a flange 25b engaging snugly in the enlargement 24a of the hole 24. The forward end portion of the thimble 25 accommodates a snugly fitting bush 26 which extends about halfway over the length of the thimble and forms a bearing for a plunger generally indicated at 27. The plunger comprises a forwardly disposed cylindrical portion 27a slidably engaged in the bush 26, and a rearwardly disposed finger-piece 27b projecting freely through the perforation 25a in the rear end of the thimble 25, the portion 27a of the plunger being separated from the finger-piece 27b by means of a collar 27c accommodated within the thimble. A helical compression spring 28 is arranged around the cylindrical portion 27a of the plunger 27 and bears between the inner end of the bush 26 and the collar 27c. Thus, normally, the plunger 27 is maintained by the spring in an extreme rearward position so that the finger-piece 27b projects to a maximum extent from the rear face of the arc, as indicated in the middle part of Figure 5. The cylindrical portion 27a of the plunger is made of such length that, with the plunger in its normal rearmost position, the forward extremity of the portion 27a will lie at a substantial distance inwardly of the forward end of the bush 26 so that this extremity will be, practically speaking, invisible to the patient by being in shadow.

When the finger-piece 27b is pressed by the practitioner, the plunger 27 will be moved forwardly against the pressure of the spring 28 so that the forward part of the cylindrical portion 27a will pass out of the bush 26, thereby exposing to view the forward extremity of this portion, as indicated at the lower part of Figure 5.

On release of the finger-piece 27b, the spring 28 will act to return the plunger 27 to its normal inoperative position.

In the embodiment illustrated, the thimbles 25, with their bushes 26, are held in their various holes 24 by

means of a cover-plate 29 which is secured to the front face of the arc 2, by means of screws 30, the cover-plate being formed with clearance holes 31 which are arranged in axial alignment with the holes 24 in the arc and through which the forward ends of the portions 26a of the plungers 26 can freely pass when any selected one of the plungers is pressed into operative position. A further hole 32 (Figures 2 and 3) is provided in the cover plate 29 and registers with the bore 12 of the spindle 11 so as to let light through the fixation point.

Usually the exposed face of the cover-plate 29, the exposed parts of the screws 30 and the circular walls of the holes 31 will be treated to give a matt black or other suitable finish inhibiting reflection of light. The bushes 26 may be made of a dense black material such as ebonite or a synthetic resinous material of a black colour so that the parts of the bores thereof which are exposed when the plungers are in normal retracted position, will not reflect light. Where, however, the bushes 26 are made of a light-reflecting material such as a metal, the said parts of the bores thereof can be treated to give a matt black finish.

To give the necessary contrast, the plungers 27, or the target ends thereof, are made of a white or coloured material, such as a white or coloured form of hard synthetic resin. The possibility presents itself of making the target ends of the plungers of different colours.

In Figures 1 and 2 of the drawings each arm of the arc 2, that is to say, the part extending from the axis about which the spindle 11 is rotatable in the sleeve 1c, to an end of the arc, is shown to be provided with eighteen plungers 27, making thirty-six plungers for the whole arc. The plungers on each arm are arranged at a distance of five degrees apart, this distance being measured from the centre about which the arc is struck, and the plungers nearest the axis of rotation of the arc, which corresponds to the fixation point and constitutes zero, are spaced at a distance of ten degrees apart.

The degrees representing the various distances at which the plungers are situated from zero are marked on the side faces of the arc 2 so that the practitioner can obtain a reading by looking at either one of these faces. To this end, and as illustrated in Figure 6, the side faces of the arc are formed with recesses 33 in which are fitted discs 34 having the figures of degrees suitable inscribed thereon.

In the use of a perimeter constructed as described, the arc 2 will, to start with, usually be positioned to lie in a vertical plane, such position corresponding to zero as indicated by the pointer 20 in relation to the graduations marked on the dial 19. After the patient's eye has, by means of the locating protuberance 8, being correctly positioned in relation to the fixation point, the practitioner presses one of the plungers 27 so as to bring the forward extremity of the portion 27a thereof into view and, depending on the response of the patient, takes a reading from the corresponding figure on a side edge of the arc, or releases this plunger and then presses another, and so on until the response made by the patient indicates that a reading should be taken, the practitioner thereby obtaining at least a partial measure of the ocular field of the eye under test. If further exploration is desired, the arc is rotated step-by-step as shown by the pointer 20 in relation to the graduations marked on the dial 19, the plungers 27 being manipulated between each step and a reading taken on each occasion. When the arc has been turned full circle, the practitioner will have obtained a measure, having a substantial degree of accuracy of the entire ocular field of the eye under test.

The arc 2 may carry a lamp or lamps acting to illuminate the target ends of the plungers 27 when these are brought to exposed position, the lamp or lamps being so arranged that the light rays therefrom do not destroy the shadow effect when the plungers are in retracted position.

Thus a lamp arranged in conjunction with a suitable directed shield or reflector, may be fitted at each end of the arc.

While in the embodiment illustrated, the arc 2 carries a single row of plungers 27 it will be understood that it may carry a plurality of side-by-side rows of such plungers. In such case, the target ends of the plungers in one row may have a colour differing from that in the next row.

What I do claim and desire to obtain by Letters Patent of the United States of America is:

1. An ophthalmic perimeter for use in testing eyes comprising an arc, a series of holes formed in the arc, said holes being arranged at fixed intervals along the arc and extending from the front face to the rear face of the latter, plungers mounted for movement in said holes, the forward extremities thereof having a contrasting effect with said arc and means acting normally to maintain the plungers in a rearward position so that the forward extremities thereof are sunk in the holes sufficiently to be in shadow and substantially invisible to the eye under test when positioned adjacent the center of curvature of the arc and having its line of sight fixed on a fixation point at a predetermined offset location with respect to said forward extremities, and the plungers being selectively movable to a forward position so as to bring the said extremities out of shadow and into view.

2. An ophthalmic perimeter for use in testing eyes comprising an arc, a series of holes formed in the arc, said holes being arranged at fixed intervals along the arc and extending from the front face to the rear face of the latter, plungers mounted for axial sliding movement in said holes, and springs acting normally to maintain the plungers in a rearward position so that the forward extremities thereof are sunk in the holes sufficiently to be in shadow and substantially invisible to the eye under test when positioned adjacent the center of curvature of the arc and having its line of sight fixed on a fixation point at a predetermined offset location with respect to said forward extremities, and the plungers being individually movable by finger pressure to a forward position so as to bring the forward extremities thereof out of shadow and into view said forward extremities having a contrasting effect with said arc.

3. An ophthalmic perimeter for use in testing eyes comprising a pedestal, an arc supported by the pedestal for rotation about an axis passing through the center about which the arc is struck, a series of holes formed in and arranged at fixed intervals along the arc and extending from the front face to the rear face of the latter, plungers mounted in said holes for forward and rearward movement, and means acting normally to maintain the plungers in a rearward position so that the forward extremities thereof are sunk in the holes sufficiently to be in shadow, and substantially invisible to the eye under test when positioned adjacent the center of curvature of the arc and having its line of sight fixed on a fixation point at a predetermined offset location with respect to said forward extremities, and the plungers being selectively movable to a forward position so as to bring said forward extremities out of shadow and into view said forward extremities having a contrasting effect with said arc.

4. An ophthalmic perimeter for use in testing eyes comprising a pedestal having a base portion and an upwardly extending arm, an arc, a spindle secured to and extending from the rear face of the arc and arranged in axial alignment with the center about which the arc is struck, said spindle being rotatably engaged in the upper end of said upwardly extending arm, a hole extending through the spindle and through which light can pass to the front face of the arc so as to constitute the fixation point, a series of holes formed in and arranged at fixed intervals along the arc and extending from the front face to the rear face of the latter, a plunger mounted for axial sliding movement in each hole in the arc, and a spring associated

with each plunger and acting normally to maintain the plunger in a rearward position so that the rearward portion of the plunger projects from the rear face of the arc while the extremity of the forward portion of the plunger lies sunk within the hole sufficiently to be in shadow and substantially invisible to the eye under test when positioned adjacent the center of curvature of the arc and having its line of sight fixed on a fixation point at a predetermined offset location with respect to the forward extremities of the plungers, the spring permitting the plunger to be moved forwardly by pressure on the projecting rearward portion of the plunger so that the extremity of the forward portion of the plunger is then brought out of shadow and into view at the front face of the arc the forward extremities of said plungers having a contrasting effect with said arc.

5. An ophthalmic perimeter for use in testing eyes comprising an arc, a series of holes formed in the arc, said holes being arranged at fixed intervals along the arc and opening at the front and rear faces of the latter, hollow thimbles arranged in said holes and having their forward ends opening at the front face of the arc and their rearward ends formed with perforations, plungers journaled for axial movement in said thimbles, and springs accommodated in the thimbles and acting normally to maintain the plungers in a rearward position so that the rearward portions thereof project from the rear face of the arc while the extremities of the forward portions lie within the thimbles and are thus in shadow in relation to the patient, the springs permitting the plungers to be selectively moved by finger pressure to a forward position so that the extremities of the forward portions are then exposed at the front face of the arc the forward extremities of said plungers having a contrasting effect with said arc.

6. An ophthalmic perimeter for use in testing eyes comprising an arc, a series of holes formed in the arc, said holes being arranged at fixed intervals along the arc and opening at the front and rear faces of the latter, hollow thimbles arranged in said holes and having their forward ends opening at the front face of the arc and their rearward ends formed with perforations, plungers journaled for axial movement in said thimbles, springs accommodated in the thimbles and acting normally to maintain the plungers in a rearward position so that the rearward portions thereof project from the rear face of the arc while the extremities of the forward portions lie within the thimble and are thus in shadow in relation to the patient, the springs permitting the plungers to be selectively moved by finger pressure to a forward position so that the extremities of the forward portions are then exposed at the front face of the arc, said forward extremities having a contrasting effect with said arc, and a cover plate acting to hold the thimbles in place and being formed with clearance holes which are arranged in coincidence with the open forward ends of the thimbles and allow for passage of the forward end portions of the plungers when the latter are moved to their forward positions.

7. An ophthalmic perimeter for use in testing eyes comprising an arc, a fixation point provided on the arc, a series of holes formed in the arc, said holes being arranged at fixed intervals along the arc, hollow thimbles arranged in said holes and having their forward ends opening at the front face of the arc and their rearward ends formed with perforations, a cover plate secured to the front face of the arc and having holes in register with the forward open ends of the thimbles, bushes arranged in the forward end portions of the thimbles, plungers having forward end portions engaged for axial sliding movement in said bushes and rearward end portions passing freely through the perforations in the rearward ends of the thimbles, and springs acting on the plungers in such manner that the forward extremities of the forward end portions of the plungers are normally maintained within said bushes

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sufficiently to be in shadow and substantially invisible to the eye under test when positioned adjacent the center of curvature of the arc and having its line of sight fixed on a fixation point at a predetermined offset location with respect to said forward extremities, while the rearward end portions of the plungers are normally maintained in a position in which they project to a maximum extent from the perforations in the rearward ends of the thimbles, said springs permitting the projecting rearward portions of the plungers to be selectively moved towards the thimbles so that the forward extremities of the forward portions of the plungers are moved through the holes in the cover plate and are thus out of shadow and into view at the front face of the cover plate the forward extremities of said plungers having a contrasting effect with said arc.

8. An ophthalmic perimeter for use in testing eyes comprising an arc, a plurality of rows of holes formed in the arc, the holes in each row being arranged at fixed intervals along the arc and extending from the front face to the rear face of the latter, plungers mounted for axial movement in said holes, and means acting normally to maintain the plungers in such a position that the forward extremities thereof are sunk in the holes sufficiently to be in shadow and substantially invisible to the eye under test when positioned adjacent the center of curvature of the arc and having its line of sight fixed on a fixation point at a predetermined offset location with respect to said forward extremities, and the plungers selectively being movable to a position at which the said forward

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extremities thereof are brought out of shadow and into view at the front face of the arc the forward extremities of said plungers having a contrasting effect with said arc.

9. An ophthalmic perimeter for use in testing eyes comprising an arc, a plurality of plungers axially slidably mounted on said arc and in spaced relation with each other longitudinally of said arc, said plungers having targets on the forward extremities thereof having a contrasting effect with said arc, means acting normally to urge and maintain the plungers in a rearward position with respect to the front face of said arc so that the targets on said forward extremities lie rearwardly of said face by an amount sufficient to be in shadow and substantially invisible to the eye under test when positioned adjacent the center of curvature of the arc and having its line of sight fixed on a fixation point at a predetermined offset location with respect to said targets, and the plungers being selectively axially slidable to a forward position with respect to said face so as to bring said targets on said extremities out of shadow and into view.

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