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B. G. RUSSELL
OPTOMETRIC APPARATUS
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Fig. 2.

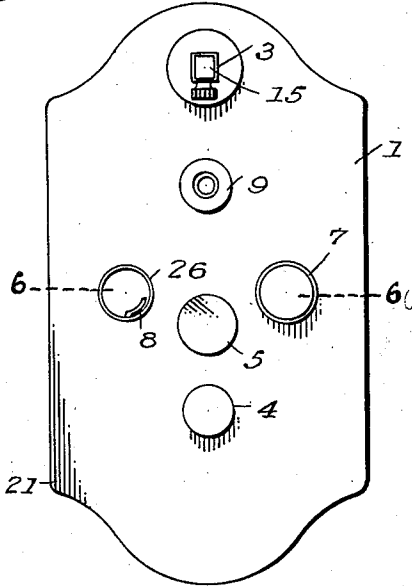


Fig. 1.

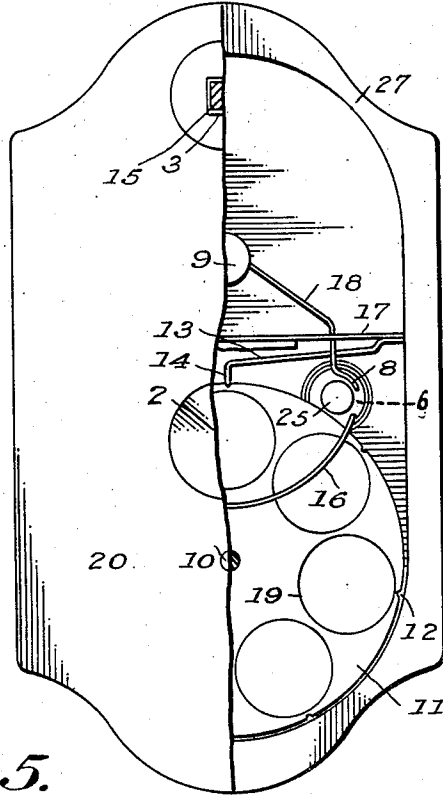


Fig. 3.

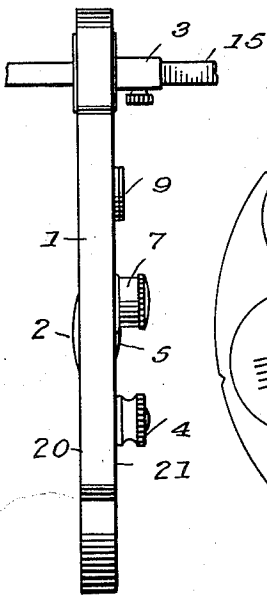


Fig. 5.

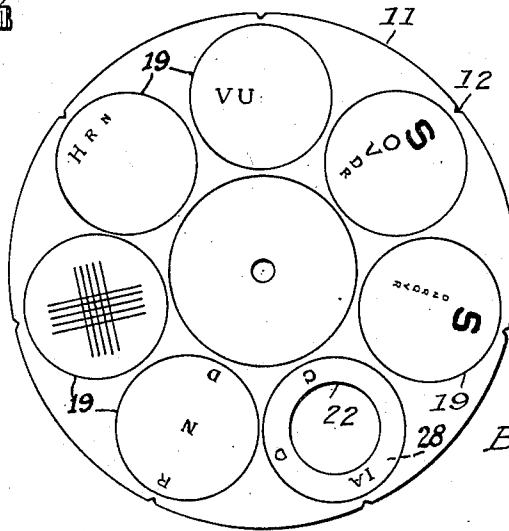
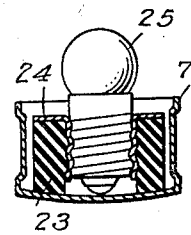


Fig. 4.



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OPTOMETRIC APPARATUS

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2 Claims. (Cl. 88—20)

The present invention relates to vision testing devices and more particularly to an improved device for protecting and for conveniently presenting in operating position a series of charts of the type commonly used in connection with apparatus for testing the human eye.

An object of this invention is to provide a substitute for the awkward cards on which are printed the patterns of letters, symbols, or figures of varying sizes which are commonly employed for the testing of vision.

A further object is to provide a set of uniformly illuminated eye testing charts so mounted in a lightweight, dust-proof case as to be easily shifted into operating position.

A further object of this invention is to provide a device which will simplify those optometric procedures wherein a series of tests must be given in succession and a series of individual charts must be used in the corresponding succession. Such a procedure is the near point examination adopted by the American Optometric Association.

This examination consists of a definite series of tests conducted by placing a succession of test charts in a predetermined order in front of the patient at a distance from his eye corresponding to the convenient near point of vision, for instance at from about 16 to 20 inches. Between the chart and the eyes of the patient is placed a variable lens, or lens and prism, system, called a refractor, so that each chart is viewed by the patient through the refractor. The tests are made by recording the adjustments of the lenses and prisms necessary to produce various visual responses in the patient with the successive charts. The charts are used in a definite order not only for the purpose of an orderly procedure but also because in some cases the lens and prism adjustments obtained for one chart are used as the starting point for the test with the next succeeding chart. Both monocular and binocular tests are made.

At present this procedure is carried out with the patient and operator seated at opposite sides of the refractor. Individual cards are used as charts and are suspended in any convenient manner in front of the patient, for instance by means of a horizontal rod extending in front of and in line with the lens system, on which rod the card may be moved back and forth to the proper distance from the patient. The charts are illuminated either by daylight, or, if the tests are made in a dark room, by an artificial lighting means, usually placed between the patient and the chart.

There are many disadvantages to the procedure outlined above. The cards soon become worn and mutilated from dust and from handling. The cards are apt to get out of the proper order, causing delay and confusion in examination. A great deal of delay is caused by the inconvenient method of changing cards, thus not only unduly prolonging the examination but also producing less accurate results than would be obtained if the successive tests were made more or less instantaneously, one after the other. This decrease in accuracy results from the fact that the eye is not a fixed lens system but a psychologically influenced organ. Any interruption to the smooth procedure throws off the previous set of the eye and unfavorably influences to a certain extent, the desirable coordination of the various tests. A further disadvantage of this procedure lies in the annoying glare to which the operator is exposed when artificial illumination is employed. Further the possibility of non-uniform, excessive, or insufficient illumination of the test chart exists.

All of these disadvantages are eliminated by the device of the present invention. Other objects and advantages of the invention will be apparent from the following description of an embodiment of this invention when read in connection with the accompanying drawing, wherein:

Figure 1 is a view partly in section of the device from the position of the patient.

Figure 2 is a view of the device from the position of the operator shown with one lamp mounting in position and the other removed.

Figure 3 is a side view of the device suspended in operating position from a rod.

Figure 4 is a sectional view of the lamp mounting.

Figure 5 is a view of the disk on which is carried the various test charts.

The device of this invention is enclosed in a hollow lightweight case 1 made of any suitable material, as for instance, two thin metal sheets 20 and 21 spaced apart by a wooden frame 27. The pieces of which the case is made are joined, as by the use of an adhesive material known to the art to be suitable for joining glass to metal, etc. or any other suitable method, in such manner as to effectively seal the interior of the case against the entrance of dust. The case is preferably made with a thickness which is relatively small as compared to the height and width as shown in Fig. 3 of the drawing, so that device may be handled in a manner not substantially different from an ordinary test card. The exterior of the case is preferably finished in black, although any

other color offering a suitable background for the test charts may be employed.

The face 20 of the case which is intended to be placed toward the person being tested is provided with a suitably located window 2, of circular or other suitable shape, covered by a transparent material, such as glass, sealed to the case in such manner as to prevent the entrance of dust, as for instance by the use of an adhesive material known to the art to be suitable for joining glass to metal, etc. This window will preferably have a size not greater in width or height than one third the width or height of the case. A window 5 may also be provided in the face 21, which is intended to be toward the operator, in registering relation with the window 2. The window 5 is also covered with a transparent material sealed to the case.

Within the case is a disk 11 made of any suitable material as, for instance, thin metal sheet. On the side of the disk intended to face the person being examined is situated a series of eye testing charts or targets 19 circumferentially arranged so that they are the same distance from the center of the disk as shown in Fig. 5. Each target is of a size such that it may readily be viewed through the window 2. The targets are so arranged that each target is next to the one which will be used either before or after it in the conduct of the examination. Thus a simple manipulation of the disk will bring the targets into view in the proper order. The appropriate arrangement of letters or symbols or the appropriate design, as predetermined for each test, is employed on each target. The targets may be printed directly on the disk or may be printed on a separate sheet which is fastened to the disk. The opposite side of the disk is preferably finished in black.

The disk is mounted on an axle 10 extending through the face 21 and joined to the knob 4. The disk is so situated that when it is rotated by means of the knob 4, the targets are successively brought into a position in which they may be viewed through the window 2. The disk is provided with any suitable stop means adapted to facilitate bringing each target into proper registering position with the window. Such a stop means is illustrated in Fig. 1 as a series of shallow notches 12 around the circumference of the disk, one above the center of each target. A spring means 13 is mounted on the case in any suitable position so that a sharp edged member 14 presses against the edge of the disk firmly engaging each notch as it is moved into position, but not materially hindering the turning of the disk when it is desired to shift the targets.

The targets are illuminated from the interior of the case by means of electric lamps 25 inserted through suitably placed holes 6 shown in Figures 1 and 2. Preferably low voltage lamps such as flashlight bulbs or pilot lamps are employed, thus simplifying the problem of insulation. The lamps may be mounted in any suitable manner so as to make replacement easy and yet prevent the entrance of dust into the interior of the case. One such type of mounting is illustrated in Fig. 4 of the drawing. The lamp 25 is held in a metal socket 24 embedded in an insulating material 23 and thus insulated from the cap 1 which holds the insulating material. The end contact point of the lamp 25 touches the cap 1, whereas the threaded portion of the lamp is in contact with the metal socket 24. The opening 76 in the face 21 of the case is provided with a

metal tubular member 26 extending outwardly of such a size that the cap 1 may be snugly but removably fitted over the tubular member thus bringing the lamp within the case and also sealing the case against the entrance of dust. The metal case is grounded to one wire of the source of electric current thus supplying current to the lamp through the cap 1. When the cap 1 is placed over the tubular member 26, the collared portion of socket 24 is forced against a contact member 8 fastened to the other wire of the current source, thus completing the circuit through the lamp.

The case may be provided with a socket 9 into which may be inserted a plug fastened to a suitable source of electric current. One contact point of the socket is grounded to the case. The other is connected by means of insulated conductors 18 to the contact members 8.

To uniformly distribute the light, a wall 17 having a reflecting and diffusing surface may be placed across the case above the lamps thus dividing the case into two compartments. Similarly a reflecting and diffusing strip 16 extending inwardly toward but not touching, the disk may be fastened to the inside of face 20 just below the window 2. The inside of that portion of the case containing the disk is preferably finished in white to effectively reflect and diffuse the light.

Any suitable means for mounting the device in line with the lens system used for testing may be employed. The device has been illustrated in the drawing as equipped with a hole and tubular guide member 3 fastened to the upper portion of the case so that it may be slid onto and suspended from a horizontal rod 15 which is in line with the lens system, in the same manner as the commonly used cards. A screw clamping means may be provided in the member 3.

The examination is conducted with this device as follows. The patient is seated in front of face 20 of the device with his eyes at the level of the window 2. The variable lens and prism system is placed in front of his eyes. The target containing device is moved along the rod 15 until it is at the proper distance from the patient's eyes. The targets are then illuminated by switching on the supply of electric current for the lamps. The knob controlling the disk is then turned by the operator until the proper target for the beginning of the test appears at the window 2. The entire series of tests may then be quickly and conveniently made, the successive targets being turned into position as needed. It is unnecessary for the operator to see the window 2 since he is warned by the stop mechanism when he has turned the next target to its proper position. His attention need therefore not be taken from the testing.

The entire device is light in weight and preferably of a size and shape such that it may be as conveniently manipulated as a single one of the cards commonly used. The uniform illumination of the targets increases the accuracy of the tests. The elimination of the necessity of outside illumination increases the comfort and efficiency of the operator since he is relieved of the tiring glare. The use of interior illumination also makes it possible for the examination of a number of patients to be conducted at the same time in the same dark room without probability of the lighting arrangement of one testing device interfering with the conduct of the test of another patient. The rapid change of targets makes it less likely that the eyes of the

patient will lose their proper set between successive tests. The psychological effect on the patient of the more neat and orderly procedure produces greater accuracy in the results. The increased rapidity of examination results in less tiring of the patient and operator. The charts are always kept in a neat and clean condition by the protecting dust-proof case. There is no possibility of the charts getting out of the proper order.

During the conducting of the tests it is necessary to introduce a prismatic effect in the refractor so as to cause the patient to see a double image of the chart, one image being above the other or beside the other depending upon the type of prism introduced. As has been noted above the size of the window is such that there is sufficient room on either side or above or below for a second image to be clearly seen against the contrasting background of the case.

In addition to the targets commonly used in conducting the near point examination a target having a hole 22 in its center may be placed on the disk. Around the circumference of the hole are arranged vertical letters or symbols 28. This additional target, when in position makes possible the use of a retinoscope without a change of apparatus. The retinoscope is placed in front of the window 5. The operator then has a clear view through the retinoscope, the window 5, the hole in the target, and the window 2 into the eye of the patient. The letters arranged around the hole keep the patient's eye in the proper position and focus. A target of this type is commonly used in connection with the retinoscope. The device of the present invention conveniently

contains and protects this type of target together with other targets.

The invention has been described in connection with a single embodiment. Certain changes in the structure will be obvious to those skilled in the art and are intended to be included within the scope of the invention.

What is claimed is:

1. An optical testing device comprising a completely enclosed flat casing having two broad faces at least one observation window in each of the two broad faces, an observation window in one face being disposed in registering alignment with an observation window in the other face, a rotatable disc on a shaft within said casing, said disc carrying a plurality of test chart targets, at least one of said targets having an opening smaller than said windows and being encircled by a group of characters, said windows being positioned away from the axis of the rotatable disc so that each target in succession comes in registering alignment with said aligned windows, the said disc being mounted on a shaft passing through the casing for rotating said disc, and a plurality of lamps within said casing and adjacent to said windows to illuminate the target registering with the said aligned windows.

2. The device of claim 1 wherein the casing is constructed of metal and each lamp is carried by a removable mounting including a flanged lamp socket, an insulating ring and a conducting cap which coacts with an opening in the casing to introduce the lamp and to complete the electrical circuit.

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