(No Model.)

W. H. REISNER.

LENS MEASURE.

No. 595,865. Patented Dec. 21, 1897.

Fig. 1.

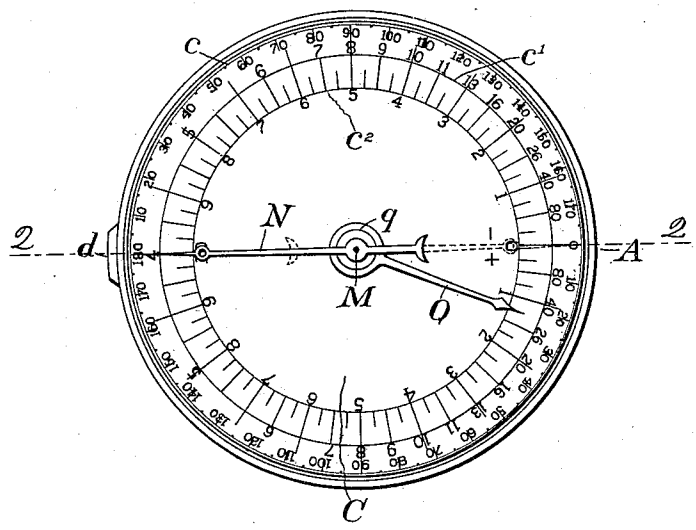


Fig. 2.

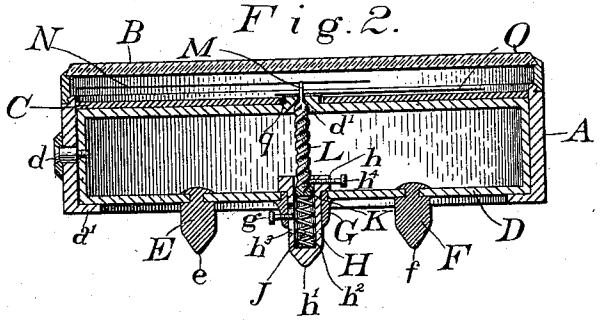
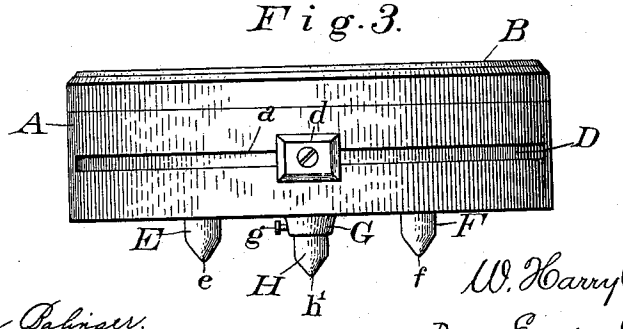


Fig. 3.



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LENS-MEASURE.

SPECIFICATION forming part of Letters Patent No. 595,865, dated December 21, 1897.

Application filed April 28, 1897. Serial No. 634,203. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM HARRY REISNER, a citizen of the United States, residing at Hagerstown, in the county of Washington and State of Maryland, have invented certain new and useful Improvements in Lens-Measures; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to lens-measures, particularly to that class of focal measures for spherical and cylindrical lenses possessing three or more relatively fixed and movable bearing-points against which a lens may be pressed, a graduated dial or annulus, a suitable hand or pointer, and intervening mechanism adapted to turn the hand upon the dial in correspondence with changes in position of the movable point or points.

In dealing with lenses composed of different substances of varying refractive power allowance must be made or a correction applied to the normal dial.

The object of my invention is to produce a lens-measure of the character stated wherein the bearing-points are placed upon the opposite side from the dial—that is to say, the measure being given the customary form of a disk or cylinder of short axis the dial would appear at one flat end and the bearing-points at the other. This arrangement adds materially to the convenience of the user by permitting the lens to be held either in hand or clamped in any position or resting upon a flat surface.

Another object of my invention is to improve the mechanism by which the motion of the movable point is transmitted to the hand upon the dial.

A further object of my invention is the construction of an improved lens-measure from which the focal distance of ordinary lens forms may be read directly without the necessity of adding one reading to or subtracting it from another, those operations being carried out by simple movements of the working parts.

Each constituent element of my invention is described in detail, and its individual office, together with the mode of operation as a whole, fully explained hereinbelow.

Referring to the accompanying drawings, wherein like letters are used to designate like parts throughout the several views, Figure 1 represents a top plan view showing the two hands and the manner of marking the dial. Fig. 2 represents a vertical section upon the line 2 2 of the first figure; and Fig. 3, a side view of the exterior casing, showing the circumferential slot and thumb-lug adapted to travel the slot and revolve the interior casing of frame with parts attached thereto.

Considering Fig. 2, A marks the outer casing, usually cylindrical, having slot a, (see Fig. 3,) flange a', and a suitable bezel, in which is set a crystal B. Secured to casing A is the dial C, having three graduated circles, (designated for purposes of description and identification as c c' c^2,) being respectively the outer, intermediate, and inner circles of the dial. The zero-mark upon the dial at the right of Fig. 1 denotes the spot to which the point of hand N is directed when the three contacts e h' f are held upon a straight-edge. From zero the hand would be moved toward the plus (+) side of the dial by a convex surface applied to the contacts, while a concave surface would permit the hand to recede toward the minus (−) side. Beginning at a point upon the radius passing through zero the two halves of inner circumference c^2 are graduated in like numerical order from "1" to "10," each division representing an increase of one diopter refractive power. For example, a lens having a focal length of one meter must be bounded by surfaces so related that the algebraic sum of their refractive powers equals one diopter. As a focal length of one meter is the same, approximately, as forty inches, therefore upon the same radius of the dial with the one diopter-mark is found the number "40" upon the middle circumference c' on the plus side. Middle circumference c' is divided into equal parts corresponding to the diopter-scale, and, beginning at a point upon the zero-radius, certain of the divisions are numbered empirically as nearly as may be to indicate the focal length in inches of a lens measuring a

given sum in diopters. Obviously as an increase of refractive power produces a decrease in focal length the greater numbers upon the inch-scale c' are found toward the zero-radius. Where the convexity of the lens predominates, the focal length in inches is positive and is read from the plus side. When concavity is in excess, the focal length is a negative quantity, the focus being assumed to be in the axis upon the same side of the lens as that from which light enters, and the reading is taken from the minus (—) side of inch-scale c'. By reason of the relation, familiar to opticians, existing between inches of focal length and radii of curved surfaces the curvature of the faces of spherical and cylindrical lenses may be very accurately read from scale c' by a skilled operator. With regard to the degree-scale or outer circumference c it will be noted that upon the plus side the numbers increase from the zero-point to "180" directly opposite that point, while upon the minus side the numbers are placed exactly the reverse in order—that is to say, the "—180°" mark would fall upon the zero-point if placed upon the dial and the numbers decrease to a zero-point at the left of Fig. 1, now marked "+180°." In handling spectacles provided with cylindrical lenses to correct astigmatisms it is often desirable to learn the inclination of the axis of the cylinder with respect to the greatest diameter of the elliptical frame, which is the line joining the bow and temple of the spectacles. For this purpose the degree-scale is provided. Dial C has a central orifice.

Between dial C and flange a', Fig. 2, is an interior casing or frame D, and projecting therefrom through the slot a is a thumb-lug d, by which the interior casing may plainly be circularly moved within the outer. d' marks a conical depression centrally placed within top of casing D. The depression has an orifice at its apex and is intended to constitute an upper bearing for a worm-spindle, to be hereinafter described. Through the bottom of casing D and ordinarily upon the same diameter are riveted pins E and F, having the conical or other chosen bearing-points e and f. I employ usually but two stationary pins E and F, that number being found convenient for common uses. Others could obviously be introduced.

Letter G designates a collar centrally secured in an opening through the bottom of casing D, and it is provided with a set-screw g. Fitting movably within collar G is a hollow plug or pin H, having a flange h, a conical point h', similar to points e and f, an axial bore h^2, a longitudinal slot h^3, and a set-screw h^4, working through the flange. The set-screw h^4 will be again referred to. Set-screw g is seen engaging slot h^3.

Located in the bore of plug H is a spiral spring J, upon the upper coils of which rests a block K, cupped conically to receive the correspondingly-shaped extremity of worm-spindle L, the upper end of which is also conical, fitting depression d' and terminating in a pintle M, that supports the superior hand N above dial C. (See also Fig. 1.) Set-screw h^4 will be noted in engagement with worm L, and both these parts are accurately fashioned and hardened in order to prevent loss of motion. Spiral spring J at all times holds the worm firmly but yieldingly between block K and depression d'.

In Figs. 1 and 2 will be noticed a second or inferior hand Q, secured by means of a split spring band or collar q to a nipple which rises above depression d' in the top of casing D. The offices of hand Q and coöperating parts are set out in the following statement of the mode of operation.

In view of the foregoing description it will be understood from Figs. 2 and 3 by inspection that any movement of thumb-lug d carries with it not only casing D, but all the movable parts, since all are connected directly and indirectly with the inner casing. Independent of its rotative movement the hollow plug H may be given a reciprocating motion vertically, governed by set-screw g in slot h^3.

In assembling the elements the dial and hand N are so placed relatively that upon applying a straight-edge to the three points e, h', and f together the extremity of the hand will come to rest exactly above the zero-line common to the three graduated circles.

Assume that a certain lens to be measured is a (periscopic) concavo-convex having a focal length of three diopters and that the convex side measures 4.25 and the concave side 1.25 diopters. As is customary in these instruments I have marked the side of dial C, arranged to indicate convexity, with a plus sign, while degrees of concavity are found upon the minus side—that is to say, when point h' is forced upwardly above the straight line joining points e and f hand N moves toward the plus degrees and when point h' projects below the line the hand indicates minus divisions of the scales. In measuring a lens of the dimensions assumed I first place properly against the points the concave side, which will cause the hand to indicate "—1.25." Now by means of the thumb-lug let the casing D and all the mechanism be turned until inferior hand Q points to "—1.25" diopters. Upon removing the lens and applying a straight-edge both hands now point to "—1.25," and upon pressing the convex side of lens to the bearing-points the hand N must move over 1.25 diopters actual convexity before reaching dial zero and necessarily comes to rest upon the three-diopter line, although, in fact, having swept through 4.25+ diopters. Thus in the case of concavo-convex forms the minus or concave divisions are deducted from the plus or convex divisions, and the real focal length and refractive power directly shown upon the dial in parts of the intermediate and inner circles predetermined

to represent, respectively, inches and diopters. By a corresponding series of simple adjustments the hand and dial may be caused to indicate the convex sum or concave sum of double convex or concave lenses.

It is believed to be plain from the foregoing that the curvature and focal distance of a cylinder may be ascertained upon scales c^2 and c', and to determine the inclination of the axis the lens is applied to contacts $e\ h'\ f$ and turned until hand N points to zero, indicating that the contacts all lie in a straight line on the surface of the cylinder parallel with the axis. If the axis of the cylinder is perpendicular to the greatest diameter of the frame, the bow and temple will fall directly below the opposite ninety-degree marks. If the axis of the cylinder inclines toward one side or the other of the perpendicular, the ends of the greatest diameter or bow and temple fall directly below a degree-mark indicating an angle greater or less than ninety degrees. To secure uniformity of manipulation, the instructions for using my invention suggest that the casing be held with the zero-point to right of operator, that the middle of the lens be placed against contact h', and that the greatest diameter be held in line X X, Fig. 1. Casing A may now be rotated either way. The arc joining zero and the degree-mark above the temple-pivot measures the angle sought.

I am aware that the use of bearing-points relatively movable and fixed is common to this class of devices, and I do not claim that feature broadly; and,

Having thus described my invention, what I do claim, and desire to secure by Letters Patent of the United States, is—

1. In a lens-measure, the combination of an exterior casing, a graduated dial, an inner casing, devices for moving the inner with respect to the outer casing, relatively fixed and movable pins borne by said inner casing, superior and inferior hands arranged to sweep said dial independently, mechanism supported by said inner casing and adapted to operate said superior hand, said inferior hand being attached to said inner casing, said pins, mechanism and hands partaking of the movement of said inner casing as a whole, substantially as described.

2. In a lens-measure, the combination of a cylindrical exterior casing, a graduated dial attached to said exterior casing and having a central orifice, a cylindrical inner casing, devices for moving the inner with respect to the exterior casing, fixed pins borne by said inner casing, and a relatively-movable central pin borne by said inner casing, said dial arranged to face one open end of said cylindrical exterior casing and said pins to project beyond the opposite end, superior and inferior hands placed to sweep said dial-face independently, mechanism supported by said inner casing and adapted to operate said superior hand, said inferior hand being attached to said inner casing, said pins, mechanism and hands partaking of the movement of said inner casing as a whole, substantially as described.

3. In a lens-measure, a dial having a circumference divided into two semicircumferences each marked in degrees and numbered in the same direction around the dial beginning from opposite ends of a given diameter, in combination with a hand arranged to sweep said dial, a casing, fixed and movable points borne by the casing, and mechanism adapted to operate said hand, substantially as described.

4. In a lens-measure, the combination of an exterior casing, a suitable dial attached to said casing, an inner casing having orifices and central depression, devices for moving the inner with respect to the exterior casing, pins secured to said inner casing, a collar centrally secured to said inner casing and provided with a set-screw, a movable pin or plug fitting said collar, said movable pin having a central bore, a longitudinal slot and a flange provided with a set-screw, said pins having bearing-points, a spiral spring and a cupped bearing-block movable within said pin-bore, a worm-spindle, superior and inferior hands, all said parts other than exterior casing and dial being borne by said inner casing and partaking of its movement, the whole constructed and arranged substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

W. HARRY REISNER.

Witnesses:
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