

D. S. SMITH.
EXPOSURE METER.
APPLICATION FILED OCT. 15, 1918.

1,358,472.

Patented Nov. 9, 1920.
3 SHEETS—SHEET 1.

Fig. 1.

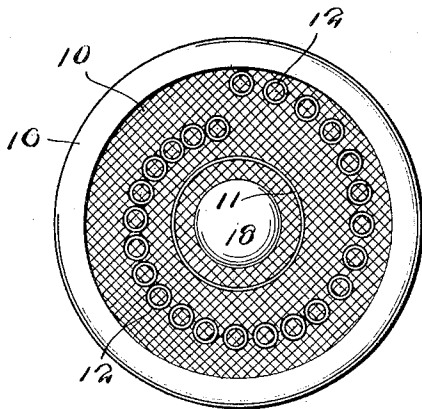


Fig. 2.

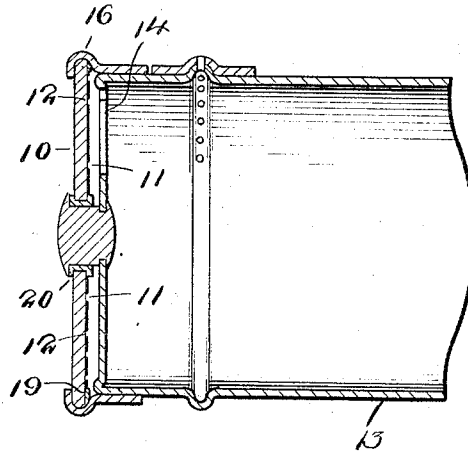


Fig. 3.

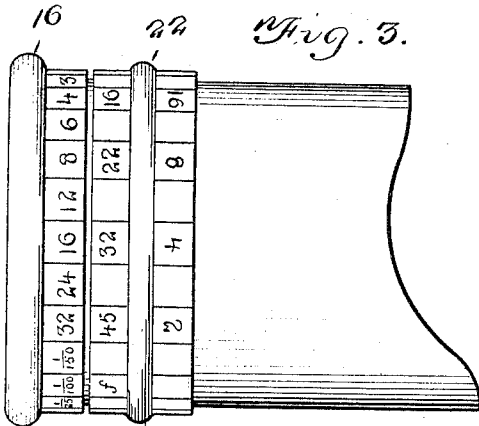


Fig. 4.

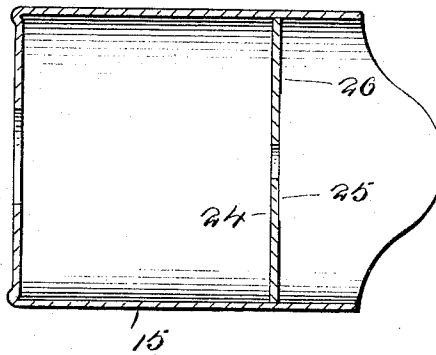


Fig. 11.

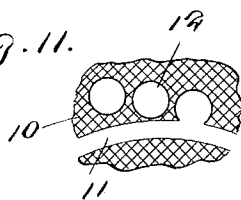
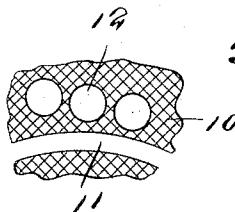


Fig. 12.



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Fig. 5.

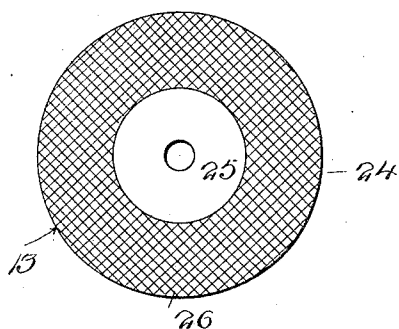


Fig. 6.

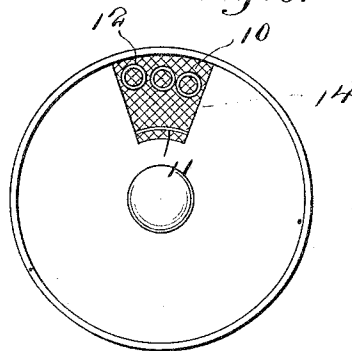


Fig. 10.

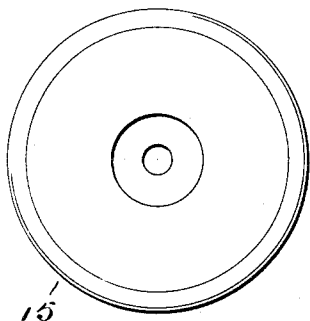
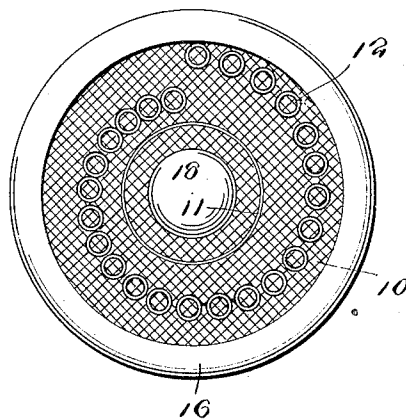
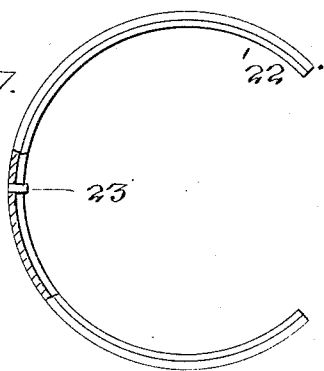


Fig. 7.



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Fig. 8.

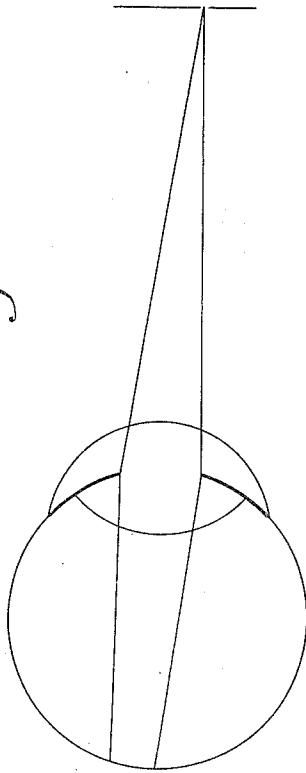
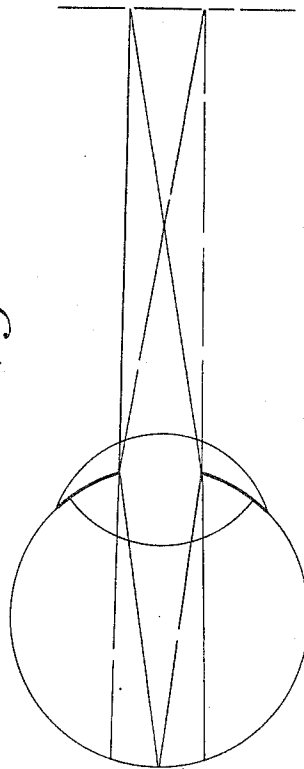
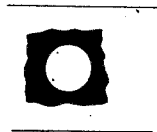


Fig. 9.



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UNITED STATES PATENT OFFICE.

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EXPOSURE-METER.

1,358,472.

Specification of Letter's Patent.

Patented Nov. 9, 1920.

Application filed October 15, 1918. Serial No. 258,133.

To all whom it may concern:

Be it known that I, DAVID S. SMITH, a citizen of the United States, residing at Arlington, in the county of Hudson and State of New Jersey, have invented new and useful Improvements in Exposure-Meters, of which the following is a specification.

This invention relates to exposure meters adapted for properly timing exposures in photographic work, the broad object in view being to provide a simple, accurate and inexpensive meter which will determine the correct time for the exposures of photographic plates, films and other sensitized surfaces, the result being obtained by direct observation of the field without calculation or previous experience in the photographic art.

In this invention I utilize the fact that the pupil of the human eye is enlarged or reduced in size, according to the intensity of the light to which it is subjected. This increased diameter under a dull light, or reduced diameter under a bright light, causes objects, when seen through a tube, to take different degrees of proximity, according to the size of the pupil. I therefore arrange, preferably in the tube, a series of objects, preferably transparent portions on an opaque plate, which objects are situated at different relative distances from the center of the tube and from each other, and I further employ a scale that indicates, when these indicating points are in their proper relative positions, the duration of time of an exposure to which a photographic plate should be subjected to secure a good picture.

I also find that in a short tube, two or three inches long, a very fine transparent line is represented to the eye as a thick band of misty light well defined on its edges, and a small circular line with an opaque center and on an opaque field appears to the eye as a foggy or milk-like disk, and I prefer to use such configuration on the opaque screen in use in this invention and to be hereinafter described, although I do not wish to be limited to such particular forms of connecting openings.

The device is more accurate when both eyes are used, as this nullifies the effect of external light from wide angles entering the open or closed eye not used in measurement.

By means of the device herein shown and described, only a few seconds, say from

three to five seconds, are required to determine the proper period of time for any given exposure.

With the above and other objects in view, 60 the invention consists in the construction, combination and arrangement of parts, as herein described, illustrated and claimed.

In the accompanying drawings:—

Figure 1 is a front elevation or face view 65 of the left eye sight tube.

Fig. 2 is a diametrical section through the left eye sight tube.

Fig. 3 is a plan view of the same.

Fig. 4 is a diametrical section through the 70 right eye sight tube.

Fig. 5 is a plan view of the diaphragm of the right eye sight tube.

Fig. 6 is a transverse section through the left eye sight tube showing the contour of 75 the sight aperture in the forward end of the tube, also showing a portion of the screen.

Fig. 7 is a detail view of the adjustable stop scale.

Fig. 8 diagrammatically illustrates the 80 path of the rays of light through one aperture and eye section.

Fig. 9 is a similar view showing the light rays through two apertures and the eye 85 section.

Fig. 10 is an end elevation of the complete meter.

Fig. 11 shows a fragment through the shutter or sight opening properly set for 90 reading the exposure scale.

Fig. 12 shows the same improperly set for reading.

In the preferred form of device I use a small portable tube which is adapted to be placed in front of the eye and has a screen 95 on its outer end, the screen being opaque, except for transparent openings in it, these, as before stated, being preferably in the form of fine circular lines, and there is a fixed transparent opening, toward and from 100 which the movable transparent openings are adapted to be moved, the screen being provided with a scale, so that when the openings appear to the eye to be in a predetermined position, the scale will indicate the 105 amount of exposure, and in addition I prefer to provide, with the scale, a supplemental scale indicating the exposure to be used with a certain size stop used on the camera. 110

A section of the eye is shown in Fig. 8 and also the path of the rays of light enter-

ing a fine aperture in the screen when held close to the eye. The rays of light form a luminous cone with its apex far behind the retina, the latter cutting the light cone near the base. The observer sees a section of the cone as a bright disk which varies in diameter with every change in size of the pupil. Since the diameter of the pupil depends upon the intensity of the light entering the lens of the eye, a measurement of the image will indicate a definite light value.

Two of such apertures are shown in Fig. 9 in a screen spaced about one quarter inch apart, causing a bright disk to appear with its edge overlapping, in contact, or standing clear of a curved line according to the size of the pupil. For any one light value therefore, the edges of these figures can be made to appear in contact by changing the space between the screen apertures. One form of device for accomplishing this is by furnishing a circular opaque screen 10 with an annular translucent reference line 11 concentric to the axis or center of the disk, and preferably annular translucent figures 12 which are disposed in spiral formation, said figures being at different distances from the center or axis of the disk.

The screen when rotated about the end of the left eye sight tube 13, brings to view through the shutter opening 14 in the end of the tube a section or portion of the screen, showing, for example, three of said translucent figures above a section or portion of the concentric reference line or circle. While but one translucent figure can be in contact or intersection with such arc or portion of the reference line or circle, three disks are shown as an aid in determining the correct position of the screen with greater facility, since one disk overlapping, one above, and the intermediate disk resting on the reference line, indicates that the scale is properly set and the correct time for any camera stop can be directly read from the scale.

The screen is clamped within a sleeve 16 and supported upon and revolves around a center pin 18. A washer 19 is also clamped within the sleeve flange protecting the screen from wear, as does also a bushing 20 passing through the center of the screen. The screen, (preferably of celluloid), is first made translucent on one surface before printing with opaque ink although any other method may be employed in producing the screen. As clearly shown in Fig. 2 a circumferential flange 21 is pressed on the left eye sight tube to strengthen the wall of said tube, and also to serve as a guide for a stop scale collar 22 having a like flange. A locking pin 23 through a collar engages perforations in the flange 21, to hold the scale securely and yet enable the same to be readily released for adjustment when re-

quired, by springing the collar slightly off the tube. Two graduated scales are provided as shown and arranged with relation to each other, so that the stop collar may be reversed, enabling either scale to be used without liability of confusion.

In Fig. 5, I have shown a diaphragm 24 preferably of celluloid, which is placed near the eye opening of the right eye sight tube, said diaphragm having a central perforation to allow a clear view of the field, a translucent zone or disk like space surrounding said opening and an opaque band or field 26 on the marginal portion of the diaphragm. The right eye sight tube will ordinarily be and preferably is of smaller diameter than the left eye sight tube, so that it may be housed within the latter when not in use, thus making a very compact instrument for carrying in the pocket.

The function of the tube 15 is to allow of exploring the field to be photographed and to admit to the eye only those light rays falling within the angle of the lens of the camera. Said tube is held to the right eye and receives the light rays to be measured, expanding or contracting, through sympathetic connecting nerves and muscles, the iris of the left eye, although the latter be in the shade. This is a feature of the binocular method of which I have taken advantage in producing the improved exposure meter.

From the foregoing description taken in connection with the accompanying drawings, it will be seen that I have produced a simple, accurate and inexpensive device for determining the correct time for the exposure of photographic sensitized surfaces of all kinds by direct observation of the field, without calculation or previous experience in the photographic art. Furthermore, the device calls for the employment of both eyes during the operation, thus nullifying the effect of external light from wide angles entering the open or closed eye not used in measurement.

The eye tubes of both eyes are employed, as stated, to make the device more accurate, since there is no straining of the eye in use for measuring, since the other eye is looking at the object through a restricted opening and the size of such observing eye is not unduly affected and therefore does not cause sympathetic action in the pupil of the first mentioned eye, but when only one eye tube is employed there is sufficient accuracy to warrant the use of one such tube, if desired.

I claim:—

1. An exposure meter embodying a sight tube having an off-center sight aperture, and a screen having a rotatable mounting in relation to said sight tube and comprising an opaque field having a translucent annular reference line concentric with the axis of said screen, and a plurality of translucent

figures arranged at different distances from said axis.

2. An exposure meter embodying a sight tube having an off-center sight aperture, and a screen having a rotatable mounting in relation to said sight tube and comprising an opaque field having a translucent annular reference line concentric with the axis of said screen, and a plurality of translucent figures arranged at different distances from said axis, the last named figures being disposed in spiral formation.

3. An exposure meter embodying a sight tube having an off-center sight aperture, and a screen having a rotatable mounting in relation to said sight tube and comprising an opaque field having a translucent annular reference line concentric with the axis of said screen, and a plurality of translucent figures arranged at different distances from said axis, said sight aperture being of segmental contour and adapted to expose a portion only of said reference line and concurrently a plurality of said figures.

4. An exposure meter embodying a sight tube having an off-center sight aperture, and a screen having a rotatable mounting in relation to said sight tube and comprising an opaque field having a translucent annular reference line concentric with the axis of said screen, and a plurality of translucent circular figures arranged at different distances from said axis.

5. An exposure meter embodying a sight tube having an off-center sight aperture, a screen having a rotatable mounting in relation to said sight tube, and comprising an opaque field having a translucent annular reference line concentric with the axis of said screen, a plurality of translucent figures arranged at different distances from said axis, a graduated annular scale revoluble with said screen, and a curvilinear stop scale member.

6. An exposure meter embodying a sight tube having an off-center sight aperture, and a screen having a rotatable mounting in relation to said sight tube and comprising an opaque field having a translucent annular reference line concentric with the axis of said screen, a plurality of translucent figures arranged at different distances from said axis, a graduated annular scale revoluble with said screen, and a curvilinear stop scale

member, said stop scale being adjustable about the axis in relation to the axis of the screen.

7. An exposure meter embodying a sight tube having an off-center sight aperture, and a screen having a rotatable mounting in relation to said sight tube and comprising an opaque field having a translucent annular reference line concentric with the axis of said screen, a plurality of translucent figures arranged at different distances from said axis, a graduated annular scale revoluble with said screen, and a curvilinear stop scale member, said stop scale being adjustable about the axis in relation to the axis of the screen, and reversible end for end.

8. An exposure meter embodying a sight tube having an off-center sight aperture, and a screen having a rotatable mounting in relation to said sight tube and comprising an opaque field having a translucent annular reference line concentric with the axis of said screen, a plurality of translucent figures arranged at different distances from said axis, in combination with a second sight tube having a central aperture at one end, and also having a diaphragm embodying a central aperture, a larger central translucent zone, and an opaque field surrounding said zone.

9. An exposure meter which utilizes variations in size of the pupil of the human eye under varying light conditions, which meter comprises a tube with a fixed translucent opening, a movable element with translucent light openings, and a scale associated with the movable element to indicate times of exposure when the light openings appear in predetermined positions relative to each other.

10. An exposure meter which utilizes variations in size of the pupil of the human eye under varying light conditions, which meter comprises a tube with a fixed translucent opening, a rotatable screen having a series of translucent light openings, the openings on the screen being disposed at various distances radially from the fixed opening, and a scale associated with the rotatable screen to indicate times of exposure when the light openings appear in predetermined positions relative to each other.

In testimony whereof I affix my signature.
DAVID S. SMITH.