Aug. 18, 1942. M. G. TOWNSLEY 2,293,576

PHOTOGRAPHIC EXPOSURE METER

Filed April 29, 1941

Fig. 1

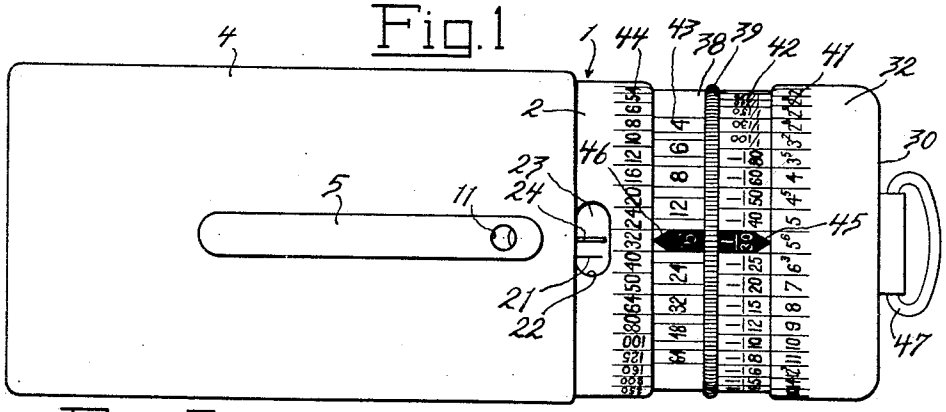


Fig. 2

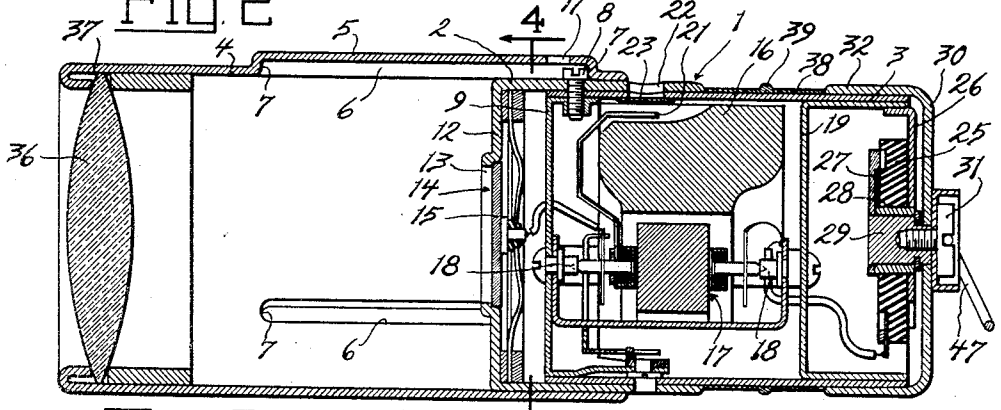


Fig. 5

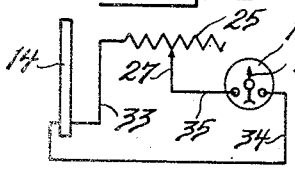


Fig. 3

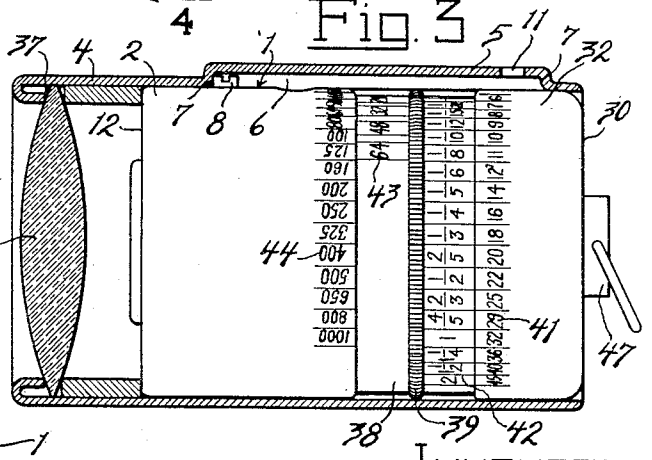
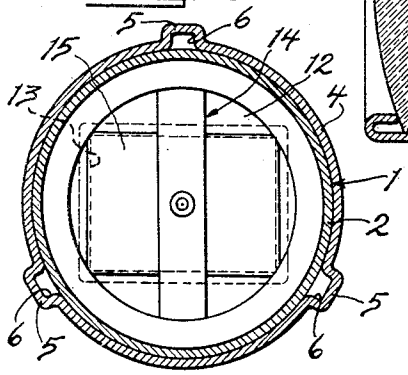


Fig. 4



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PHOTOGRAPHIC EXPOSURE METER

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3 Claims. (Cl. 88—23)

My invention relates to photographic exposure meters such as are used for calculating exposure for photographic cameras and has for its general objects the provision of a novel, accurate, compact and conveniently functioning photographic exposure meter, the invention contemplating an extensible casing structure permitting contraction of the instrument when not in use and convenient exposure calculating means compactly and desirably associated with the instrument.

With these objects in view, my invention consists in certain features of novelty in the construction, combination, and arrangement of parts by which the said objects and certain other objects, hereinafter appearing, are effected, all as fully described with reference to the accompanying drawing, and more particularly pointed out in the appended claims.

In the said drawing—

Figure 1 is a side elevation of a photographic exposure meter embodying my invention and showing it in extended condition;

Figure 2 is an axial sectional view of the same;

Figure 3 is a side elevation of the same in contracted condition with a portion thereof in axial section;

Figure 4 is a sectional view substantially on the line 4—4 of Figure 2; and

Figure 5 is a wiring diagram of the exposure meter.

Referring to the drawing, 1 designates generally an interior cylindrical casing part comprising outer and inner cylindrical members 2 and 3 secured together in telescoped relation, as hereinafter described, and 4 designates an exterior casing part telescopically engaged exteriorly on the interior casing part for axial movement with respect thereto.

The exterior casing part 4 is provided with exteriorly extruded longitudinally extending portions 5 spaced angularly thereabout and forming interior longitudinally extending grooves 6 terminating with opposed shoulders 7. See particularly Figures 2 and 3.

Headed screws 8 are screwthreadedly secured with the forward portion of the interior casing part radially thereof by engaging through apertures of the casing members 2 and 3 and screwthreadedly engaging in apertures of a flanged support member 9 arranged forwardly within and transversely of the casing member 3 to secure the members 2, 3 and 9 in assembly. The heads of the screws 8 are slidably engaged in the grooves 6 and are alternately engageable with the shoulders 7 to limit relative longitudinal movement of the exterior and interior casing parts 4 and 1. The extruded portions 5 are provided with rearwardly disposed radial apertures 11 through which the screws 8 may pass for assembly. As so related, the exterior and interior casing parts 4 and 1 are relatively movable longitudinally from extended functioning position as shown in Figures 1 and 2 to contracted position as shown in Figure 3 in which the major portion of the exterior casing part overlies the interior casing part for the purpose of compactness when the instrument is not being used.

The forward end of the member 2 of the interior casing part is provided with an inwardly directed flange 12 normal to the axis of the casing parts and having a central rectangular aperture 13, and a photoelectric cell 14 is secured within the member 2 at the rear of the flange 12 and includes flat sensitized layer carrying element 15 which extends normal to the axis of the casing parts at and across the aperture 13. See Figures 2 and 4.

Secured within the intermediate portion of the interior casing part 1 is a galvanometer comprising a field magnet 16 and a cooperating armature 17 pivotally mounted on an axis parallel to the axis of the casing parts by means of bearings 18, the forward bearing being carried on the support member 9, and the other bearing being carried on a flanged support member 19 arranged rearwardly within and transversely of the casing member 3 and suitably secured therewith, see Figure 2. An indicating arm 21 is secured with the armature 17 and has its outer end underlying an observation aperture 22 through the wall of the interior casing part 1, and a transparency 23 is secured with this casing part and extends across the aperture 22 and is provided with an indicating mark 24 for accurately observing the position of the indicating arm. See Figures 1 and 2.

A variable resistance device 25 of usual construction is secured within the rear portion of the casing part 1 by means of a support member 26 secured within the flange of the support 19, and includes a control arm 27 pivotally mounted in coaxial relation with the casing parts as designated at 28 and by means of a hub 29 secured with the arm. A cylindrical cup-shaped manipulating member 30 is operatively connected with the control arm 27 by means of a headed screw 31 passing axially through the member 30 and screwthreaded axially into the hub 29. The flange 32 of the member 30 overlies the rear portion of the casing element 3 and is angularly

movable with respect thereto to adjust the variable resistance device.

The photoelectric cell 14, the armature 17 of the galvanometer, and the variable resistance device 25 are connected in series, as shown in Figure 5, by means of electrical conductors 33, 34 and 35. Accordingly, current generated by the photoelectric cell 14 by light imparted thereto energizes the armature 17 in correspondence with the degree of light to which the photoelectric cell is subjected and causes the indicating arm 21 to assume a corresponding position, and adjustment of the variable resistance device 25 by angular adjustment of the manipulating member 30 adjusts the amount of current imparted to the armature for the purpose of bringing the indicating arm 21 into registry with the indicating mark 24 for a purpose hereinafter appearing.

An objective lens 36 is secured, as designated at 37, within the forward end portion of the exterior casing part 4 in coaxial relation with the casing parts 1 and 4. See Figures 2 and 3. As so mounted, the lens 36 is adapted to be positioned in focused relation with the photoelectric cell 14 when the casing parts 1 and 4 are in extended relation as shown in Figures 1 and 2. The extensible casing formed by the casing parts 1 and 4 is light excluding so that the lens 36 constitutes the sole source of light to the photoelectric cell 14, and the lens, in focused relation with the photoelectric cell, transmits light to the photoelectric cell in accurate correspondence with the light transmitted from a scene to be photographed and toward which the lens is directed with obvious accuracy in the light controlled response of the galvanometer. In the contracted non-focused relation of the casing parts 1 and 4, as shown in Figure 3, the instrument is extremely compact when not in use, alternate engagement of the heads of the screws 8 with the shoulders 7 determining the extended focused and contracted non-focused relation of the casing parts.

Also toward the end of accuracy in the light controlled response of the galvanometer with reference to a scene to be photographed, the light receptive area of the photoelectric cell 14 is marginally limited in correspondence with the photographic frame of a photographic camera. Accordingly, the light receptive area of the photoelectric cell is rectangularly limited in correspondence with a usual or standard rectangular photographic frame of a photographic camera, as by the rectangular aperture 13 of the flange 12.

The objective lens 36 preferably transmits light to the light receptive area of the photoelectric cell in correspondence with a given photographic lens of a given photographic camera having a photographic frame with which the marginal limitation of the light receptive area of the photoelectric cell corresponds, and may correspondingly relate to different given photographic lenses respectively of different given photographic cameras. As an example, the lens 36 may have the light transmission effect of a one-inch photographic lens of a standard 16 mm. motion picture camera, of a one-half-inch lens of a standard 8 mm. motion picture camera, and of a two-inch lens of a standard 35 mm. motion picture camera.

Exposure calculating means, including the flange 32 of the angularly movable manipulating member 30, is arranged on the exterior of the interior casing part 1 and consists as follows:

A sleeve 38 is engaged on the exterior of the inner member 3 of the interior casing part 1 between opposing ends of the outer member 2 and the flange 32 for angular movement with respect to the interior casing part and the manipulating member 30, the sleeve being provided with a knurled exterior circumferentially extending ridge 39 for the convenient manipulation thereof.

The exterior of the end portion of the flange 32 of the manipulating member 30 is provided with an angularly extending scale 41, the end portion of the sleeve 38 adjoining the flange 32 is provided with an angularly extending scale 42, the end portion of the sleeve 38 adjoining the outer member 2 of the interior casing part 1 is provided with an angularly extending scale 43, and the end portion of the outer member 2 adjoining the sleeve 38 is provided with an angularly extending scale 44, see Figure 1.

As shown, the scale 41 concerns photographic lens diaphragm aperture, the scale 42 concerns shutter speed, the scale 43 concerns frames per second of motion picture cameras, and the scale 44 concerns film exposure speed, these scales being related for the calculation of the proper exposure conditions in conjunction with the light measuring means including the photoelectric cell, the galvanometer and the variable resistance, heretofore described. The scales 42 and 43 are in fixed relation on the sleeve 38 and are equivalents in respect to shutter speed of motion picture cameras and of still cameras. That is to say, where the proper exposure of a motion picture camera is to be calculated, the scale 43, concerning frames per second of a motion picture camera and consequently concerning shutter speed, is used instead of the scale 42, and where the proper exposure of a still camera is to be determined, the scale 42 is used instead of the scale 43. To facilitate alternate use of the scales 42 and 43, each of these scales includes a distinctive index mark, respectively designated at 45 and 46, in the use of either of which the corresponding scale is disregarded.

The operation of the exposure meter comprises directing the lens 36, while in extended focused relation with the photoelectric cell 14, toward a scene to be photographed, adjusting the variable resistance 25 by means of angular adjustment of the manipulating member 30 to position the indicating arm 21 in registry with the index mark 24, angularly adjusting the sleeve 38 in respect to the scale 44 in correspondence with the exposure speed of the film being used (utilizing one or the other of the index marks 45 and 46, depending upon a motion picture camera or a still camera being used), and referring back to the scale 41 by means of the instantly utilized index mark (45 or 46) to determine the proper photographic lens diaphragm aperture.

The aforesaid exposure calculating means is on the exterior of the interior casing part 1, and the exterior casing part 4 is disposed over the calculating means in the contracted relation of the casing parts 1 and 4 with obvious advantage.

Toward the end of facilitating the relative movement of the casing parts 1 and 4 from contracted relation, as shown in Figure 3, to extended relation, as shown in Figures 1 and 2, a folding bail device 47 is secured on the exterior of the member 30 by means of the screw 31.

While I have thus described my invention, I do not wish to be limited to the precise details described, as changes may be readily made without departing from the spirit of my invention, but having thus described my invention, I claim

as new and desire to secure by Letters Patent the following:

1. In a photographic exposure meter, the combination with light measuring means including a light responsive element, of an objective lens adapted to be positioned in focused relation with said light responsive element, an extensible light excluding casing comprising relatively movable cylindrical telescopically engaged casing parts respectively carrying said light responsive element and said lens therein for relatively positioning said light responsive element and said lens axially of said lens, the exterior casing part being provided with an exteriorly extruded longitudinally extending portion forming an interior longitudinally extending groove terminating with opposed shoulders, and a screw screwthreadedly secured with the interior casing part radially thereof and projecting into said groove and alternately engageable with said shoulders, the extruded portion of said exterior casing part being provided with a radial aperture for insertion and removal of said screw.

2. In a photographic exposure meter, the combination with light measuring means including a photoelectric cell, a galvanometer energized thereby and a variable resistance operative to vary the energy imparted to said galvanometer, of an objective lens adapted to be positioned in focused relation with said cell, an extensible light excluding casing comprising relatively movable telescopically engaged cylindrical casing parts respectively carrying said light measuring means and lens therein for relatively positioning said photoelectric cell and said lens in extended focused or contracted nonfocused relation, and a cup-shaped manipulating member operatively connected with said variable resistance and mounted on the end of the casing part carrying said light measuring means remote from said lens with the flange of said manipulating member surrounding this casing part for angular movement on the axis thereof.

3. In a photographic exposure meter, the combination with light measuring means including a photoelectric cell, a galvanometer energized thereby and a variable resistance operative to vary the energy imparted to said galvanometer, of an objective lens adapted to be positioned in focused relation with said cell, an extensible light excluding casing comprising relatively movable telescopically engaged cylindrical casing parts of which the interior casing part carries said light measuring means therein and the exterior casing part carries said lens therein for relatively positioning said photoelectric cell and said lens axially of said lens, a cup-shaped manipulating member operatively connected with said variable resistance and mounted on the end of the interior casing part remote from said lens with the flange of said manipulating member surrounding this casing part for angular movement on the axis thereof, and exposure calculating means on the exterior of the interior casing part over which the exterior casing part is disposed when the casing parts are in contracted relation, said calculating means including the flange of said manipulating member and a circular element angularly movable with respect to said interior casing part and said manipulating member.

MALCOLM G. TOWNSLEY.