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COMPLETE SPECIFICATION.

Improvements in Photographic Reflex Cameras.

I, LUCIEN JULES EMILE ANDRE DODIN, of rue Tixador, Canet-Plage, (Pyrenees Orientales), France, a citizen of the French Republic, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :—

The present invention relates to a viewfinder for a photographic camera of the single-lens or twin-lens reflex type and in which the image is observed through an eye piece at the back of the camera in a direction parallel with the optical axis of the objective, this image being erect and unreversed laterally, the viewfinder comprising a combination of the reflex mirror with three additional mirrors interposed between this first mirror and the observer's eye, these four plane reflecting surfaces constituting, two by two, right-angled dihedrons the edges of which lie at a right angle to one another and the bisector planes of which are parallel to the said optical axis.

An inconvenience of this type of camera is a loss of intensity of the incident light rays when these are focused upon the ordinary roughly granulated ground glass generally employed in heretofore existing cameras. This inconvenience is especially serious when the viewfinding or the focusing or both are done with an objective stopped down ready for the exposure to a small aperture involving a low illumination.

It is an object of this invention to provide an improved viewfinder for use in cameras of the type referred to, and which will reduce or eliminate this inconvenience.

According to the present invention a viewfinder having the features hereinbefore referred to is characterised in that in a camera of the single-lens reflex type the axis of rotation of the reflex mirror, when the camera is disposed in its normal position, with the axes of its roll of film vertical, is vertical, and that in a camera of the single-lens or twin-lens reflex type the image reflected by the said reflex mirror is formed through a field lens disposed in the path of the light rays between the reflex mirror and the next following mirror.

In one arrangement according to the invention the lateral image thrown by the reflex system constituted by the first, vertical mirror is reflected in turn by two mirrors constituting a right-angled dihedron the edge of which is parallel to the optical axis of the objective and the bisecting plane of which is horizontal, and by a third auxiliary mirror the reflecting surface of which is perpendicular to that of the reflex mirror and faces to the rear.

In another arrangement according to the invention the image, thrown by the reflex system constituted by the first, vertical mirror, is reflected in turn by a first auxiliary mirror constituting with the reflex mirror a right-angled dihedron having its edge vertical and which throws the image forwards, and by two mirrors the planes of which together form a right-angled dihedron the edge of which is horizontal and perpendicular to the direction of the optical axis of the object lens and the bisecting plane of which is parallel to this axis and extends rearwards.

The improved viewfinders may be modified by replacing at least one of the auxiliary mirrors by a totally reflecting prism.

The light receiving face of the field lens may be very finely ground to a semi-transparent finish.

The use of a field lens and a finely ground satin-finish surface enables the same lens to serve for focusing different objectives having different focal lengths. This overcomes in known manner the disadvantages both of ordinary ground glass having too coarse a grain and also of only a field lens suited strictly to a particular focal length of the objective.

A preferred constructional embodiment of

[*Price* 2/-]

the present invention consists in the provision in a camera of a viewfinder which can be used as a rangefinder and/or means for focusing accurately the camera objective, the viewfinder having the above-mentioned four mirrors and field lens with a finely ground surface.

In this case the viewfinder, which will hereafter be called the telemetric viewfinder is formed by dividing the field lens having the finely ground surface into two half lenses parted at a diametral plane and displaceable in contact in this plane.

As stated hereinbefore, these two semi-lenses, forming a known telemetric device (as described for example in United States Patent Specification No. 886,739), are placed between the first mirror of the reflex and the second of the series of four mirrors. The sighting and the observation of the image framed in the telemetric viewfinder are effected through the eye-piece as formerly.

The present invention will be further described with reference to the accompanying drawings which show by way of example some embodiments of the invention and in which:—

Figure 1 is a rear view, with parts broken away, of a photographic camera comprising a form of viewfinder according to the present invention.

Figure 2 is a side view, with a part broken away, of the camera of Figure 1.

Figure 3 is a sectional plan view of the camera of Figures 1 and 2.

Figure 4 is an explanatory diagram with a part broken away, of a further form of viewfinder according to the invention.

Figure 5 shows a camera comprising the viewfinder of Figure 4.

In these drawings similar numerals of reference indicate like parts throughout the several views.

Referring first to Figures 1, 2 and 3, showing a single-lens reflex camera, it will be seen that the light ray 2, which emanates from the object or scene viewed and penetrates axially into the camera through the objective 1, impinges on the mirror 3 with which it forms an angle of 45° and which can be pivoted about a vertical hinge 4 into the position 3^1 perpendicular to the direction of displacement of the film 5 so that the latter may be exposed to the light at the moment of taking the desired picture.

The light ray 2 is reflected from the mirror 3 horizontally (not vertically as in ordinary reflex cameras) along the line 6 perpendicular to the optical axis. The light ray 6 is in turn reflected upwards, along a line 7, by a second mirror 8 and then reflected perpendicularly to the line 7 along a line 9 by a third mirror 11. To this end, the mirrors 8 and 11 form a right-angled dihedron having its edge 12 disposed parallel to the optical axis of the objective and its bisecting plane disposed perpendicularly to the mirror 3 and hence to the hinge 4.

The light ray 9 reflected, as stated, from the mirror 11 impinges on a fourth mirror 13 the plane of which is perpendicular to the plane of the mirror 3 and from which it is reflected, along a line 14, onto an eye-piece 16 mounted in an opening 15 cut through the rear wall of the camera body which is diagrammatically shown by dash and dot line 20.

Desirably, the light reflecting mirrors 8, 11 and/or 13 may be formed by the respective sides of suitably assembled total reflection glass prisms.

In order to intensify the light rays 7, 9 and 14, a convergent lens 18—19 is interposed at the plane at which an image is formed by the objective 1, this plane being disposed betwen the mirrors 3 and 8. The lens 18—19 concentrates upon the mirror 8 the beam of light 6 emanating from the object or scene to be photographed. This light-concentrating lens is composed of two lens-like elements adapted to form a device intended, in addition to performing its light-concentrating function, for measuring distances from the objective of the camera to the objects or scenes to be photographed and/or for focusing the objective accurately. To this end, the lens is constituted by two semi-lenses 18, 19 separated from each other by a common median for example vertical plane 21 (Figure 2) and mutually displaceable in this plane by means which are not shown.

The semi-lenses 18 and 19 are diagrammatically indicated in Figure 2 by two corresponding semi-circles 22, 22^1 displaced through the distance d upwards and downwards, respectively, from the horizontal plane passing through the axis of the objective 1.

With this device when the operator views an object or a scene through the eyepiece 16 the field of view is bisected by a line parallel to the plane 21. If the objective 1 is not correctly focused the two parts of the field of view are displaced relatively to each other, the displacement being in a direction parallel to the said bisecting line. The displacement d varies with the range of the object or scene from the camera and if the objective and the semi-lenses are adjusted until the two parts of the field of view are no longer displaced then the objective is focused accurately. It will be apparent that if the means for moving the semi-lenses are suitably calibrated then a telemetric device which can be used as a rangefinder is obtained.

The value of d for a given range varies as the aperture of the objective is varied

and it is therefore preferable to link the means for displacing the semi-lenses by cams and levers with the means for controlling the diaphragm of the objective so that the necessary corrections are made automatically.

In cheaper cameras the amount of displacement of the semi-lenses may not be corrected for changes in the objective aperture; the focusing will then have to be effected at a particular aperture of the objective. The semi-lenses, in this case, may be worked up in a plano-convex or biconvex or meniscus system, these elements being taken into account in the design of the camera.

In the case of cameras having objectives with a short focal length or interchangeable objectives with different focal lengths, the faces of the semi-lenses 17—18 should be finely ground to a satin finish for rendering uniformly clear the focused image seen by the operator's eye through the aforesaid eye-piece 16.

The telemetric viewfinder illustrated in Figures 1, 2 and 3 can be easily arranged in the body 20 of a camera of the single-lens reflex type in which the film 5, unwound for example from a delivery spool 23 having a vertical axis 24 (Figure 1) placed on one side of the central portion of the camera, passes behind the mirrors 3, 8 and is wound on a take-up spool 25 having a vertical axis 26 placed on the other side of said central portion.

For the sake of clarity, there have been omitted in the apparatus of Figures 1, 2 and 3 all usual inside partitions separating the various parts from one another with respect to the light, as well as all usual mechanisms with the exception of what is needed for understanding the invention.

In the form of telemetric viewfinder illustrated in Figure 4 the incident light ray coming from the objective 1 is reflected from the mirror 33, which corresponds to the mirror 3 of Figures 1 and 3, through the concentrating lenses 48, 49 similar and disposed similarly to the lenses 17, 18 of Figure 1, onto the mirror 38 from which it is reflected onto the mirror 41 and herefrom onto the mirror 43 wherefrom it is further reflected onto the eye-piece 16 similar to that of Figures 1, 2 and 3. To this end, the mirrors 33 and 38 conform to a right-angled dihedron having its edge disposed vertically, i.e. perpendicularly to the direction of movement of the film 5 and to the optical axis of the objective 1, while the mirrors 41 and 43 conform to a right-angled dihedron having its bisector plane horizontal and its edge 45 disposed parallel to the direction of movement of the film.

The group comprising the mirrors 38, 41, 43, eyepiece 16 and light-concentrating displaceable lenses 48, 49 may be constructed as a self-contained telemetric viewfinder unit which, when arranged in a casing 30 indicated by thick dash-and-dot lines in Figure 5, may be mounted on the top and in place of the horizontal ground glass of a twin-lens reflex camera, such as that designated by 40. A twin-lens reflex camera is one having two objectives, one for co-operation with the said viewfinder unit and the other for forming images on the film.

The outstanding advantages of viewfinders designed according to the invention are briefly as follows.

The sighting can be effected level with the operator's eye, in the direction in which the object or scene is observed. Since the image is erect in all positions of the camera about the optical axis of the objective, the camera can be oriented at will about this axis; this is particularly useful in the case of a camera in which the image is rectangular, for setting such rectangle at will with its longer dimension vertically or horizontally. It is possible, without changing the direction of sighting, to turn the camera completely round the optical axis. The image is uniformly clear, without any granulation and loss of light due to the usual ground glass. When the viewfinder is a telemetric viewfinder, since the telemetric base is always proportional to the aperture of the diaphragm, the image remains clear whatever the value of this aperture may be, in contrast with the case of the ground glass in existing types of single-lens reflex camera. Furthermore, since the image is reflected laterally by the reflector of the reflex camera, the space occupied by the camera equipped with the viewfinder of the invention is smaller than that occupied by heretofore known cameras in which the reflector of the reflex camera reflects the image upwardly.

What I claim is:—

1. A viewfinder for a photographic camera of the single-lens or twin-lens reflex type and in which the image is observed through an eye piece at the back of the camera in a direction parallel with the optical axis of the objective, this image being erect and unreversed laterally, the viewfinder comprising a combination of the reflex mirror with three additional mirrors interposed between this first mirror and the observer's eye, these four plane reflecting surfaces constituting, two by two, right-angled dihedrons the edges of which lie at a right angle to one another and the bisector planes of which are parallel to the said optical axis, characterised in that in a camera of the single-lens reflex type the axis of rotation of the reflex mirror, when the camera is disposed in its normal position

with the axes of its roll of film vertical, is vertical and that in a camera of either the single-lens or the twin-lens reflex type the image reflected by the said reflex mirror is formed through a field lens disposed in the path of the light rays between the reflex mirror and the next following mirror.

2. A viewfinder as claimed in Claim 1, wherein the lateral image thrown by the reflex system constituted by the first, vertical mirror is reflected in turn by two mirrors constituting a right-angled dihedron the edge of which is parallel to the optical axis of the objective and the bisecting plane of which is horizontal, and by a third auxiliary mirror the reflecting surface of which is perpendicular to that of the reflex mirror and faces to the rear.

3. A viewfinder as claimed in Claim 1, wherein the image, thrown by the reflex system constituted by the first, vertical mirror, is reflected in turn by a first auxiliary mirror constituting with the reflex mirror a right-angled dihedron having its edge vertical and which throws the image forwards, and by two mirrors the planes of which together form a right-angled dihedron the edge of which is horizontal and perpendicular to the direction of the optical axis of the object lens and the bisecting plane of which is parallel to this axis and extends rearwards.

4. A modification of the viewfinder as claimed in Claim 1, wherein at least one of the auxiliary mirrors is replaced by a totally reflecting prism.

5. A viewfinder as claimed in Claim 1, wherein the light-receiving face of the field lens is very finely ground to a semi-transparent finish.

6. A viewfinder incorporated in a camera as claimed in Claim 1 or 5, wherein the field lens is divided at a meridian plane into two half lenses, the said half-lenses being offset in contact with each other at the common meridian plane to form a telemetric device, and/or a device for focusing the camera objective accurately of the coincidence type.

7. A viewfinder as claimed in Claim 6, wherein the offsetting of the two half-lenses is adjustable by the operator, independently of the adjustment of the diaphragm.

8. A viewfinder as claimed in Claim 6, wherein the necessary offsetting of the two half-lenses is variable automatically in conjunction with the aperture of the diaphragm of the objective and is effected by the adjusting control member of the diaphragm.

Dated this 23rd day of December, 1947.

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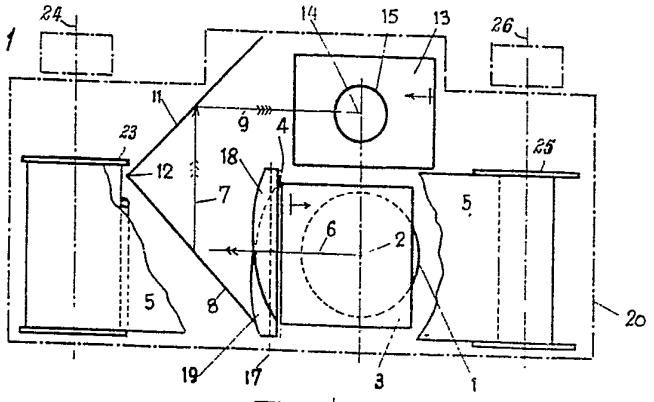
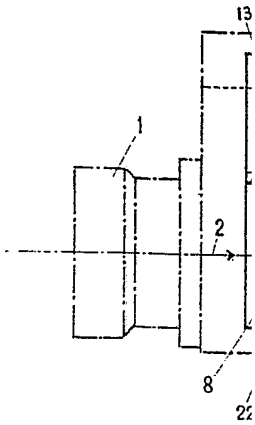
Fig. 1





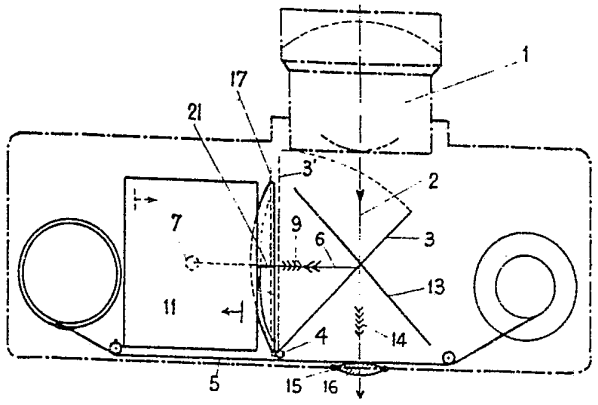


Fig. 3

SHEET 1

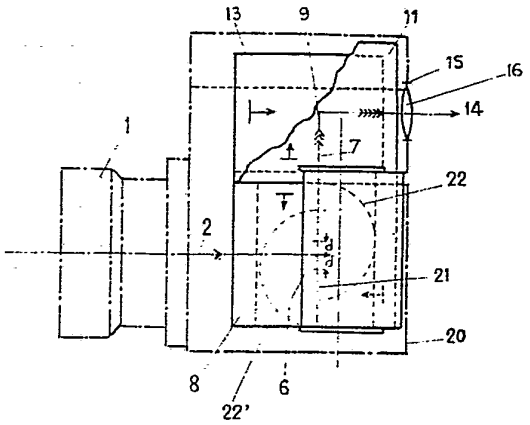
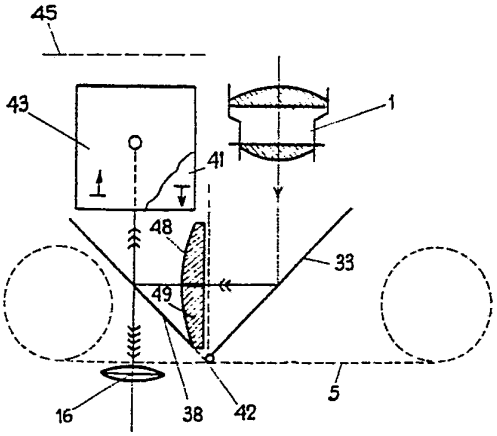


Fig. 2

3

SHEET 2

Fig. 4



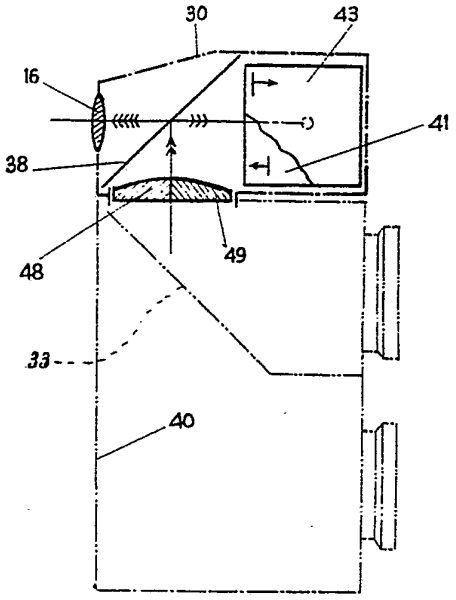


Fig. 5

H.M.S.O.(Ty.P.)

652,043 COMPLETE SPECIFICATION

2 SHEETS

SHEET 1

SHEET 2

This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1

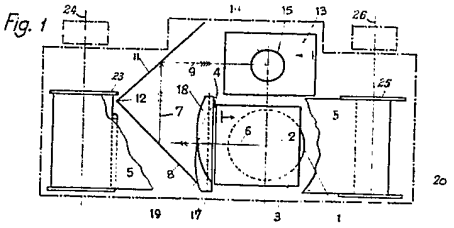


Fig. 3

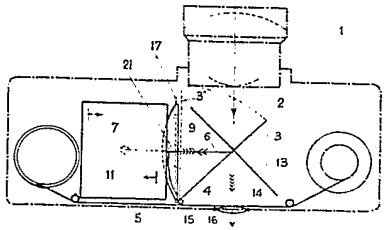


Fig. 2

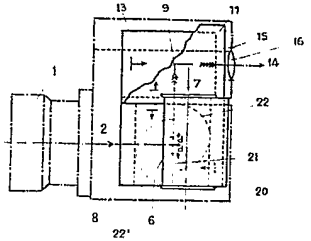


Fig. 4

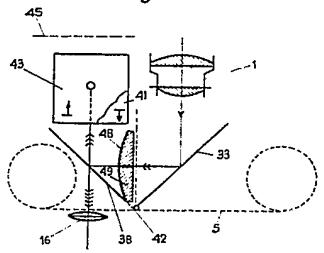
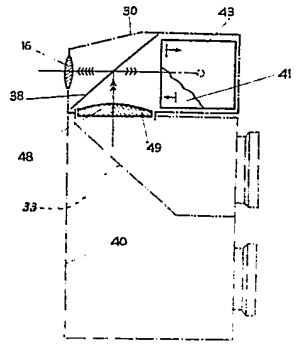


Fig. 5



H.M.S.O. (T.)