

COPY

PATENT SPECIFICATION

Application Date: Sept. 22, 1933. No. 26158/33. **430,648**

Complete Specification Left: Oct. 19, 1934.

Complete Specification Accepted: June 24, 1935.



PROVISIONAL SPECIFICATION

Improved Shutter for Photographic Cameras

I, ALFRED CROGER MAYO, 28A, Onslow Road, Richmond, Surrey, British Subject, do hereby declare the nature of this invention to be as follows:—

5 Consists of two metal plates one sliding on the other and working free in guides across the face of the film. The under plate is the shutter plate and is a flat plate having a slot cut in its face for the exposing of the image to the film, this plate has two pegs standing out at right angles and a notch on its top edge for a catch pawl to engage.

15 The top plate is the capping and slot adjusting plate, it is a flat plate with a portion cut out to allow the two pegs of the shutter plate to project through, this aperture being large enough to slide in either direction on the shutter plate to cover and uncover the slot in the shutter plate when either of these operations has been performed the solid parts of the capping plate come into engagement with the pegs on the shutter plate and move it across the film.

25 At the end of the capping plate adjacent to the pegs on the shutter plate are two pegs set at right angles to the plate and which engage with distance pieces carried on the operating levers. These levers are pivotted in front of the shutter and are sliding free on a spring loaded

rod so that they can be raised or lowered to determine which of the distance pieces shall be between the two sets of pegs. At the ends of the levers are two prongs the pegs of the capping shutter being set between the prongs so that in whichever direction the levers move the capping shutter follows them. The prongs between the pegs are shaped into a series of steps each step being a different size of distance piece.

40 The shutter being in the "closed" position the levers are set in motion and drag the capping plate across the shutter slot. When the slot is covered it engages with the shutter plate pegs and the whole assembly moves across to the "set" position a pawl catch falls into the notch in the shutter plate. The direction of the levers is then reversed under the action of the spring loaded bar and the capping plate slides back across the shutter plate until the capping pegs engage with the distance pieces which, in turn, engage with the shutter pegs, thus determining the amount of shutter slot exposed.

45 When the catch is released the whole assembly passes across the face of the film, the slot being held open by the pressure of the spring loaded levers.

Dated September 21st, 1933.

ALFRED CROGER MAYO.

COMPLETE SPECIFICATION

Improvements in or relating to Cameras with Focal Plane Shutters

I, ALFRED CROGER MAYO, a British Subject, of 28a, Onslow Road, Richmond, Surrey, 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:—

70 This invention comprises improvements in photographic cameras.

75 It is an object of this invention to provide a camera having a focal-plane shutter which is easily set and is constructed entirely of metal or like rigid material; is compact and is adapted to be readily operated in a film camera of small dimensions; and which facilitates the construction of a camera capable of giving rapid ex-

80 posures with a simple lens of small aperture.

85 The invention comprises the combination of a back-plate with a picture-aperture therein means to hold a light sensitive surface close against the back of the picture-aperture, a shutter-plate with an exposure aperture therein slidable in front of the back-plate, a covering plate slidable relatively to and close against the shutter-plate to cover the exposure aperture therein and means to move the covering- and shutter-plates together (with the exposure aperture closed) across the picture-aperture into a "set" position, to uncover the covering plate from the exposure aperture and thereafter to return

the plates together to make the exposure.

The invention further comprises in a photographic camera having a focal-plane shutter the combination of a back-plate
5 with a picture-aperture therein, means to hold a light sensitive surface close against the back of the picture-aperture, a shutter-plate having an exposure aperture therein slidable in front of the back-plate,
10 a covering-plate slidable relatively to and close against the shutter-plate, means yieldingly to urge the covering-plate into register with the exposure-aperture in the shutter-plate, setting means to engage the
15 covering-plate and slide it to cover said exposure-aperture and thereafter to move said covering-plate and shutter-plate simultaneously across said picture-aperture in the back-plate to set position,
20 means to hold said shutter-plate in set position while allowing said covering-plate to move to uncover said exposure-aperture and means to release the shutter-plate so that it and the covering-plate return together to make the exposure.

It has previously been proposed in British Patent No. 128,938 to make a sliding shutter operating in the neighbourhood of the focal plane with two sliding plates, one of which moved after the shutter had been "set" to make the exposure, and the second of which subsequently moved to terminate the exposure, but it will be appreciated that the shutter plates according to the present invention move together both during setting and during exposure, an arrangement which permits of very short exposures and also of providing for variation of the width of slit between the two plates, in other words of varying the time of the exposure.

In the preferred construction the back-plate, a shutter-plate and the covering-plate are all curved so as to be concave on the side toward the camera lens as this leads to a compact construction of camera capable of accommodating roll film of the ordinary kind and moreover tends to compensate for the distortion otherwise produced by a simple lens when focussing upon a flat field.

The invention will now be described with reference to a specific embodiment illustrated by way of example in the accompanying drawings in which:—

55 Figure 1 is a perspective view of the exterior of a camera.

Figure 2 is a front view with the lens and the front-plate of the camera removed to show the shutter.

60 Figure 3 is a cross-section upon the line 3—3 of Figure 2 looking in the direction of the arrows.

65 Figure 4 is a perspective detail of the shutter parts, and

Figure 5 is a view to an enlarged scale of the camera with parts broken away and looking in the opposite direction to that of Figure 3.

The camera is built up upon two main
70 side plates 11, 12 which are united together by a curved plate 13 passing around the front of two spool spaces 14, 15 and curved rearwardly between the spool spaces nearly to the back of the camera.
75 The plate 13 constitutes a back plate behind the shutter hereinafter described and has a picture aperture 16 cut in it. A spool-holder 17 is provided with slots 18 to receive the projections usually provided on film spools carrying $1\frac{3}{8}$ inches \times $2\frac{1}{2}$ inches film for so-called "vest-pocket" cameras and at one end outside the plate 11 there is a winding knob 19.
80 The spool space and the parts just described are covered in at the back by means of a camera-back 20 provided with two number windows 21, 22 so that two pictures can be taken for each number on the spool of film. The sensitive surface of the film in the camera is held close against the back of the picture aperture 16 in the back-plate 13 by means of light springs 23, 24 on the back of the camera.
85 The front of the camera comprises a front-plate 25 which is curved at its ends to fit around the curved end portions of the plate 13 and which is clamped between the side-plates 11, 12. The edges of the plate 25 fit beneath flanges 26, 27 formed
90 around the rim of the side plates 11, 12 and thus the curved ends of the front-plate 25 are firmly fixed between the back-plate 13 and the flanges 26, 27. It will be observed that at the bottom of the
95 front-plate the plate 13 is bent a little away from it and the back-plate 20 of the camera is inserted at its bottom edge between the back-plate 13 and the front-plate 25. This makes a light tight joint.
100 The side edges of the back 20 overlie inwardly projecting flanges 28 around the rear edges of the side-plates 11, 12 and at the top the back of the camera fits at 29 between the front 25 and the plate 13, being clipped in place by a spring clip 30. These parts are best shown in Figures 2 and 3.

The front-plate 25 carries a forwardly projecting tubular lens-mounting 31 in which is slidably carried a lens-tube 32, capable of telescoping in the mounting 31. In the lens tube is a lens 33 and the lens-tube is resiliently pressed forward by a spring 34. It is covered with a cap
105 35 held on the mounting 31 by means of a bayonet joint. When the cap is in place the lens 33 is pushed inwardly by the cap as shown in Figure 3 but on removal of the cap the lens automatically shoots for
110 115 120 125 130

ward into the position shown in Figure 5 in which position it is focussed for average distances. A diaphragm 36 is provided in front of the lens. The front-plate 25 has a rectangular opening 37 behind the lens of adequate size to ensure illumination of the picture openings 16 in the back-plate 13.

The shutter parts are best seen in Figure 4 and they comprise a curved shutter-plate 40 which fits closely but is freely slidable over the back-plate 13. The shutter-plate has fitting closely over it a covering-plate 41 and the side edges of the plates 40, 41 are overlaid by narrow flanges 42, 43 projecting inwardly from the main side plates 11, 12 of the camera. These flanges may be welded or brazed in place and they are spaced from the back-plate 13 by such a distance as to allow the shutter-plate 40 and covering-plate 41 to be slid beneath the flanges freely and without undue play.

The shutter-plate 40 has a rectangular aperture 45 cut across it corresponding in width to the width of the picture-aperture 16 and in length to the aperture required for the desired maximum length of exposure to be afforded by the shutter. The covering-plate 41 has a similar aperture 46 in it so located that in one position of the covering-plate the apertures 45 and 46 may be made to coincide as shown in Figure 4. Figure 4 shows the shutter in its set position, ready for making an exposure and the aperture 16 in the back-plate is indicated by a dotted line. It will therefore be seen that in this position the exposure apertures 45, 46 are drawn beyond the picture-aperture 16. In this position the shutter-plate 40 is held by a releasable catch 48 hereinafter more fully described. The covering-plate 41 is yieldingly connected to the shutter-plate by means of a hairpin spring 49 hereinafter referred to.

In order to bring the shutter-plate 40 and the covering-plate 41 into the set position as shown in Figure 4 a setting knob 50 is provided carried on a spindle 51 and connected to a setting lever 52. The setting lever 52 comprises a yoke portion 53 which extends across the camera from side to side and two downwardly projecting lever arms 54, 55. The lever arm 54 carries a laterally projecting fork 56 at its lower end and the lever arm 55 carries a similar fork 57. Two ears 58, 59 are bent up from the side edges of the covering-plate 41 so as to enter between the arms of the forks 56, 57. Therefore rotation of the setting knob 50 with the lever 53 will carry the covering-plate 41 with it. The lever 53 is retracted by a shutter spring 60 secured at one end of

the side-plate 12 of the camera. The spring 60 not only tends to retract the lever 53 from the set position but also to carry with it the covering-plate 41.

In addition to the above parts the shutter-plate 40 is provided with two bent up ears 61, 62 which lie behind the arms of the forks 56, 57.

Furthermore the spindle 51 of the setting knob 50 and with it the lever 53 are moveable axially to a slight extent to the left as shown in Figure 4 against the action of a short coil-spring 63, for the purpose of setting the speed of the shutter, as hereinafter described. The releasable-catch 48 is operated by a trigger 66 pivoted at 67 on the side wall 11 of the camera. The trigger 66 is not mounted directly upon the catch 48 but is pivoted about the same axis therewith upon a trigger-plate 68 and the trigger-plate 68 is arranged to overlie the catch-plate 48 so that when the trigger 66 is pressed there will be a slight lost motion and then the catch will be released. The trigger-plate 68 is moreover provided with an arm 69 and bent partly with and just behind the plane of the front 25 of the camera. The arm 69 carries an auxiliary safety shutter 70 best seen in Figure 5. Thus the first operation of the trigger 66 is to move the flag and the second operation is to release the shutter. The auxiliary safety shutter 70 is disposed immediately behind the aperture 37 in the front 25 of the camera through which the light from the lens 33 passes. Consequently the auxiliary shutter 70 acts as an additional precaution against light leakage when the shutter is being set. The trigger plate 48 and the auxiliary shutter 70 carried thereby is urged to the position in which the auxiliary shutter covers the rectangular opening 37 by a leaf spring 71 fixed at one end to the side-plate 11 of the camera and extending freely through an opening 72 in the catch-plate 68 to bear upon the trigger plate 48 (see Figure 5). The spring loading thus provided returns the auxiliary shutter 70 to position when the trigger 66 is released and moreover serves to hold the trigger plate and catch steady in the "set" position.

In the operation of the shutter the setting knob 50 is first rotated in the direction shown by the arrow in Figure 4, the forks 56, 57 of the setting lever 53 thereby carrying the covering-plate 41 forwardly into the position in which the aperture 46 is out of register, beyond the exposure aperture 45 in the shutter-plate 40. After the exposure-aperture 45 has thus been closed the lateral projections 80, 81 on the covering-plate engage the

rear faces of the ears 61, 62 on the shutter-plate and the shutter-plate and covering-plate (movement of the knob 50 being continued) move together across the picture-aperture 16 until they have passed it. If a rapid exposure is desired, the knob 50 will now be pressed inwardly so that the face 65 may engage the ear 62 and prevent the covering-plate 41 being retracted by the spring 60 (when the knob 50 is released by the operator) more than a little way, sufficient to afford a narrow slit-like opening through the two apertures 45, 46, which are only partially in register with each other. If a longer exposure is required the knob 50 is not pressed inwardly and the spring 60 will draw the covering-plate 41 back into the position shown in Figure 4. The parts are held from further retraction under the influence of the spring 60 by the catch 48. The shutter is now set and will not be released until the trigger 66 is operated. The camera can be carried in this condition, the cap 35 if in position effectually preventing accidental exposure. As a further safe-guard against accidental exposure a view-finder 82 is pivotally secured to the side-plate 11 of the camera by means of a clamping-plate 83, as shown in Figure 1, and when the view-finder is folded down as shown in that Figure an aperture 84 in the view-finder-plate embraces the trigger 66 and positively prevents it from movement. On erecting the view-finder in the position shown in Figure 2 the trigger 66 is freed from restraint so that the operator can actuate it at his pleasure. All that is necessary therefore to make an exposure, if the view-finder be raised, is to remove the cap 35 and press the trigger 66 against the action of spring 71. This will displace the auxiliary safety shutter 70 from behind the aperture 34 and thereafter release the catch 48, thus permitting the shutter-plate 40 and the covering-plate 41, still retaining their relative position in which they have been set, to slide across the picture-aperture 16 under the influence of the spring 60.

The side-plates 11, 12 and all the intermediate parts are held together by the aid of only two long screws 86, 87 which pass through the camera from side to side.

It will be observed that the camera described is constructed from a minimum of parts and provides a focal plane shutter which works in the closest possible proximity to the film being exposed, thus leading to maximum efficiency. Owing to the slight curve on which the film is laid a measure of compensation for the aberration of a simple lens is provided, and owing to the

efficiency of the shutter very rapid exposures can be taken with a relatively small aperture. With a suitable strength of spring 60, the camera being held in such a position that the shutter-plate 40 falls during the making of the exposure,

speeds of about $\frac{1}{75\text{th}}$ and $\frac{1}{250\text{th}}$ of a

second can be provided; while if the camera is inverted so that the shutter moves upwardly in making the exposure, the speeds can be made longer, say

$\frac{1}{25\text{th}}$ and $\frac{1}{75\text{th}}$. If the camera be held horizontally, intermediate speeds are

obtained of about $\frac{1}{40\text{th}}$ and $\frac{1}{120\text{th}}$ of a

second. By properly selecting the strength of the spring 60 and the aperture 45 afforded by the amount of overlap between shutter-plate 40 and aperture 46 in the covering-plate 41, it is possible to obtain a selection of speeds from any part of a wide range of "instantaneous" speeds.

By making the apertures 45, 46 of dimensions similar to those of the picture-aperture 16 and providing an auxiliary catch to hold the shutter-plate 40 temporarily in the position of the parts in which they coincide with the picture-aperture 16 it is possible to arrange for time exposures.

It is to be noted that when the shutter is "set" by rotating knob 50 with the camera held in an inverted position, the light hairpin spring 49 referred to above (which tends to close itself) tends to urge the covering plate to the position in which aperture 46 in the covering plate 41 is out of register with the shutter-aperture 45 as otherwise the weight of the shutter-plate would tend to keep the apertures in register.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. In a photographic camera having a focal plane shutter, the combination of a back-plate with a picture-aperture therein, means to hold a light sensitive surface close against the back of the picture-aperture, a shutter-plate having an exposure aperture therein slidable in front of the back-plate, a covering-plate slidable relatively to and close against the shutter-plate to cover the exposure aperture therein and means to move the covering- and shutter-plates together (with the exposure aperture closed) across the

picture aperture into a "set" position, to uncover the covering plate from the exposure aperture and thereafter to return the plates together to make the exposure.

2. In a photographic camera having a focal-plane shutter the combination of a back-plate with a picture aperture therein, means to hold a light sensitive surface close against the back of the picture aperture, a shutter-plate having an exposure aperture therein slidable in front of the back-plate, a covering plate slidable relatively to and close against the shutter-plate, means yieldingly to urge the covering plate into register with the exposure aperture in the shutter-plate, setting means to engage the covering plate and slide it to cover said exposure aperture and thereafter to move said covering plate and shutter-plate simultaneously across said picture aperture in the back-plate to set position, means to hold said shutter-plate in set position while allowing said covering plate to move to uncover said exposure aperture and means to release the shutter-plate so that it and the covering plate return together to make the exposure.

3. In a photographic camera a combination as claimed in Claim 1 or Claim 2, wherein means are provided to limit more or less as the operator may determine the extent of uncovering movement of the covering plate to vary the amount by which the exposure aperture is uncovered and thus to regulate the effective time of exposure.

4. In a photographic camera a combination as claimed in Claim 2 or Claim 3, wherein the setting means comprise a lever pivoted about an axis transverse to the direction of shutter movement and in front of the shutter, which lever is engaged with the covering plate by means of an abutment allowing sliding movement between lever and covering plate to and from the plate surface.

5. In a photographic camera a combination as claimed in Claim 4, wherein the lever is provided with one or more abutments to engage co-operating abutments on the shutter-plate so that when said abutments on the lever and shutter-

plate are mutually engaged, the covering plate is held with the exposure aperture in the shutter-plate partly open, while when said abutments are disengaged the exposure aperture is differently open.

6. In a photographic camera a combination as claimed in any one of the preceding Claims, wherein the exposure apertures in the shutter-plate and the covering plate are made of dimensions adequate to expose the whole area of the picture aperture simultaneously and an additional time-catch is provided which when operated detains the shutter in a position where the whole of the picture aperture is exposed.

7. In a photographic camera a combination as claimed in any one of the preceding Claims, wherein the means to return or release the shutter parts to make the exposure is a releasable-catch which carries an auxiliary safety shutter interposed between the focal plane shutter and the camera lens but moved out of the way by the catch when the catch is operated to release the shutter.

8. In a photographic camera a combination as claimed in Claim 7, wherein the releasable-catch is spring loaded to bring back the auxiliary safety shutter between the focal plane shutter and the camera lens when the catch is released after operation.

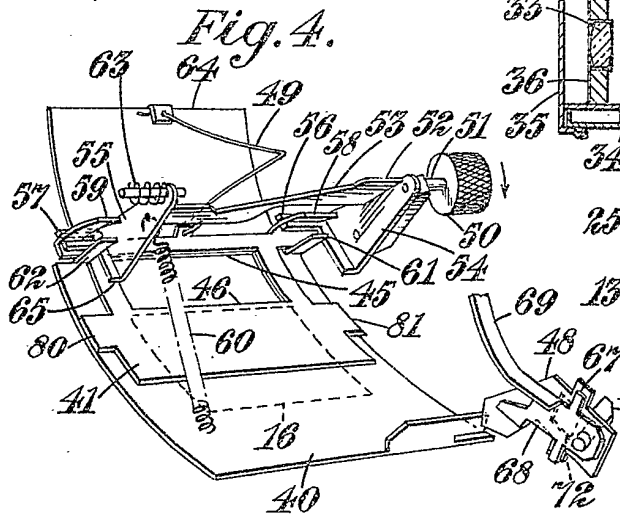
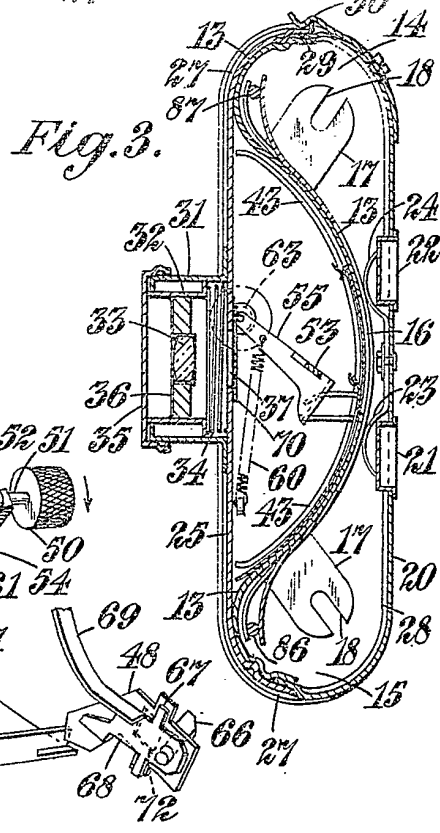
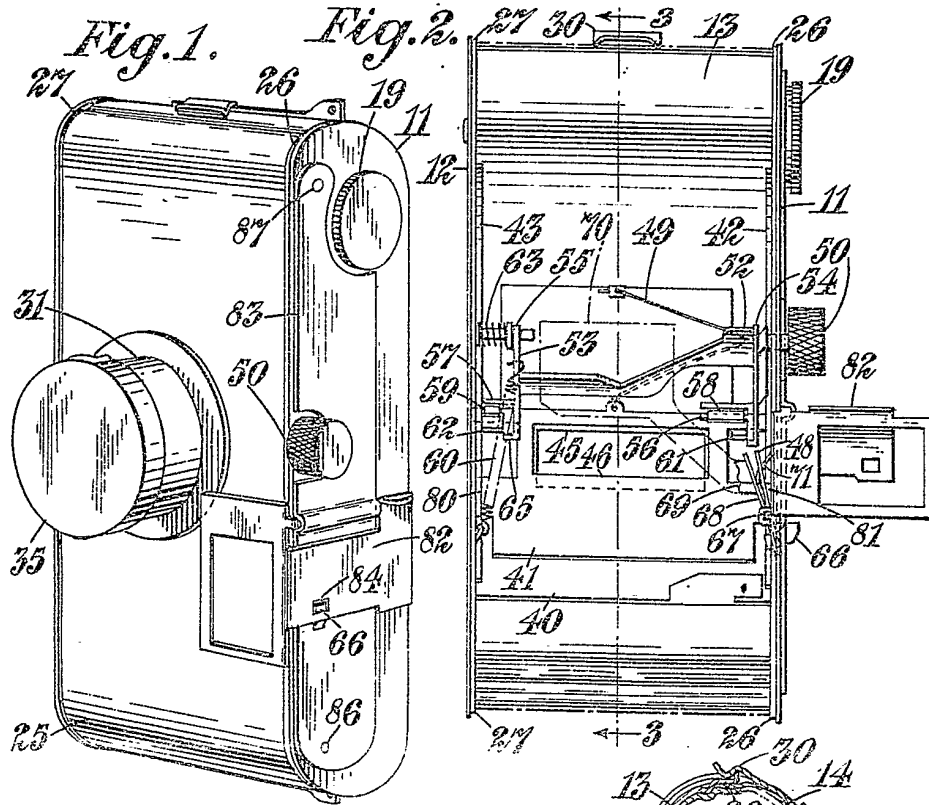
9. A photographic camera having a combination as claimed in any one of the preceding Claims and a folded viewfinder so disposed that when folded it overlies and prevents operation of the means to return or release the shutter parts to make the exposure.

10. A photographic camera having a combination as claimed in any one of the preceding Claims and a foldable viewfinder so disposed that when folded it overlies and prevents operation of the means to return or release the shutter parts to make the exposure together with a spring-operated lens mounting substantially as set forth.

Dated this 19th day of October, 1934.

BOULT, WADE & TENNANT,
111/112, Hatton Garden,
London, E.C.1.
Chartered Patent Agents.

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

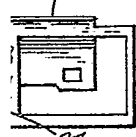


6
19

11

50
14

82



81
66

14

18

24

22

22

16

23

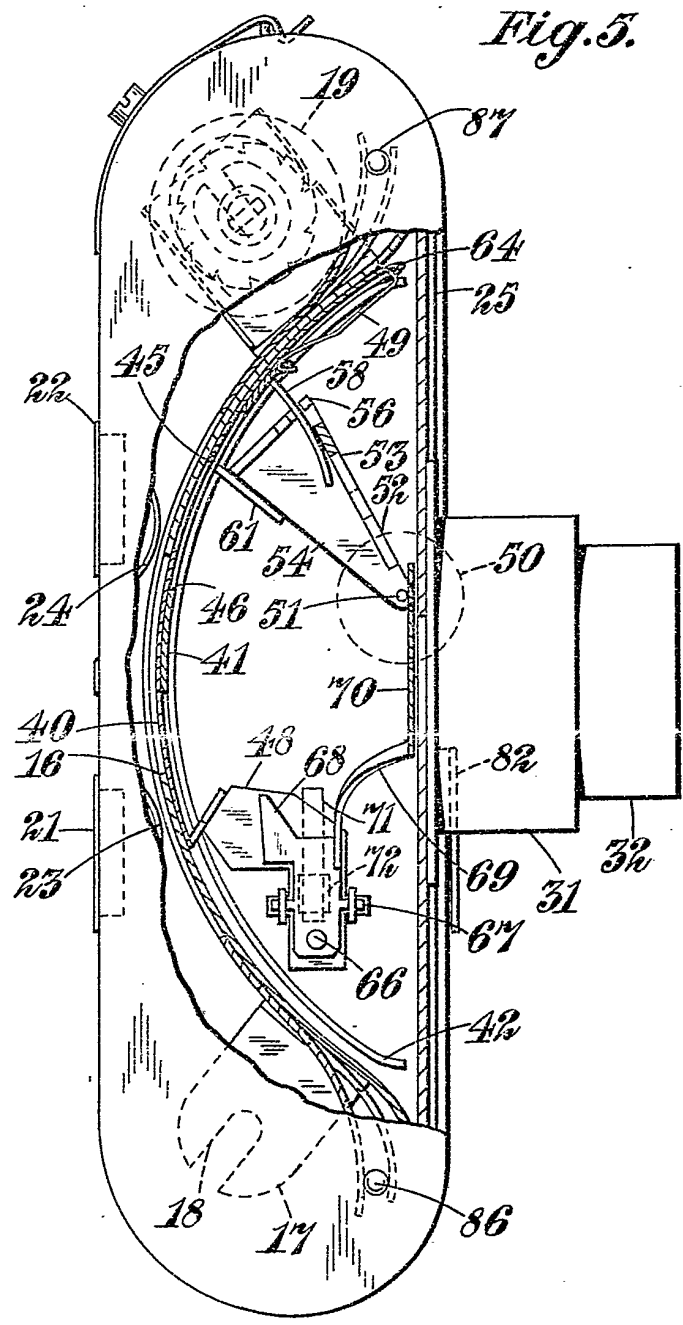
21

20

28

15

Fig. 5.



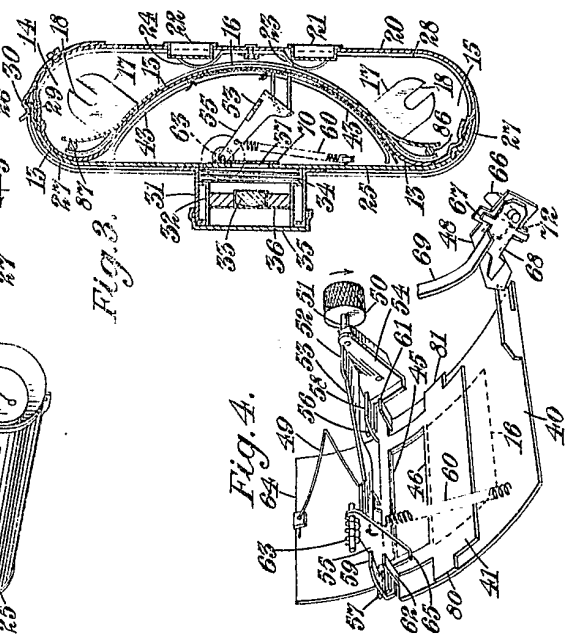
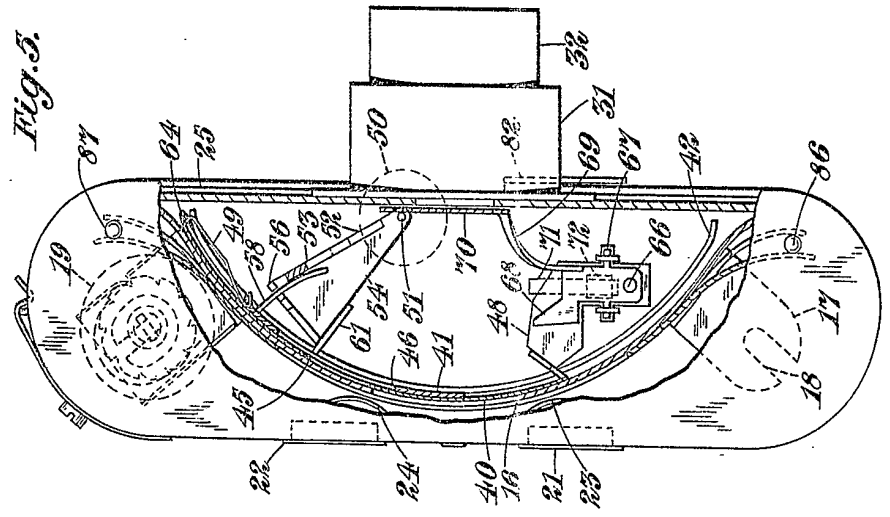
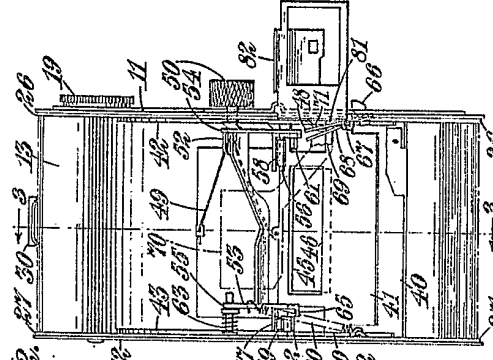
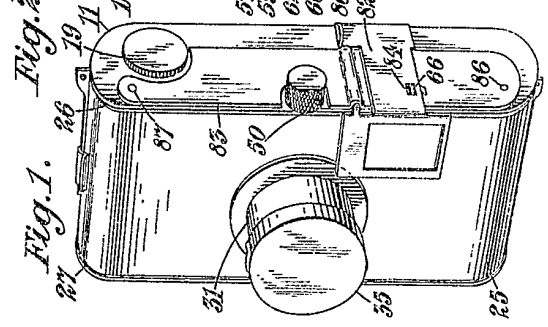


Fig. 3.

Fig. 4.

Fig. 2.

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