

W. F. FOLMER.  
 AVIATOR'S CAMERA.  
 APPLICATION FILED MAR. 3, 1919.

1,400,277.

Patented Dec. 13, 1921.  
 6 SHEETS—SHEET 1.

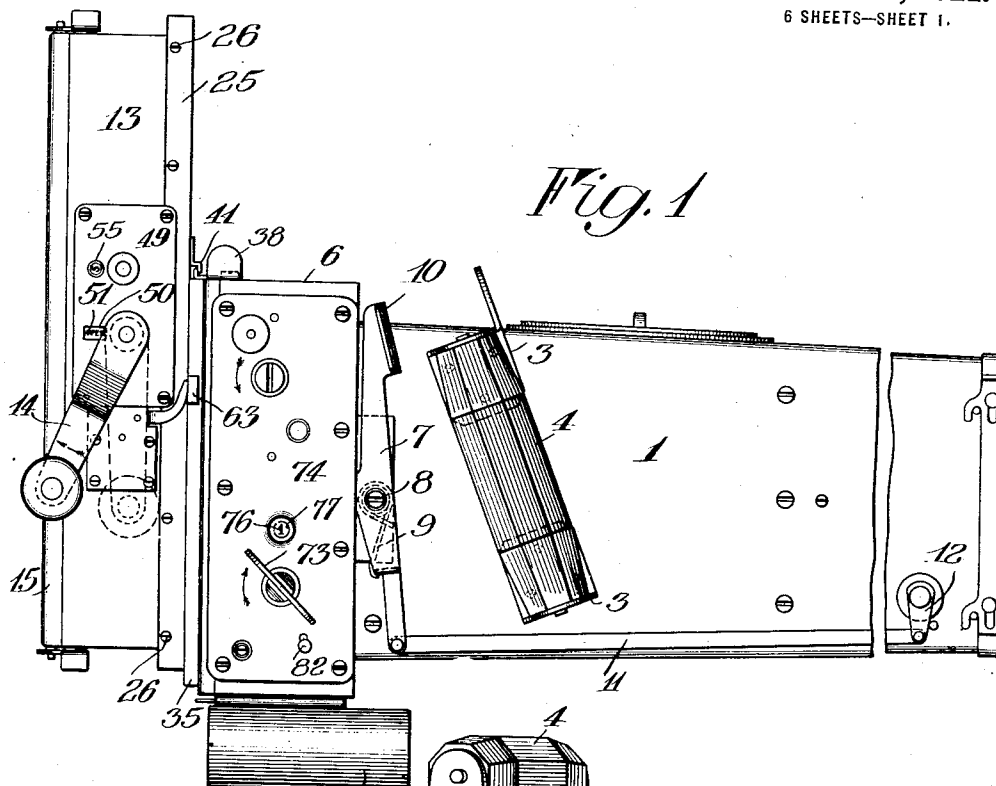


Fig. 1

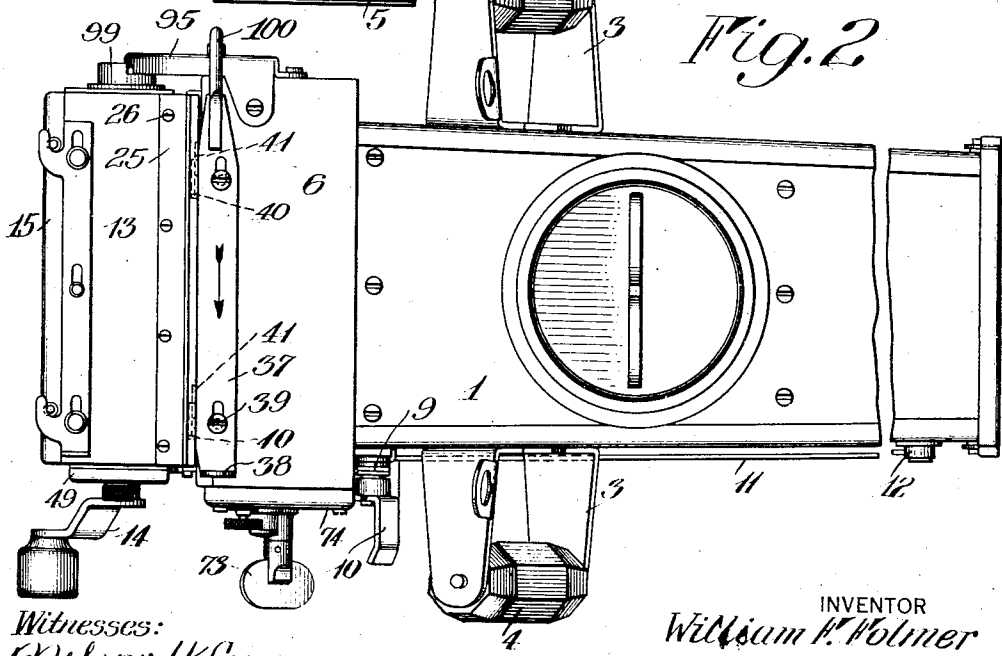


Fig. 2

Witnesses:  
*Wilson H. Copp*  
*[Signature]*

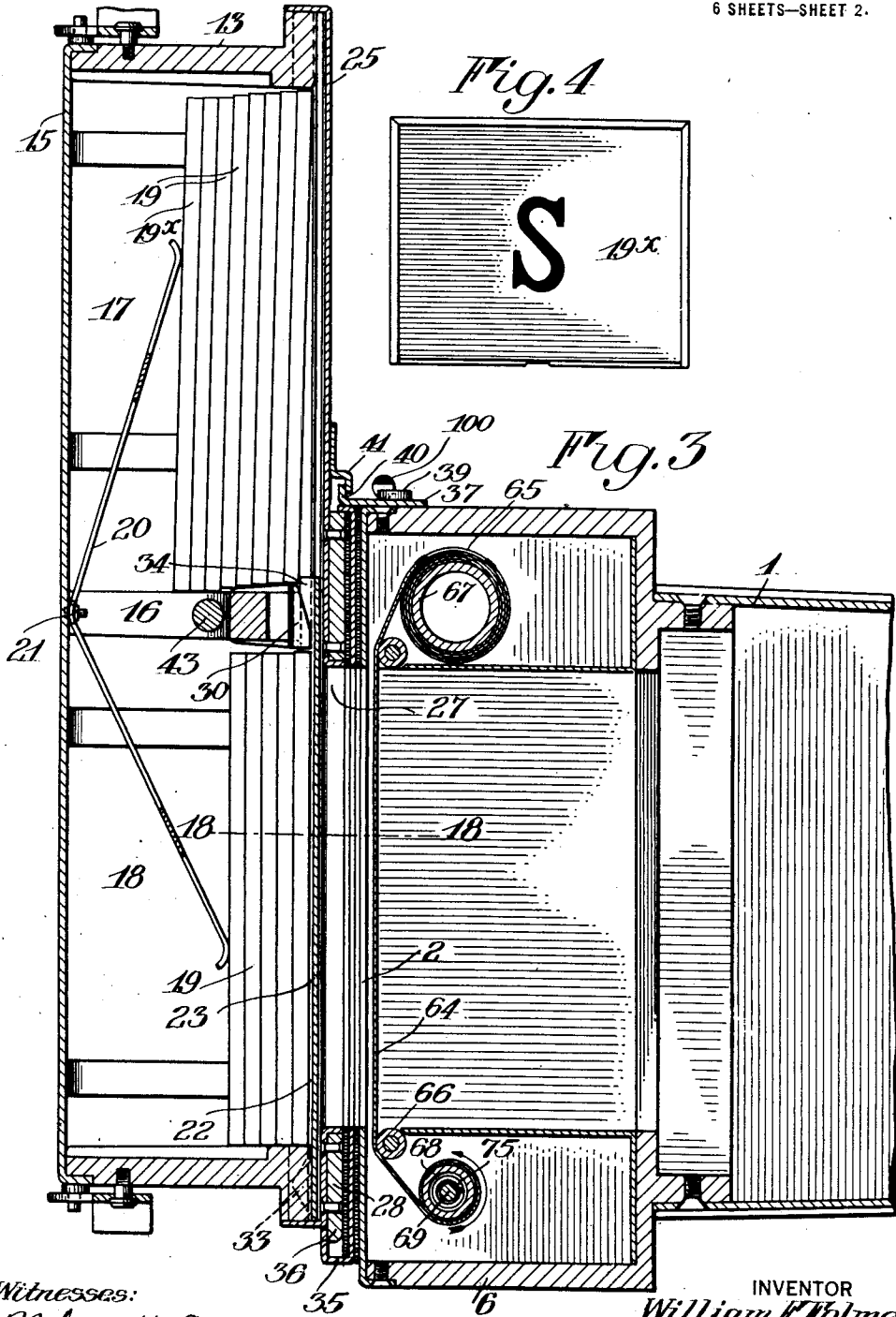
INVENTOR  
*William F. Folmer*  
 BY  
*Charles R. [Signature]*  
 HIS ATTORNEYS

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Witnesses:

*Nelson H. Copp*  
*Amos H. Huffer*

INVENTOR

*William F. Folmer*

BY

*Charles R. Ruck*  
 HIS ATTORNEYS

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Fig. 5

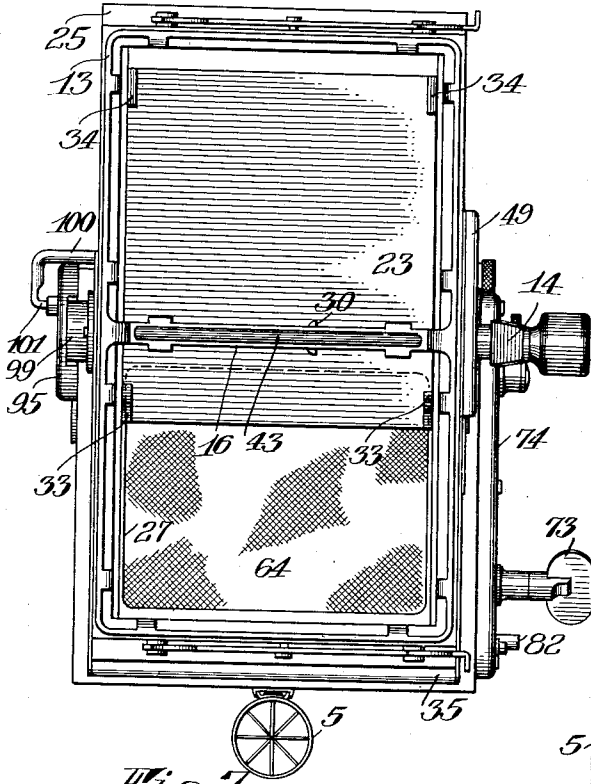


Fig. 6

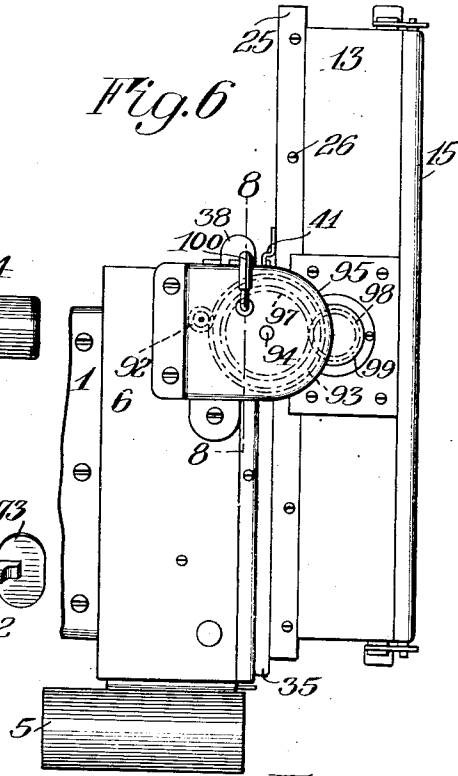


Fig. 7

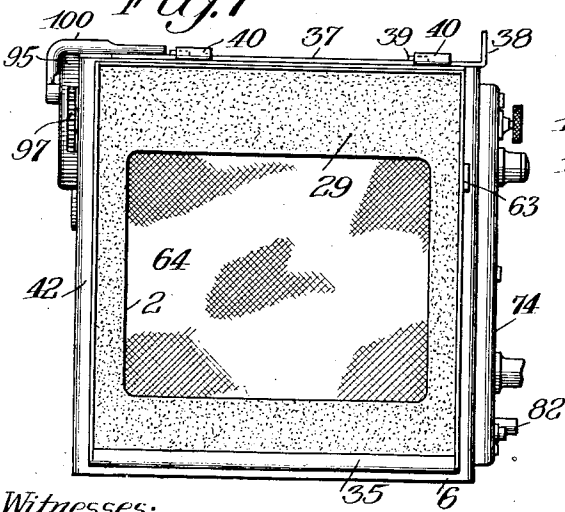
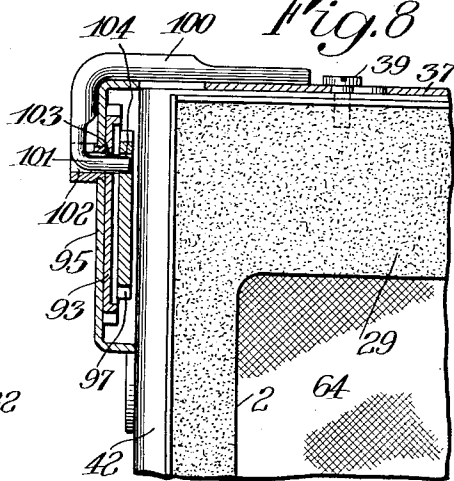


Fig. 8



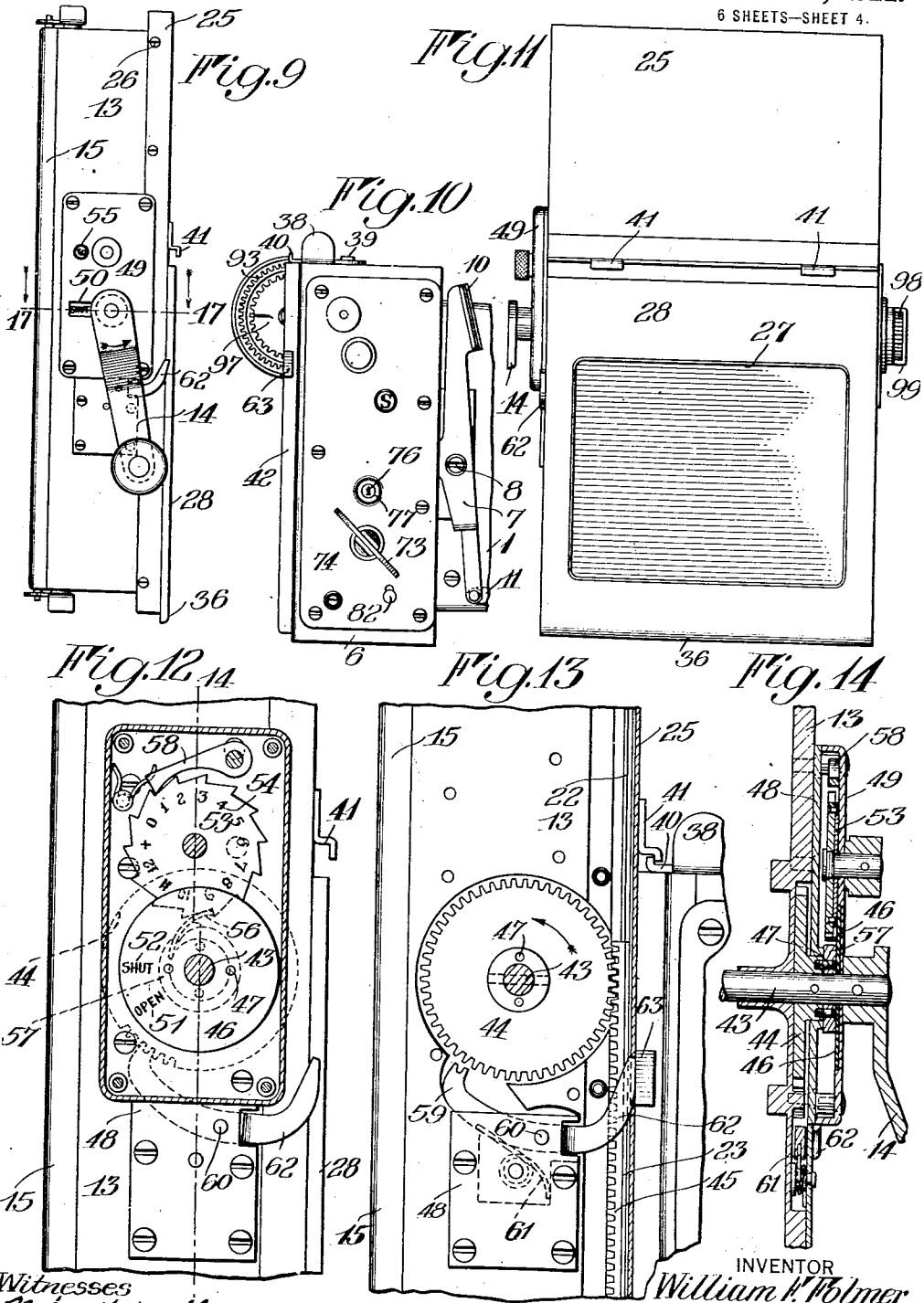
Witnesses:  
*Nelson H. Copp*  
*Russell H. Duffell*

INVENTOR  
*William F. Folmer*  
 BY  
*Charles R. ...*  
 HIS ATTORNEYS

1,400,277.

Patented Dec. 13, 1921.

6 SHEETS—SHEET 4.



Witnesses  
*Reismuth Copp*  
*Thurston*

INVENTOR  
*William F. Folmer*  
 BY  
*Ernest Rich*  
 his ATTORNEYS

1,400,277.

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6 SHEETS—SHEET 5.

Fig. 15

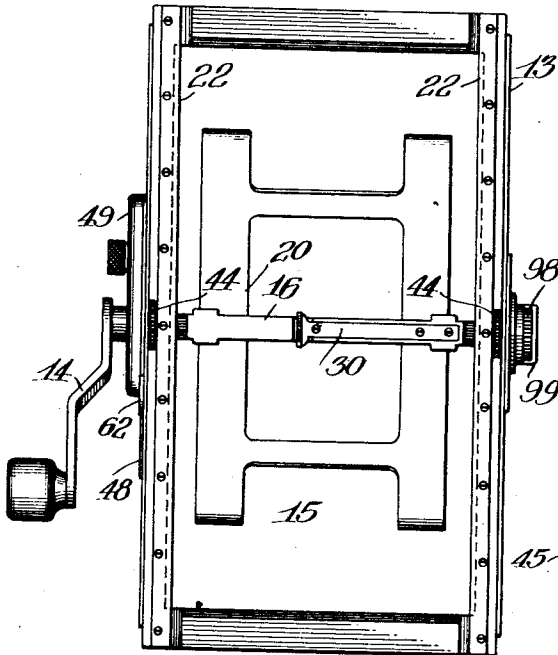


Fig. 16

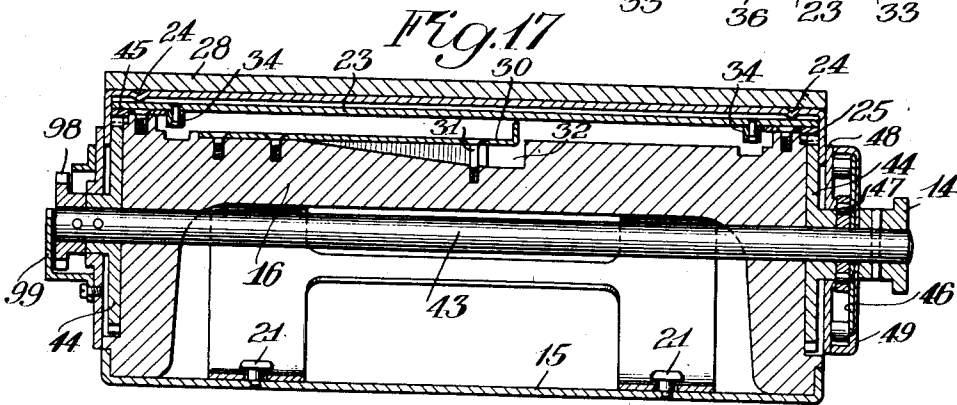
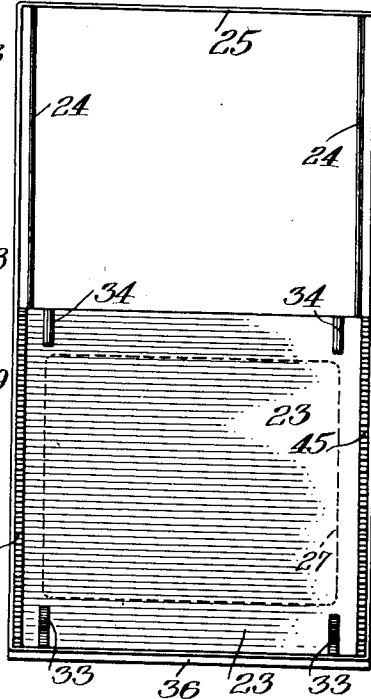
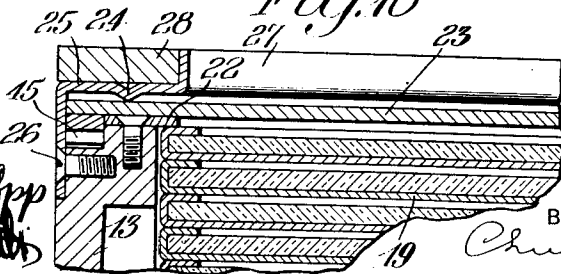


Fig. 17

Fig. 18



Witnesses:

*Nelson H. Lipp*  
*Charles H. Lipp*

INVENTOR

*William F. Folmer*

BY

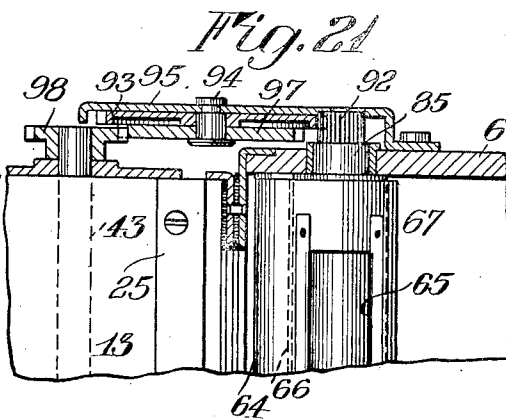
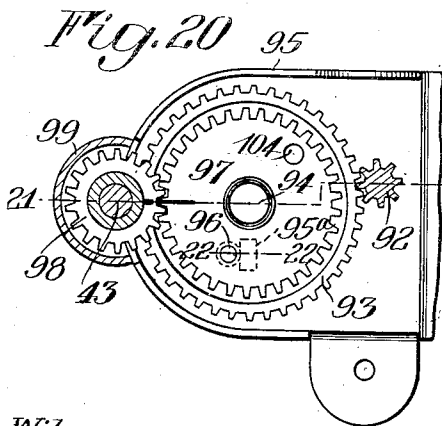
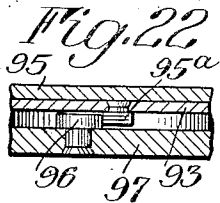
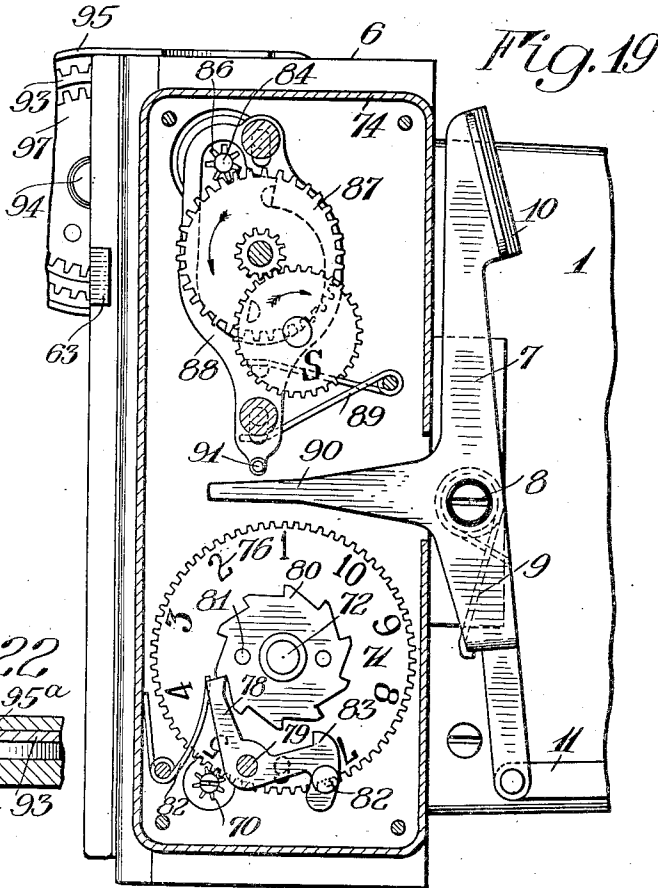
*Charles H. Lipp*  
his ATTORNEYS

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Patented Dec. 13, 1921.

6 SHEETS—SHEET 6.



Witnesses:  
*Nelson H. Copp*  
*Arthur H. ...*

INVENTOR  
*William F. Folmer*  
 BY  
*Charles Rich*  
 HIS ATTORNEYS

# UNITED STATES PATENT OFFICE.

WILLIAM F. FOLMER, OF ROCHESTER, NEW YORK, ASSIGNOR TO EASTMAN KODAK COMPANY, OF ROCHESTER, NEW YORK, A CORPORATION OF NEW YORK.

## AVIATOR'S CAMERA.

1,400,277.

Specification of Letters Patent. Patented Dec. 13, 1921.

Application filed March 3, 1919. Serial No. 280,258.

*To all whom it may concern:*

Be it known that I, WILLIAM F. FOLMER, of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Aviators' Cameras; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the reference-numerals marked thereon.

My present invention relates to photography and more particularly to photographic cameras and it has for its object to provide a strong and serviceable camera particularly adapted for aerial photography, the improvements being directed in part toward promoting the ease and rapidity with which the sensitive material may be shifted and exposed and toward provisions whereby the peculiar conditions under which the instrument is used will not influence the operator to the end that he may make mistakes in the sequence of his operations and in the repetition of operations and adjustments. To these and other ends the invention resides in certain improvements and combinations of parts all as will be hereinafter more fully described the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Figure 1 is a side view, partly broken away, of a photographic camera constructed in accordance with and illustrating one embodiment of my invention;

Fig. 2 is a top view;

Fig. 3 is an enlarged central vertical section through the rear portion of the camera and the magazine;

Fig. 4 is a plan view of the safety dark slide of the magazine;

Fig. 5 is a rear view of the camera with the back plate of the magazine removed;

Fig. 6 is a fragmentary view of the left side of the camera and magazine;

Fig. 7 is a rear view of the camera body with the magazine removed;

Fig. 8 is an enlarged fragmentary view of a portion of Fig. 7, with certain parts in section, on the line 8—8 of Fig. 6;

Fig. 9 is a side view of the magazine detached;

Fig. 10 is a fragmentary side view of the rear end of the camera body with the magazine detached;

Fig. 11 is a front view of the magazine detached;

Fig. 12 is an enlarged fragmentary view of a portion of the magazine showing the housing thereon in section;

Fig. 13 is a similar view, but with parts removed to show underlying mechanism;

Fig. 14 is a section on the line 14—14 of Fig. 12;

Fig. 15 is a front view of the magazine detached, but with the plate shifting device removed;

Fig. 16 is a rear view of such plate shifting device;

Fig. 17 is a section on the line 17—17 of Fig. 9;

Fig. 18 is an enlarged fragmentary section through a corner of the exposure chamber of the magazine taken substantially on the line 18—18 of Fig. 3;

Fig. 19 is an enlarged fragmentary view of the rearward portion of the camera body showing a casing on the well thereof in vertical section;

Fig. 20 is an enlarged fragmentary view of the opposite side of the shutter gearing shown in Fig. 6;

Fig. 21 is a fragmentary sectional view of the shutter gearing taken substantially on the line 21—21 of Fig. 20, and

Fig. 22 is a detail section taken substantially on the line 22—22 of Fig. 20.

Similar reference numerals throughout the several views indicate the same parts.

Referring principally to Figs. 1 and 2, I will first give a general idea of the design, major parts and principal functions of the apparatus before describing in detail any particular group of mechanism.

In the embodiment shown, the camera comprises an elongated body 1 for a long focus lens (not shown) located at the front thereof that casts the image in a focal plane in the rear of an exposure opening 2 (Fig. 3) at the back of the camera body. Brackets 3 secured to opposite sides of the body carry hand grips 4 preferably arranged in a rearwardly inclined position, as shown, and located approximately at the point of balance. The operator grasps the grips with his two hands and holds the camera at a partial arm's length in front of him and slightly above his line of vision, which latter is taken through a particular form of finder or sighting device 5. The inclination of the grips 4 makes this position a natural and con-

venient one for the hands. The camera is fitted with a roller blind or curtain shutter housed within an enlargement 6 at the rear end of the body 1, which shutter is tripped to make an exposure by an operating lever 7 pivoted at 8 and held in the normal position of Fig. 1 by a spring 9. The lever is so arranged adjacent to the handle 4 that an offset 10 at its upper end can be conveniently engaged by the thumb of the operator and moved by a squeezing pressure of the hand in which the fingers that are meantime supporting the camera, react against the grip 4 and prevent a jerky action that might otherwise destroy the aim. A link 11 is shown to connect the operating lever 7 with a crank 12 at the front of the camera. This crank actuates another flap shutter (not shown) that normally protects the lens, but this subject-matter has nothing to do with the present invention.

A detachable magazine 13 at the rear of the camera body constitutes the holder for the sensitized material which, in the present instance, consists of plates that are shifted from a storage chamber to a lower exposure chamber by means of a crank 14 on the exterior of the magazine. After an exposure has been made, a throw of this crank feeds a fresh plate into position for exposure and also winds the curtain shutter. A device is provided which prevents the crank from being operated when the magazine or holder 13 is removed from the camera body. Provision is also made for automatically locking the shutter mechanism to again receive the gearing of the crank when the magazine is removed, and the same devices under the control of the shutter mechanism, prevent the magazine from being removed until the crank 14 is in such position as to prevent the fogging of the foremost plate, all as will be hereinafter described.

I will first describe the magazine for holding and feeding the plates. It comprises a frame 13 having a light-tight cover plate or rear wall 15 and divided by a horizontal partition member 16 into an upper storage chamber 17 and a lower exposing chamber 18 for the septums 19 containing plates or cut films, as desired. They will be herein referred to as plates. A follower 20 of the form best shown in Figs. 3 and 15 rocks upon fastening pins 21 secured to the back wall 15 in the region of the partition 16, so that one arm or branch of the follower presses against the rear of the plates in the storage chamber and the other arm against those in the exposure chamber 18. In this way, the pressure is equalized and made uniform as the plates that are removed from one chamber and relieve the tension on one arm serve to build up the pile of plates in the other chamber and increase the tension on the other arm. In both instances, the

pile of plates is pressed forwardly against flanges 22 (Figs. 15 and 18) on the lateral front edges of the frame 13 (see Figs. 15 and 18).

The plate shifting slide 23, best shown in Fig. 16, slides upon the forward surfaces of these flange plates 22 and between them and ribs 24 (Fig. 18) on a frame 25 secured to the sides of frame 13 by screws 26. An opening 27 in the lower part of this frame 25 constitutes the exposure opening of the magazine or holder (see also Fig. 11) which opening, when the holder is in cooperation with the camera body, coincides with the exposure opening 2 of the latter. An additional frame 28 surrounding the exposure opening 27 abuts against the rear of the camera and the contacting surface of the latter is preferably composed of or covered by a piled fabric 29 (Fig. 7) which makes the joint light-tight. The plate shifting slide 23 when in the position of Fig. 3, serves to close the exposure chamber 18 and protect its contents from the entrance of light. When it is raised to permit the exposure of that plate and engage the next plate in the storage chamber above, a bevel spring detent 30, best shown in Figs. 3 and 17, working on a guide pin 31 in the cut-out portion 32 of the partition 16 prevents the plates in the exposure chamber 18, and particularly the foremost one, from going back with it. The shifter 23 has the usual cams 33 at its lower edge for raising the exposed plates to permit the introduction of an unexposed one as the slide or shifter is brought downward and it also has the usual hooks or lugs 34 for engaging the top edge of the plate to be transferred. Those skilled in the art well know the general mode of shifting plates in this way.

The magazine or holder 13 is held in engagement with the camera back by a hook shaped flange 35 at the bottom of the latter (Fig. 3) that is engaged by a projecting portion 36 of the frame 28 and also at the top by a locking bolt 37 (Figs. 3 and 2) that is movable transversely on the top surface of the camera body by means of a finger piece 38, the bolt being slotted to receive guide pins 39. Two ears 40 extend upwardly from the rear edge of the bolt and are adapted to interlock with downwardly turned ears 41 on the frame 25 of the magazine 13 (see also Fig. 11). Certain restrictions imposed upon the actuation of the bolt 37 will be later described. The magazine also fits between flanges 42 (Fig. 7) at the sides of the back of the camera so that it is inset with reference to the latter.

The mechanism for operating the plate shifting slide 23 includes the operating crank 14, earlier referred to, and a shaft 43 to which it is attached and which extends through the partition 16 of the magazine. 130



Near each end there is fixed to the said shaft 43 a large pinion 44 arranged close against the adjacent side wall of the magazine frame 13 and these pinions mesh with racks 45 (Fig. 16) arranged on each lateral edge of the shifter slide 23. When the crank 14 is in the normal position of Fig. 1, the slide 23 is in its uppermost position opposite the storage chamber 17 of the magazine and when the crank is turned to the right through nearly a complete revolution, to the position shown in Fig. 9, the slide is, through the gearing, brought down with the new plate to be exposed and which it extracts from the storage chamber. There is also carried on the shaft 43 a thin indicator disk 46 (Figs. 12 and 14) interlocked with one of the pinions 44 by pins 47. Such indicator disk lies within a housing consisting of a bearing plate 48 secured to the exterior of the magazine and in which the shaft 43 is supported and an overlying cover plate 49. The latter has an opening 50 therein and when the crank 14 is in the position of Fig. 1, with the shifter slide 23 elevated, as described, an inscription 51 on the disk 46 indicates that the exposure opening 27 of the magazine is open, while the position of the crank shown in Fig. 9 brings another inscription 52 opposite the opening 50 to show that the said exposure opening is shut, being sealed by the shifter slide 23 then in its lowered position of Fig. 3.

As each plate is brought down to exposing position, it is counted and its number indicated by a counter wheel 53, (Fig. 14), the characters 54 on which are successively brought into register with an opening 55 in the cover plate 49. The counter is given an impulse upon each actuation of the plate shifter by a spring pawl 56 carried, in the present instance, on the hub 57 of the indicator disk 46, the counter being in the form of a ratchet. Another pawl 58 coöperates with it to prevent retrograde movement.

As before mentioned and later explained, the magazine 13 cannot be removed from the camera back unless the plate shifting slide 23 is in the lowered position of Fig. 3 in which it seals the exposure chamber 18. Once removed, the crank 14 cannot be operated or the slide withdrawn from such protecting position because of an automatic latch or locking device best shown in Fig. 13. This consists of a lever 59 pivoted at 60 upon and beneath the bearing plate seat 48 and having a toothed extremity normally engaged with the teeth of one of the slide operating pinions 44 under the influence of a spring 61, as shown in Fig. 12. This is its condition when the magazine or holder 13 is detached and it prevents the rotation of the shaft 43 in both directions. When, however, the magazine is applied to the camera back, this lock is automatically released by reason of an

arm 62 of the lever engaging and being displaced by a lug 63 on the back of the camera, which action throws the lever out of gear with the pinion and leaves the crank 14 free to be rotated.

The roller blind shutter is shown in section in Fig. 3 and comprises, in the present instance, a curtain 64 having an aperture 65 and run over guide rollers 66 past the exposure opening 2 of the camera body. It passes from a feed roll 67 at the top to a spring actuated tension or winding roll 68 of the usual construction at the bottom. The shaft 69 of the winding roll terminates in a pinion 70 (Fig. 19) that meshes with a gear 71 turning on a stud 72. The latter is turned by a winding key 73 on the exterior of a casing 74 that incloses the mechanism being described and when so turned in the direction of the arrow in Fig. 1, the gear winds the spring 75 of the winding roller and increases the tension for more rapid exposures. As such winding progresses, characters 76 on the gear 71 are successively exposed through an opening 77 in the casing 74 to indicate the tension. Retrograde movement is prevented by an escapement pawl 78 pivoted at 79 to the casing engaging a ratchet 80 pinned to the gear 71 at 81 and the pawl is held in such engagement by a spring 82. To reduce the spring tension and reverse the function of the winding key 73, the escapement pawl 78 is vibrated by means of a finger-piece 82 on the exterior of the casing, whereupon another engaging tooth 83 of the pawl alternates with the first and permits intermittent retrograde motion in the usual manner.

The feed roll 67 turns on journals 84 (Fig. 19) and 85 (Fig. 21) and the former terminates in a pinion 86 meshing with a stop gear 87 in the casing 74. The revolutions of the stop gear are controlled by a reciprocating escapement member 88 in a well known manner, the details of which are not essential to an understanding of the present invention. It is sufficient to say that the member 88 is normally held in its lowermost position by a spring 89 and when raised, it causes the curtain 64 to be run off onto the tension roll 68 sufficiently to carry the exposure aperture 65 past the exposure opening 2 and also causes the curtain to be then halted through a locking of the pinion 86 with the feed roll which locking is maintained as the member 88 is lowered again by its spring. This actuation of the member 88 is brought about by the operating lever 7 previously described and which has an arm 90 passing rearwardly through the casing 74 to engage a roller 91 on the member 88.

Calling attention now more particularly to Figs. 20 and 21, I will describe the manner in which the roller blind shutter is set

for an exposure, namely, wound back upon the feed roll 67 against the tension of the winding roll 68. Adjacent to the journal 85 of the feed roll, there is fixed thereto a pinion 92 in constant mesh with a gear 93 turning freely on a stud 94 carried by a casing 95 secured to the left side of the shutter housing 6 of the camera body. The gear 93 has fixed thereto a lug 95<sup>a</sup> (Fig. 22) arranged in the path of a pin 96 on an adjacent gear 97 turning on the same stud 94 independently of the first mentioned gear. When the magazine 13 is applied to the camera back, a pinion 98 on the left hand end of the crank shaft 43 (Figs. 15 and 17) goes into mesh with the gear 97 as shown in Fig. 20. This pinion 98 has a partial housing 99 that fits against the housing 95, as shown in Figs. 2 and 6. Therefore, the parts being in the normal position of Fig. 1, in which the exposure chamber 18 of the magazine is open, with the plate shifting slide 23 raised and the shutter run down, when the crank 14 is turned to the right to the position of Fig. 9, the slide 23 brings down a fresh plate in position for exposure and the shaft 43 at the same time winds the shutter through the pinion 98 thereon, turning the gear 97. The pin 96 on this gear locks against the lug 95<sup>a</sup> on the gear 93 which, in turn, rotates the pinion 92 of the feed roll 67 of the shutter. When the crank 14 is returned to initial position, which must be done before exposure, the plate shifting slide 23 is moved out of the way to its upper position, but the shutter mechanism is not affected, for the reason that the gear 97 is then turned in the opposite direction and the pin 96 thereon travels away from the lug 95<sup>a</sup> of the gear 93, leaving that gear and the roll pinion 92 with which it meshes, undisturbed. The shutter being tripped by means of the operating member 7 to make the exposure, the gear 93 is driven in a reverse direction by the pinion 92, carrying the lug 95<sup>a</sup> back into position to take the winding contact of the pin 96 of the driven gear 97.

It will be recognized that, the magazine 13 having been removed from the camera body, should either the plate shifting gearing of Fig. 17 or the shutter gearing of Fig. 20 be operated independently, their relative positions would be changed and when brought together again, they would not necessarily function in proper sequence and relationship. I have already described the means 59 for locking the slide mechanism of the magazine automatically with the latter's detachment from the camera. To automatically lock the shutter mechanism, the locking bolt 37 for the magazine is provided with a hooked extension 100 having a downwardly and inwardly turned reduced end 101 (Fig. 8). The gear casing 95 is pro-

vided with an opening 102 to receive this portion 101 and the gears 93 and 97 with apertures 103 and 104, respectively, for this same purpose. When the crank 14 is in the position of Fig. 9 and the exposure chamber 18 is closed by the slide 23, these apertures 102, 103 and 104 are in register. Then and not until then may the bolt 37 be operated to release its ears 40 from the interlocking ears 41 of the magazine, for if the positions of the shifting mechanism and hence, of the meshing shutter mechanism, are not correct, the extension 101 of the bolt 37 will be blocked by the face of the gear 93 of the shutter mechanism. Control of the various groups of mechanism is thus linked up to the various ends that a plate in position for exposure cannot be fogged by removing the magazine without closing the slide 23; once closed and the magazine removed, the position of the slide cannot be inadvertently changed; the shutter cannot be operated inadvertently during the absence of the magazine to falsely receive its gearing when it is again applied and the magazine cannot be removed in the first place until these other matters have been attended to.

A further safety appliance that I prefer to employ consists of a dummy plate or dark slide that I have marked 19\* in Figs. 3 and 4 which accompanies the plates 19 through the storage chamber 17 and into the exposure chamber 18 at the rear of the pile. This dark slide is hence the last one to take its position in the focal plane and becomes the foremost element of the pile in the exposure chamber 18. Therefore, after the full supply of plates have been fed, should the operator not consult his register 53 and continue to work his shifting mechanism and operate his shutter, he will do no harm to the plates that have already been used and particularly the last one, for the dark slide will remain in position and protect it and the image cast by the lens will fall idly upon it. Also, when the magazine is finally removed, the dark slide forms a further seal additional to the plate shifting slide 23.

I claim as my invention:

1. In a camera, the combination with a camera body, a shutter mechanism and a detachable holder for sensitive material cooperating with the body, of means for automatically locking the shutter mechanism when the holder is detached from the body.

2. In a camera, the combination with a camera body, a shutter mechanism, and a detachable holder for sensitive material cooperating with the body, of an operating member and means under the control thereof for alternatively locking the holder to the body or the shutter against actuation.

3. In a camera, the combination with a camera body, a shutter mechanism, and a detachable holder for sensitive material co-

operating with the body, of a bolt adapted to normally lock the holder to the body and to lock the shutter against actuation when said bolt is released.

5 4. In a camera, the combination with a body, a detachable holder for sensitive material cooperating therewith, and a shutter mechanism carried by the body, of a shutter controlling means carried by the holder and  
10 a device for locking the shutter mechanism against movement when the holder is removed from the body.

5. In a camera, the combination with a body, a detachable holder for sensitive material cooperating therewith, and a shutter mechanism carried by the body, of a shutter controlling means carried by the holder and  
15 a locking device for securing the holder to the body and adapted when released to lock the shutter mechanism against movement.  
20

6. In a camera, the combination with a body, a detachable holder for sensitive material cooperating therewith and a shutter mechanism carried by the body and comprising  
25 a roller blind provided with winding gearing, of a winding member on the holder having gearing cooperating with that of the shutter mechanism when the holder is in cooperation with the body, and a locking device  
30 for securing the holder to the body and adapted when released to lock the shutter mechanism against movement.

7. In a camera, the combination with a body, a detachable holder for sensitive material cooperating therewith, a shutter mechanism carried by the body and comprising  
35 a roller blind provided with winding gearing and a gear casing on the exterior of the body inclosing said gearing and provided with an opening, of a winding member on  
40 the holder having gearing cooperating with that of the shutter mechanism when the holder is in cooperation with the body, and a locking device for securing the holder to  
45 the body and having a portion adapted when the device is released, to enter the opening in the gear casing and lock the shutter mechanism against movement.

8. In a camera, the combination with a  
50 body, a shutter mechanism and a detachable holder for sensitive material cooperating with the body, of a manually operable locking device for locking the holder to the body,  
55 said device being blocked by the shutter mechanism against release when the shutter is open.

9. In a camera, the combination with a body, a shutter mechanism, a detachable holder for sensitive material cooperating  
60 with the body and having an exposure open-

ing and a closure for the latter, of a locking device for securing the holder to the body operating when released to lock the shutter mechanism and adapted to be released only when the closure is in operative position. 65

10. In a camera, the combination with a body shutter mechanism, a detachable holder for sensitive material cooperating with the body and having an exposure opening, a  
70 closure for the latter and a common means controlling both the shutter and closure, of a locking device for securing the holder to the body and acting through the medium of the shutter mechanism to resist release while the closure is in inoperative position. 75

11. In a camera, the combination with a body, a shutter mechanism carried thereby and a detachable holder for sensitive material cooperating with the body, of mechanism  
80 on the holder for feeding the sensitive material and detachably cooperating with the shutter mechanism to actuate the latter also and means for locking the shutter mechanism in the position in which it was left by the feeding mechanism when the holder is  
85 detached.

12. In a camera, the combination with a body, a shutter mechanism carried thereby, a detachable holder for sensitive material cooperating with the body and having an exposure opening, a closure for the latter, and  
90 operating mechanism for the closure carried by the holder and detachably cooperating with the shutter mechanism, of a locking device for securing the holder to the body and adapted when released to automatically lock  
95 the shutter mechanism in position, the shutter mechanism being adapted to prevent the release of said locking device when the closure is in inoperative position. 100

13. In a camera, the combination with a camera body, of a detachable holder for sensitive material cooperating therewith, and  
105 having an exposure opening, means for feeding sensitive material into said opening and a latch for such feeding means adapted to be automatically released when the holder is applied to the body.

14. In a camera, the combination with a camera body, of a detachable holder for sensitive material cooperating therewith and  
110 having an exposure opening, a closure for the opening, means on the holder for operating the closure comprising a shaft and gearing and a latch cooperating with the  
115 latter to lock the closure in operative position and adapted to be automatically released when the holder is applied to the body.

WILLIAM F. FOLMER.