March 30, 1943. A. SIMMON 2,315,279

FOCAL PLANE SHUTTER FOR CAMERAS

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Fig. 1.

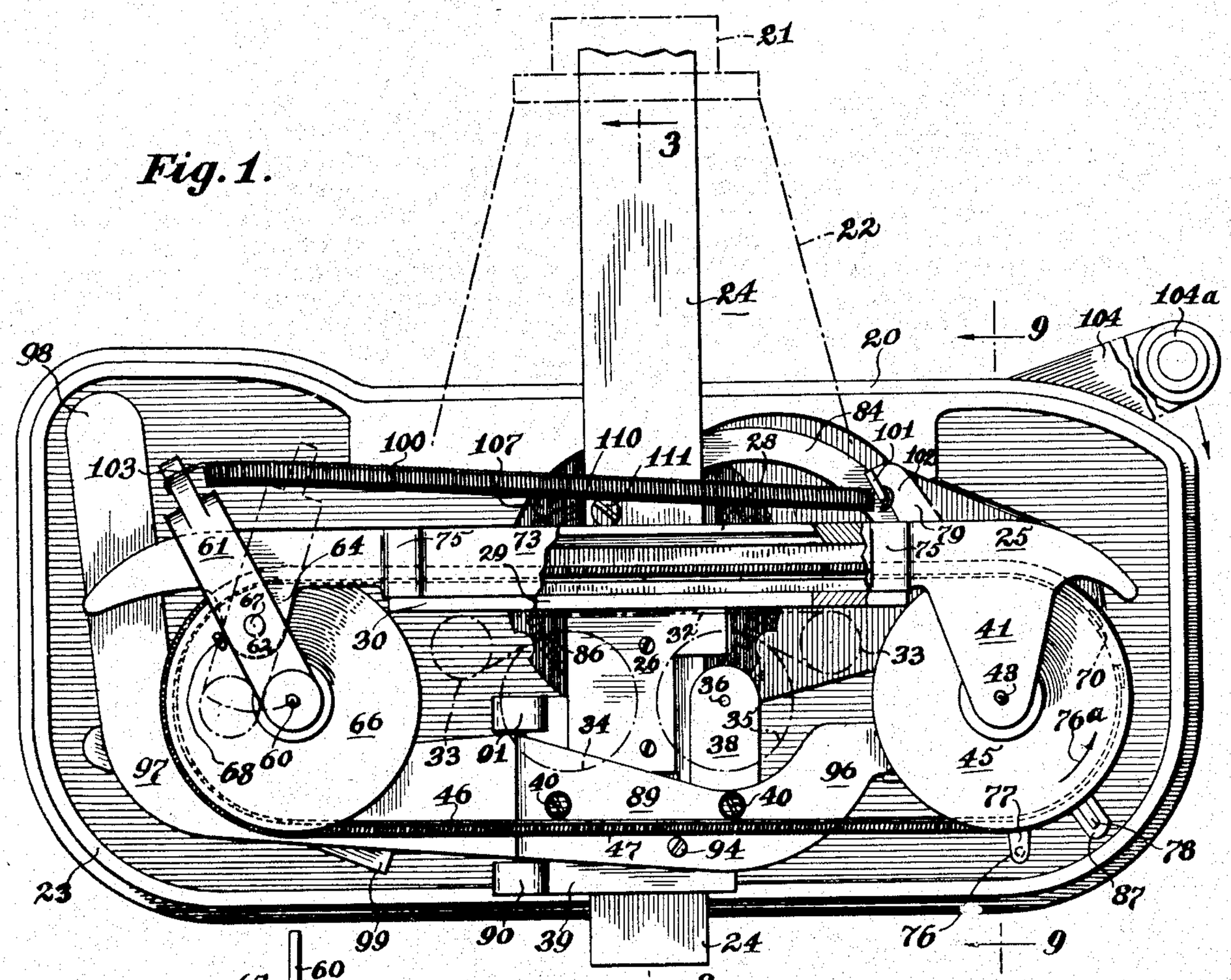
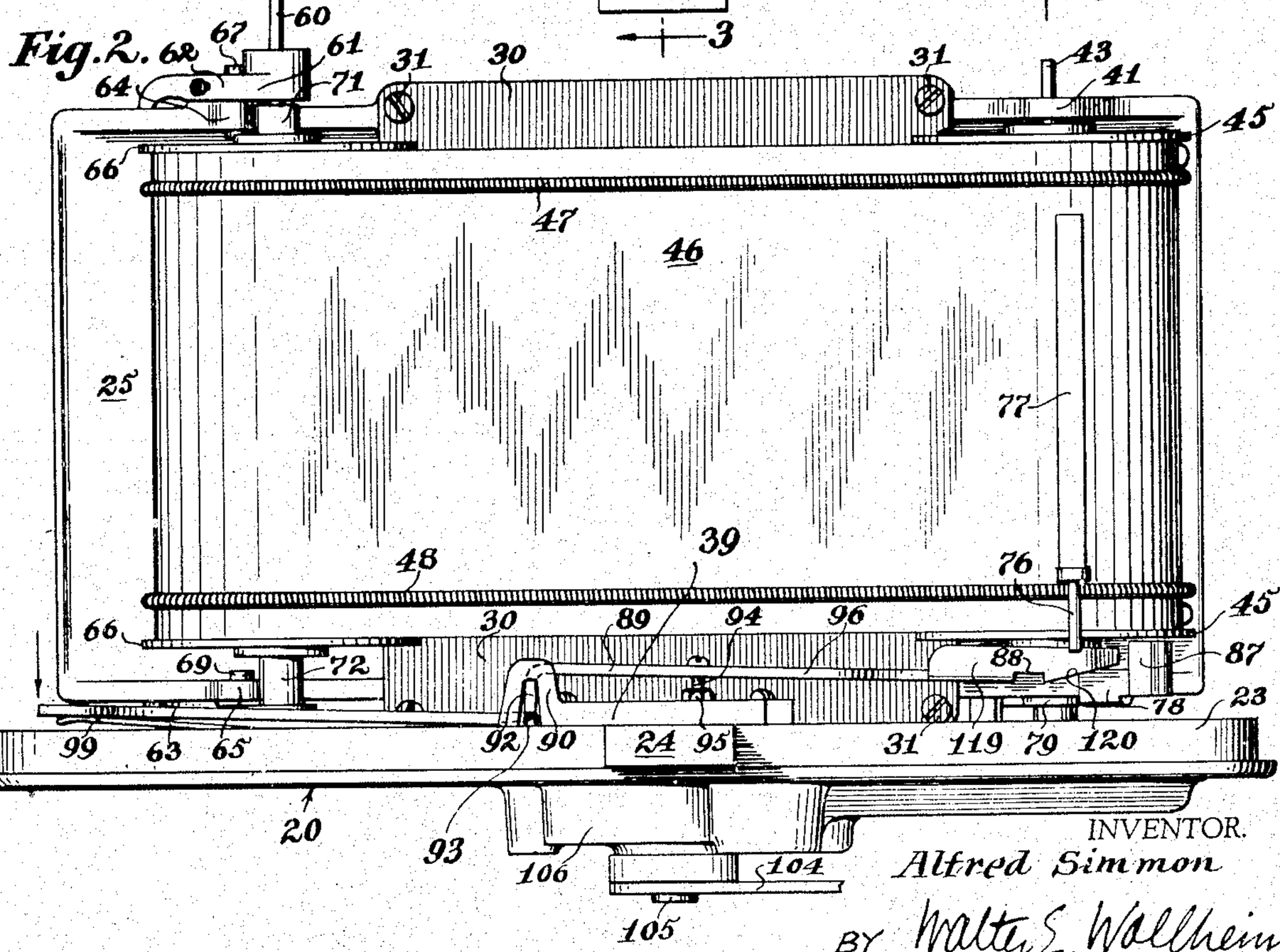


Fig. 2.



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FOCAL PLANE SHUTTER FOR CAMERAS

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Fig. 3.

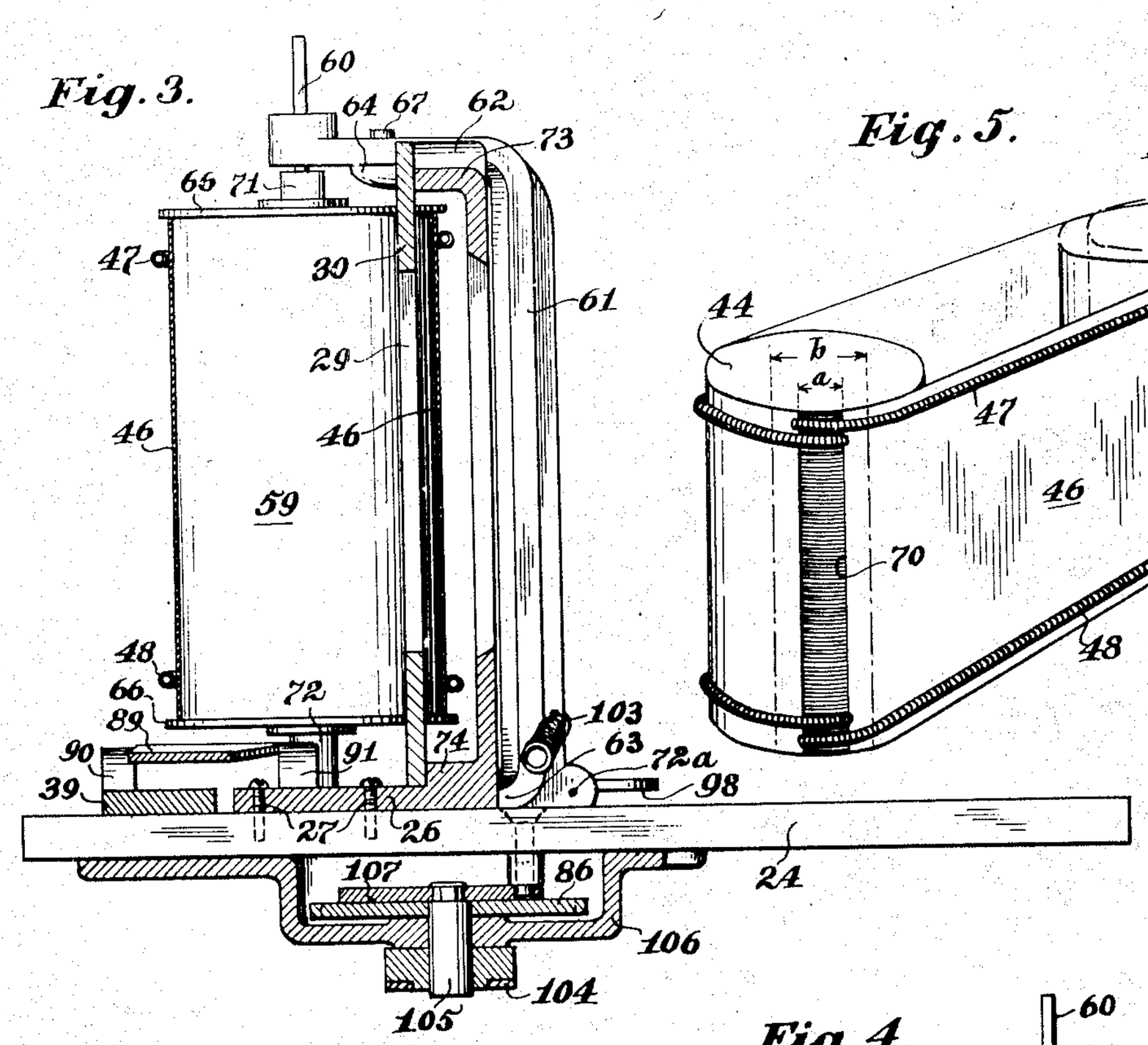


Fig. 5.

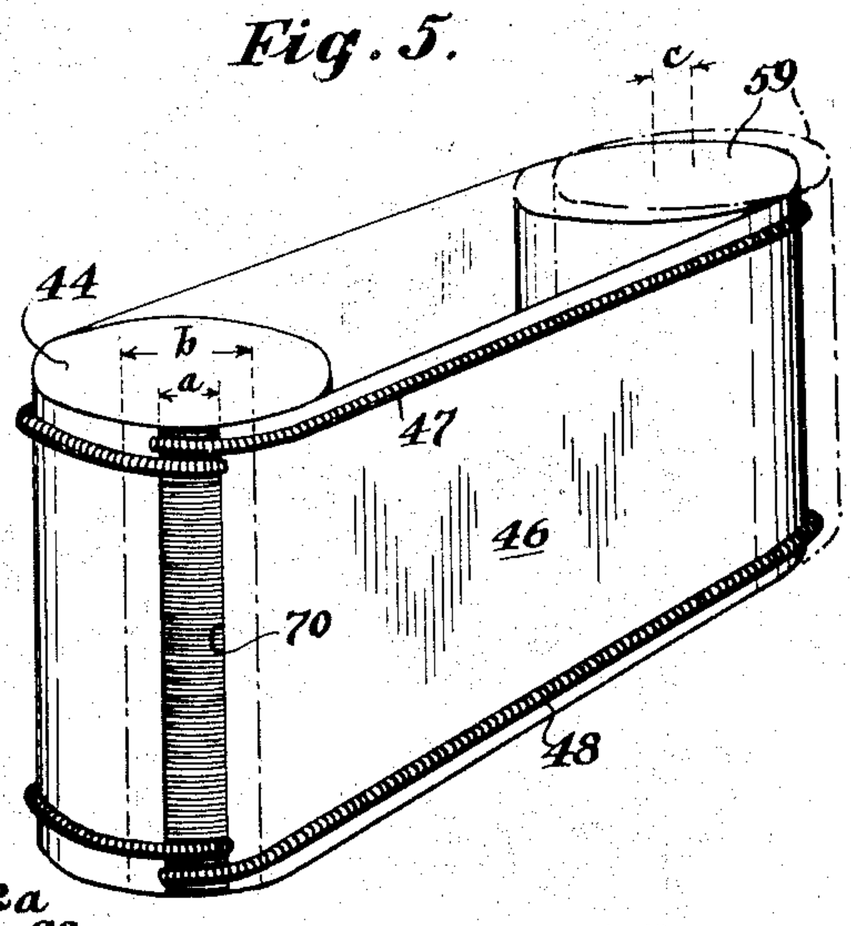
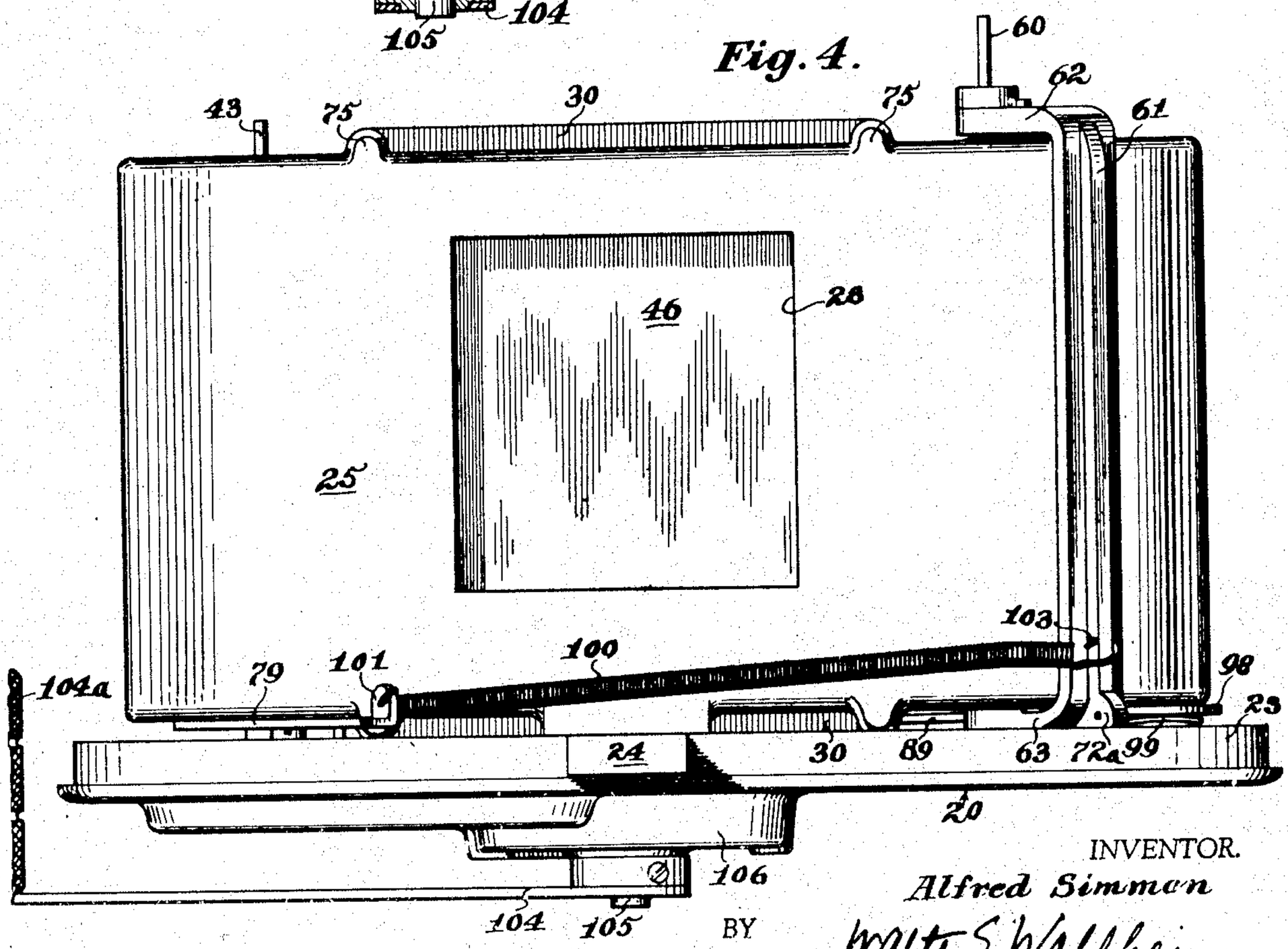


Fig. 4.



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FOCAL PLANE SHUTTER FOR CAMERAS

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Fig. 6.

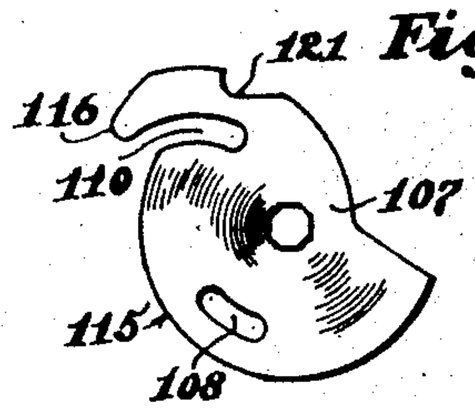
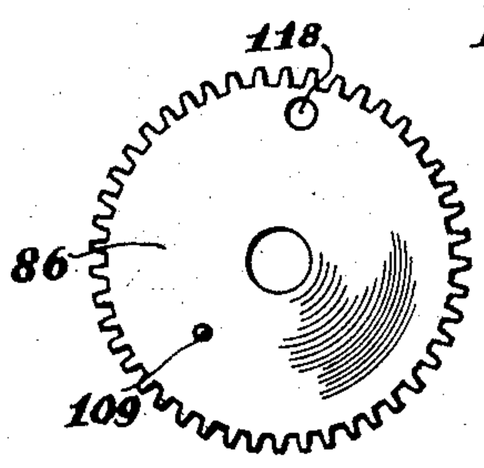


Fig. 7.



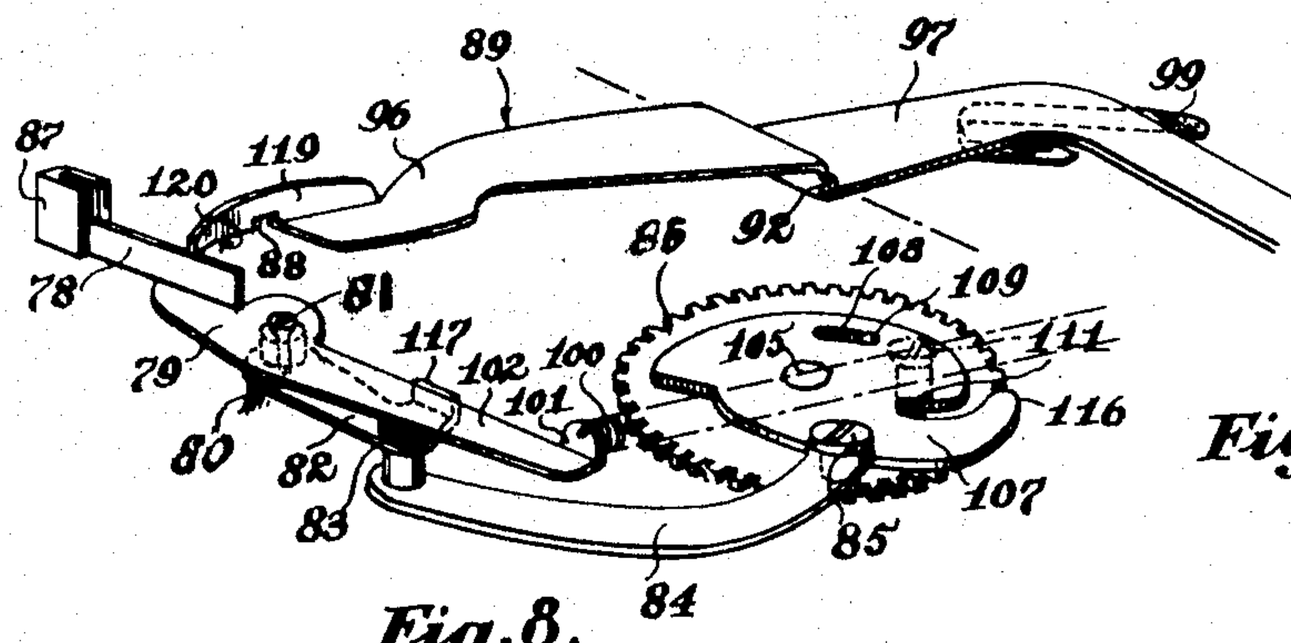


Fig. 8.

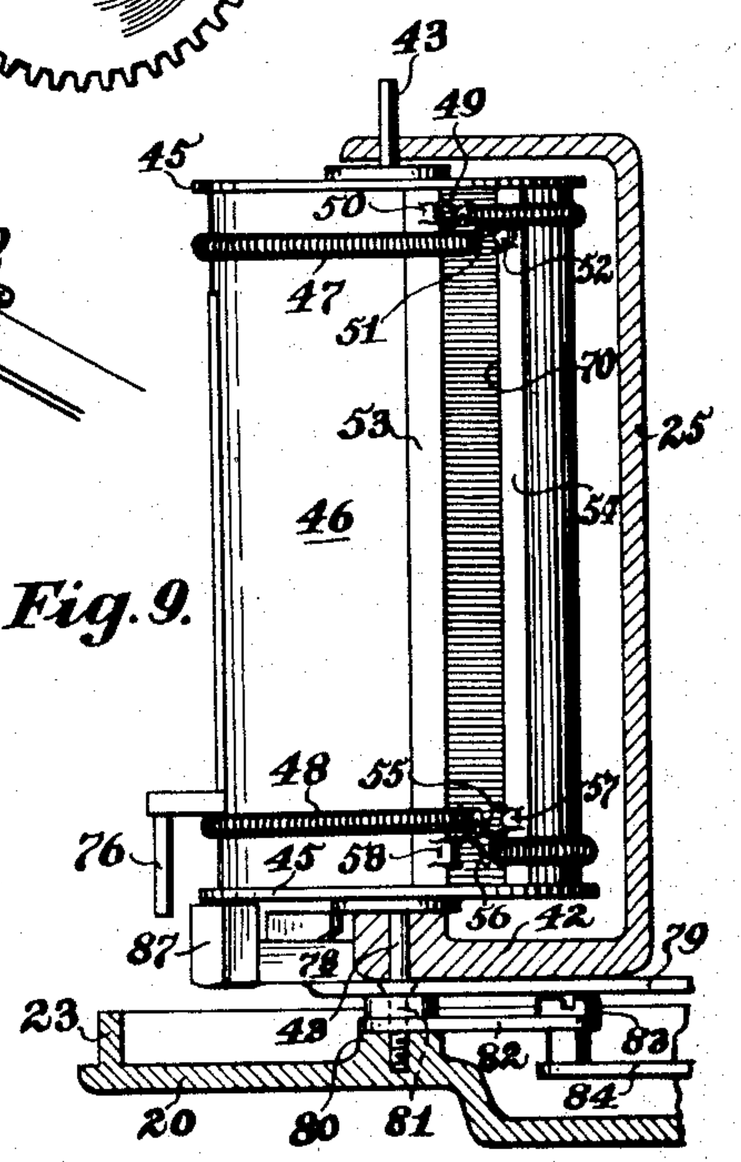
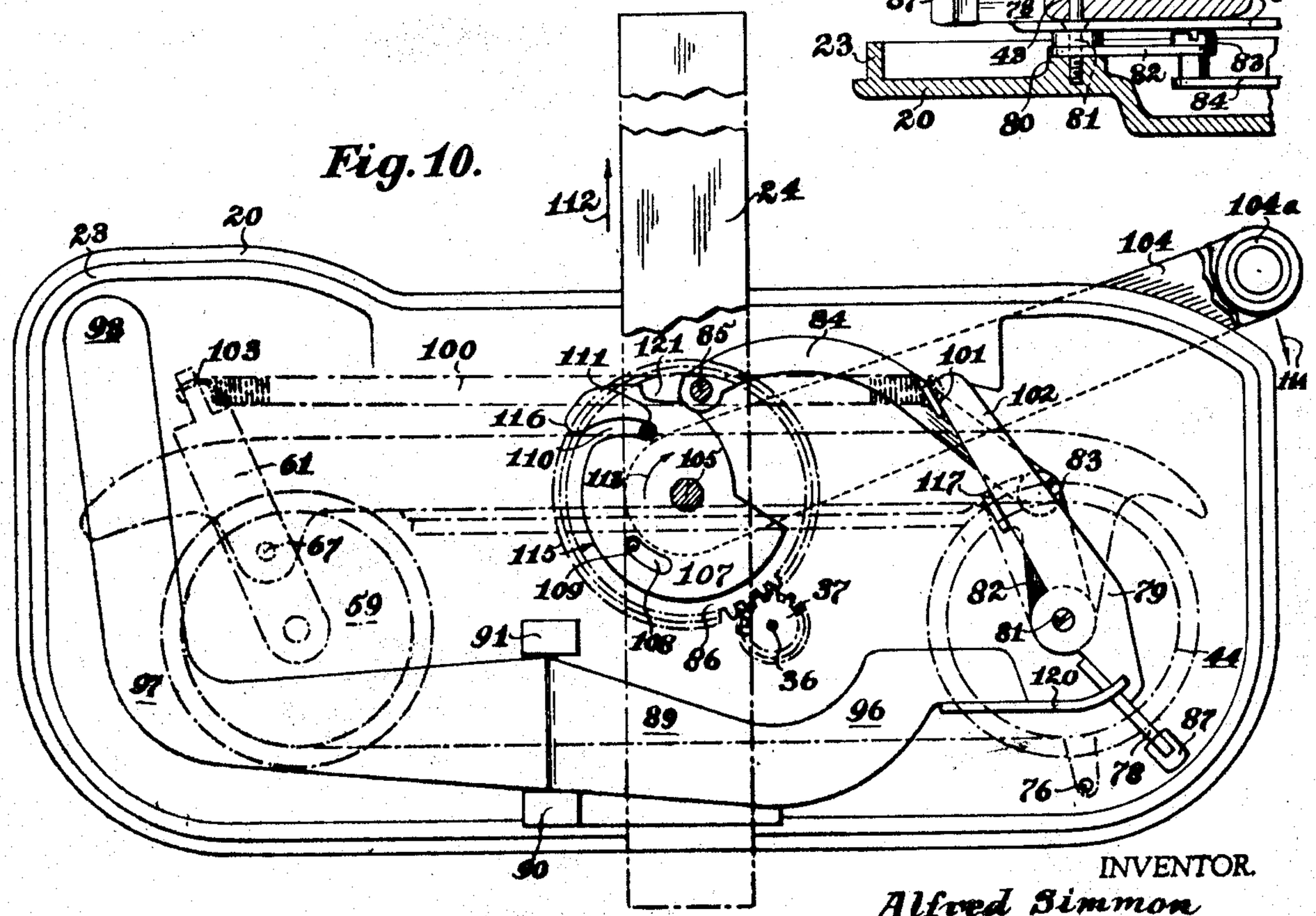


Fig. 9.

Fig. 10.



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FOCAL PLANE SHUTTER FOR CAMERAS

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Fig.11.

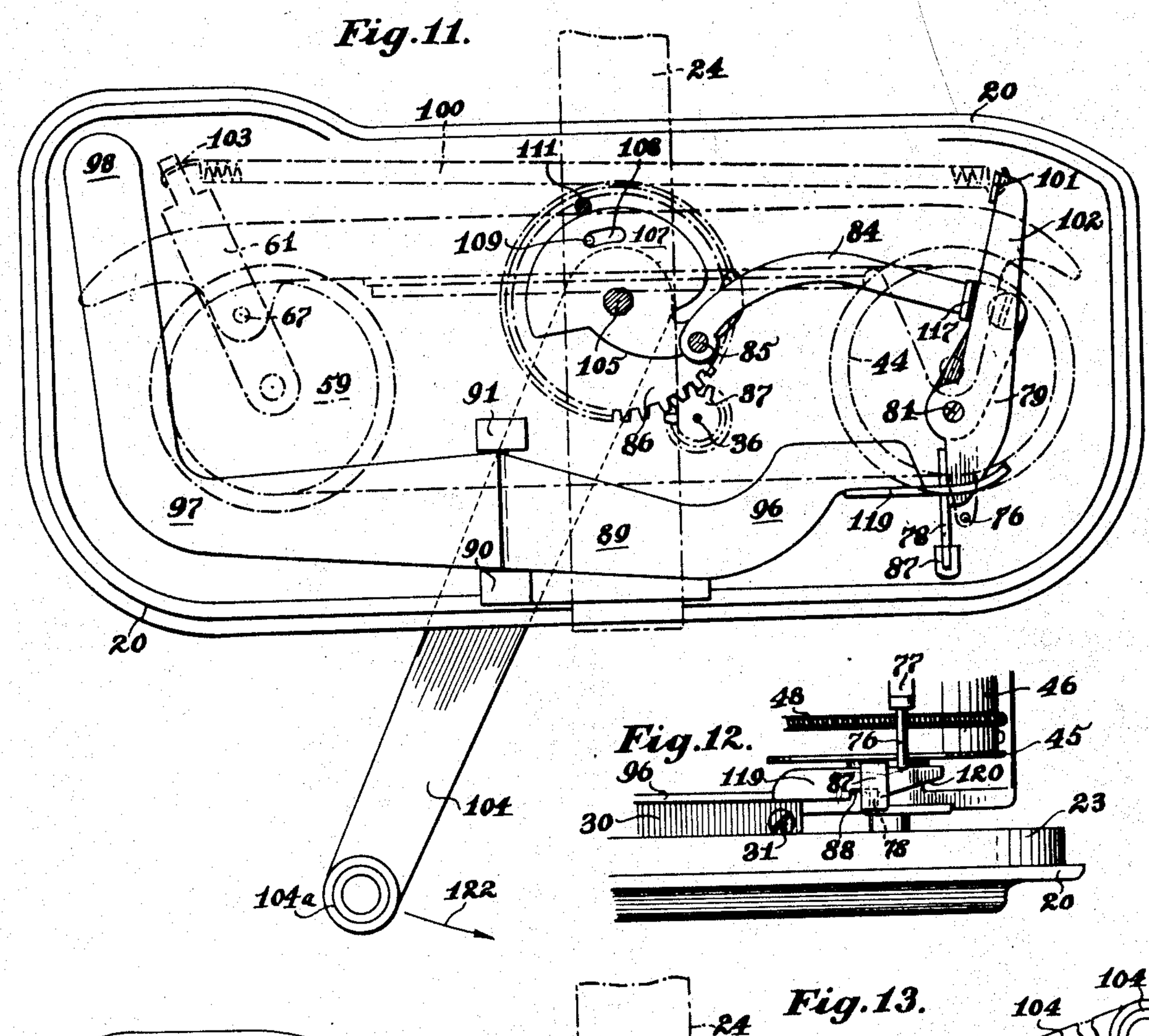
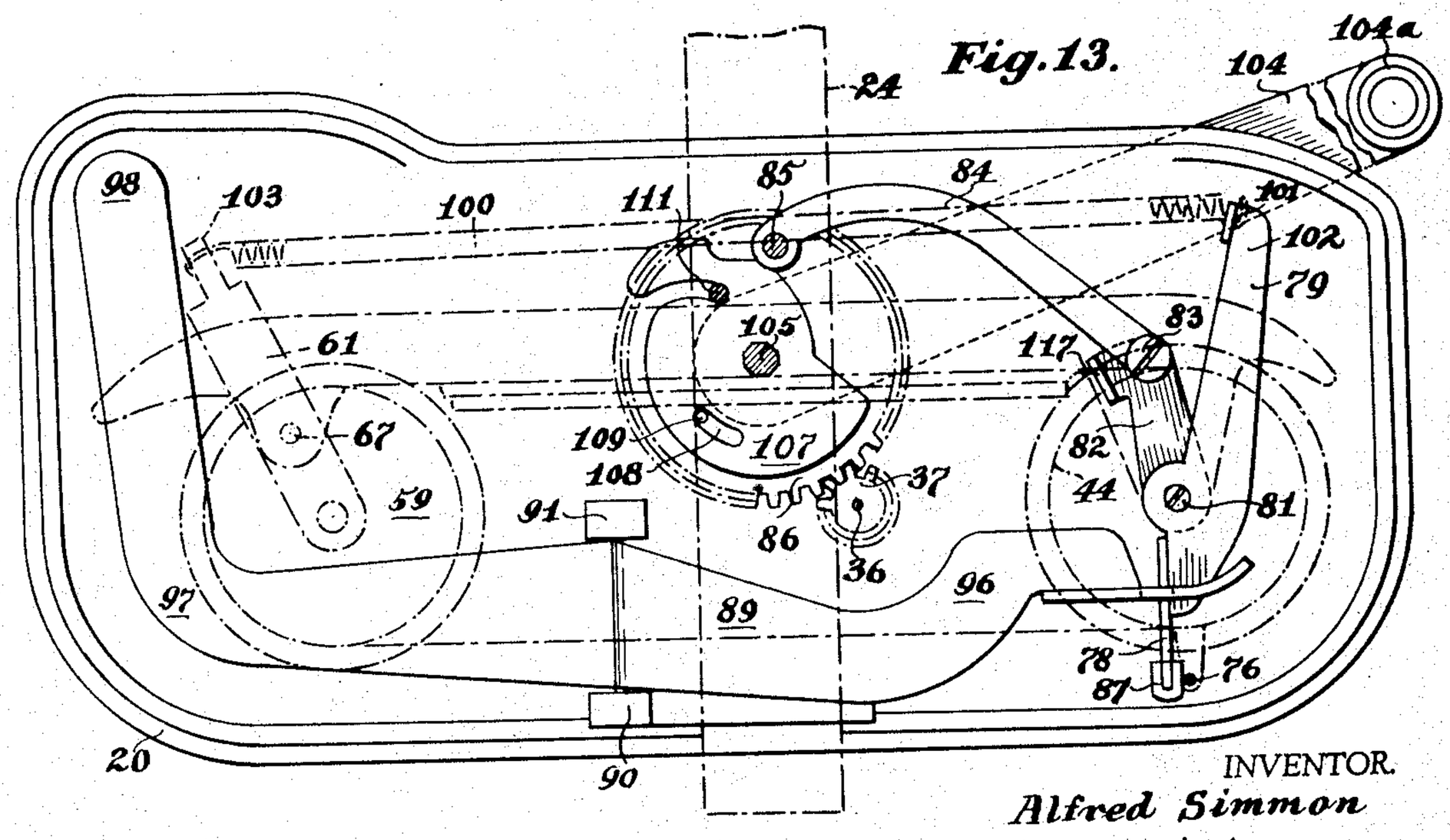


Fig.12.

Fig.13.



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Patented Mar. 30, 1943 2,315,279

UNITED STATES PATENT OFFICE

2,315,279

FOCAL PLANE SHUTTER FOR CAMERAS

Alfred Simmon, Jackson Heights, N. Y., assignor to Simmon Brothers Inc., Long Island City, N. Y., a corporation of New York

Application August 29, 1941, Serial No. 408,798

18 Claims. (Cl. 95—57)

Existing focal plane shutters consist usually of two curtains which are wound or unwound on two or more reels. The leading reel is driven by a spring and, by combining different spring tensions and slots of different width between the two curtains, a wide range of exposure times may be obtained. This type of shutter has the following principal objections:

It is difficult by simple means to expose the film uniformly. Since the shutter starts from zero velocity and becomes gradually accelerated by the spring, it will be clear that the last part of the film receives usually considerably less light than the part first exposed. Brakes and other undesirably complicated expedients have been used to overcome this, but only with moderate success. Further, it is not particularly easy to adjust the width of the slot since this involves commonly an adjustment of two curtains relative to each other. This is usually done by a train of gears or by differential drives or by other not particularly simple means. Moreover, special means must be employed to reset the shutter in such a way that the film is not again exposed, adding considerably to the complicated construction of the entire shutter.

It is the principal object of this invention to provide a focal plane shutter which can be operated at practically uniform speed.

Another object is to use in such a shutter, simple means, readily adjusted, for varying the width of the slit therein.

A further object is to make the shutter practically automatically resetting by providing means for returning the shutter always to the same position requiring only retensioning of a spring member.

A still further object is to accomplish the aforementioned advantages by extremely simple means, easy to operate and most economical to manufacture.

Still other objects will become apparent after a perusal of the following specifications on hand of the accompanying drawings in which a preferred embodiment of the shutter and its operating mechanism are shown in a more or less diagrammatic manner.

In the drawings,

Fig. 1 is a plan view of my improved focal plane shutter, portions being broken away to disclose the underlying construction, and portions of a camera with which the shutter is associated being indicated in broken lines;

Fig. 2 is a rear elevational view of the shutter of Fig. 1, the operating handle for the shutter being broken away;

Fig. 3 is a sectional view taken along the plane of line 3—3 in Fig. 1, looking in the direction of the arrows and a few parts being omitted for the sake of clearness;

Fig. 4 is a front elevational view of the shutter of Fig. 1, a portion of the operating handle being broken away;

Fig. 5 is a diagrammatic view illustrative of the principle of operating of the shutter, and showing particularly the effect of separation of the reels on the width of the shutter slit;

Figs. 6 and 7 are plan views of constructional details;

Fig. 8 is a fragmentary perspective view of the mechanism for operating the shutter, the showing being more or less diagrammatic;

Fig. 9 is a view, partly in section, along the plane of line 9—9 in Fig. 1, looking in the direction of the arrows, and portions being omitted for sake of clearness;

Fig. 10 is a plan view similar to Fig. 1, but more or less diagrammatic of the parts of the shutter operating mechanism as they appear after operation of the shutter and before resetting the shutter, the upper portions of the shutter being shown in broken lines so as to expose the operating mechanism;

Fig. 11 is a plan view, similar to Fig. 1, showing the parts of the shutter operating mechanism as they appear after the first stage in the operation of setting the shutter, namely the operation of setting the trigger;

Fig. 12 is a fragmentary rear elevational view, corresponding to the lower right hand corner of Fig. 2, but showing the trigger in its set position as it appears in Fig. 11, and

Fig. 13 is a plan view similar to Fig. 11, but showing the parts of the shutter operating mechanism as they appear after the second and final step in effecting the setting of the shutter, after which it is ready for the release which will bring the parts back into the position of Fig. 10.

Like characters of reference denote similar parts throughout the several views and the following specification.

Before going into the details of the illustrated embodiment of the invention the salient features thereof will be briefly enumerated.

Mounted in a suitable frame work are a pair of reels, spaced from each other, on which is carried the shutter curtain in the form of an endless band having a slit formed therein through which light from the lens is admitted to the film.

Suitable mechanism is provided for giving a starting impulse or "kick" to the curtain, prior to exposure, which thereafter moves with the reels at substantially uniform speed through a complete cycle, at the end of which it has returned to its initial position, ready for the next operation.

In order to assist in obtaining the desired uniform speed of travel of the curtain, the curtain-carrying reels are journalled in bearings of a low friction type, such as ball bearings, and no brake or other device is used to retard the curtain. Thus when the curtain receives an impulse or "kick" as before stated, prior to the exposure, the moving parts move freely during the exposure proper under their own momentum with slowly decreasing velocity. If friction were totally absent, the shutter would move during the exposure with truly constant velocity, but since at least a small amount of friction is always present, the velocity will in reality slowly decrease. If the amount of friction is small, as with bearings of the type explained above, the decrease will also be small and in this manner a uniform velocity will be obtained with a much better degree of approximation than possible heretofore.

To bring the shutter to a stop at the desired point, a simple form of stop is used. In order to permit of quick starting and stopping without undue strain, the curtain and the reels are made as light as possible consistent with other requirements.

The curtain consists of two parts, the curtain proper, which will hereinafter be referred to as the "curtain," and which is a sheet of opaque, flexible but not stretchable material, and elastic means connecting the free ends of this curtain in such a way as to form an endless belt. The free ends of the curtain are spaced so as to form a slit, and the width of this slit is adjustable because of the elastic connecting means, which always tends to reduce the width of the slit. This width is adjustable by varying the distance between the curtain-carrying reels.

The framework carrying the curtain and its reels is movable relative to the main body of the camera, which comprises a suitable housing within which the curtain as well as the film spools are positioned. The lens is carried on an extension of the housing, and a bellows or other type of light-proof enclosure extends between the housing and the lens.

The film spools are mounted in the housing, and the framework carrying the curtain, which is movable relative to the housing and therefore also to the film, carries a pressure plate, which during exposure is firmly clamped against the film to hold it flat, but is moved away from the film a short distance during the film winding operation.

An operating lever or crank underneath the housing serves to set the shutter and, at the same time, to advance the film and to move the pressure plate away from the film during such advance movement.

It will be understood that various controls are provided where called for, for effecting the various adjustments of the shutter from the exterior of the housing, although these are not shown in the drawings. Such controls, for example, are means for operating the trigger, means for adjusting the tension of the shutter spring and means for adjusting the slit width.

In the drawings, **20** is a base plate suitably contoured to act as a support for the operating parts of the camera and for a housing or housings to enclose the same. The latter have not been shown in the drawings, but the lens and the bellows (or other type of light proof exposure serving the same purpose) have been shown in broken lines at **21** and **22**, respectively, (see Fig. 1). The base plate **20** is generally flat with bosses and depressions where needed for the support or accommodation of the various parts, and is shown with a flange **23** running around its rim, to which the aforementioned housings may be conveniently secured.

Slidably mounted in the base plate is a bar **24**, on which is carried a structure functioning as a pressure plate and a support for the shutter. This bar also has connected to it the lens proper and its focusing mechanism (not shown). This structure comprises a plate-like member **25** having an extension **26** at its base which is secured to the bar **24** by screws **27**, and which is provided with an aperture **28** positioned at the inner end of the bellows, and through which light from the lens **21** passes through the shutter, and through a corresponding registering aperture **29** in a pressure plate **30**, which is carried on the member **25**, being secured thereto by screws **31**.

Immediately to the rear of the pressure plate is positioned a film **32**, shown in broken lines in Fig. 1, and this is guided over rollers **33**, passing from a spool **34** to a spool **35**, which latter is the take-up spool, these parts also being shown in broken lines in Fig. 1. The spool **35** is adapted for coupling to a stub shaft **36** which carries a pinion **37** (see Fig. 10) serving to actuate the shaft **36** and thereby the take-up spool **35**, by mechanism to be hereinafter described. The stub shaft **36** is journalled in the base plate **20** and in an extension **38** of a bracket **39** which is secured to the base plate by screws **40** and which serves for the support of the shutter releasing trigger, as will also be described hereinafter.

A pair of brackets **41** and **42** extend rearwardly from the upper and lower portions, respectively, of one side of the member **25** (see Figs. 1 and 3), and serve for the support of a pin **43** on which is journalled a reel **44** provided with flanges **45** at its ends and serving as one of the supports for a shutter curtain **46**.

The curtain **46** is a sheet of thin non-stretchable material held in the form of an endless band by means of a pair of tension coil springs **47** and **48** which pass completely around the curtain as clearly shown in Figs. 1, 2, 5 and 9, and have the ends of each secured to opposite ends of the curtain. By using this arrangement, rather than connecting the opposed ends of the curtain directly by short lengths of spring, it is obvious that a wide range of adjustment of the space between the ends of the curtain or slit width is obtainable without exceeding the elastic limit of the springs. The manner of attachment of the springs is shown in Fig. 9 of the drawings wherein **49** and **51** are ends of the spring **47** which are connected, respectively, to hooks **50** and **52** carried respectively, by reinforced ends **53** and **54** of the curtain **46**.

Ends **55** and **56** of the spring **48** are similarly secured to hooks **57** and **58** positioned, respectively, on the reinforced portions **53** and **54**.

A second curtain-supporting reel **59** is journalled on a pin **60** mounted in a U-shaped bracket **61** (see Figs. 1, 3 and 4), which is mounted for pivotal movement about a vertical axis passing through an intermediate point in upper and lower arms, **62** and **63**, respectively, on brackets **64**

and 65 projecting rearwardly from the upper and lower portions of the other side of the member 25.

The reel 59 is similar to the reel 44, being of the same size and being provided with flanges 66 at the top and the bottom to retain the curtain 46 on the reel.

The arm 62 of bracket 61 is provided with a pin 67 secured thereto as by set screw 68, and the arm 63 of said bracket with a pin 69 also secured thereto by means not shown, and these pins are journalled in the aforementioned brackets 64 and 65 to provide the pivotal mounting for the bracket 61. Since the pin 60 is mounted at the ends of the arms 62 and 63, while the bracket 61 pivots about the pins 67 and 69 at same distance inward, it will be seen that pivotal movement of the bracket 61, such as indicated in broken lines in Fig. 1, results in a movement of the reel 59 away from the reel 44. Movement of the bracket 61 from the broken line to the full line position results, of course, in an approach of the reel 59 to the reel 44.

The effect of this variation of the distance between the curtain-supporting reels on the width of slit 70 of the shutter will be made clear with the aid of Fig. 5, which is diagrammatic in character, although the numbering of the parts has been retained. From this figure it will become clear that with reel 59 in its full line position the width of the slit will be the distance between the ends of the curtain 46 as shown in full lines, and this distance may be represented with sufficient accuracy for the purposes of this demonstration by the ditsance *a* in Fig. 5. When the reel 59 is moved into its broken line position, however, the curtain will move with it and its ends will move away from their full line positions into their broken line positions, so that the width of the slit is now approximately represented by *b* in Fig. 5. It will be observed that the increase in the width of the slit is equal to twice the increase in the distance between the reels. In other words, if this distance is *c* (see Fig. 5), then $c=\frac{1}{2}(b-a)$.

Spacing bushings 71 and 72 on the pin 67 serve to keep the reel 59 at the proper level in alignment with the reel 44. Suitable means (not shown) may be provided for adjusting the position of the bracket 61 from the outside of the camera. This means may be in the form of a control attached to the bracket 61 at an extension 72*a* thereof (see Figs. 3 and 4).

By reference to Fig. 1 it will be noted that the curtain 46 is guided in front of the pressure plate 30 and in the space between the front wall of the member 25 and the pressure plate, and that the springs 47 and 48 are also accommodated in said space, which is bounded at its top by a flange 73 extending rearwardly from member 25 and at its bottom by a flange 74, also extending rearwardly from said bracket (see Fig. 3), these flanges serving for the support of the pressure plate 30, as already described, being provided with bosses 75 to receive the screws 31.

By reference to Fig. 1 it will be further noted that the slit 70 is located at the right hand side, overlying the reel 45, this being its initial position which is determined by a stop in the form of a pin 76 supported on a bracket 77 suitably secured to the curtain 46. This pin 76 extends slightly below the curtain 46 and into the path of an end 78 of an impulse lever 79, to be more fully described hereinafter, when the parts are in their shutter-operating position, so that after the release of the shutter by the trigger mechanism, also to be described hereinafter, and its travel in a counterclockwise direction, as indicated by the arrow 76*a* in Fig. 1, as a result of impact of the end 78 of lever 79 with pin 76, the shutter will travel through one complete cycle, which is terminated by the pin 76 striking the end 78 of lever 79.

The impulse lever 79 is pivoted at an intermediate point thereof to a boss 80 of the base plate 20 (see Figs. 8 and 9) by means of a screw 81, which also serves as the pivot for a setting lever 82, the free end of which is pivotally connected by a screw 83 to one end of a link 84, the other end of which is pivotally connected by a pin 85 to a gear 86.

The end portion 78 of the lever, which is the striking end, has already been described. In order to perform its function effectively with a minimum of noise and jarring, its striking portion is preferably padded as by a strip or strips 87 of leather or the like secured to the end 78 of the lever so as to form a thickened pad. The lever 79, as most clearly appears from Fig. 8, is of flat material disposed horizontally for the most part. The portion 78, however, is vertically disposed, whereby it serves as a latch adapted to enter a notch 88 in the end of a trigger lever 89.

The lever 89, the contours of which need not be described since they are clearly disclosed in Figs. 1, 2, 8 and 10, is pivoted at an intermediate point thereof, on the bracket 39, previously mentioned. This bracket, while is secured to the base plate 20, is provided with a pair of ears 90 and 91 into the opening of which extend lugs 92 (see Figs. 2 and 8) which extend laterally from the lever 89. The pivotal mounting may be adjusted by set screws 93 (see Fig. 2) on which the lugs 92 rest, and the throw of the lever may be regulated by a set screw 94 and a nut 95.

The notch 88 is positioned on one leg 96 of the lever 89, which may be termed the latch-engaging end of the lever. Its other leg 97 which may be described as the operating or control leg, is bent angularly. Its free end 98 may serve for the attachment of a suitable control device leading to the exterior of the camera housing, such as a push button, for instance.

The operating leg 97 is normally urged into a raised position and the latch-engaging leg 96 is correspondingly urged into a depressed position by a spring 99, which is in the form of a leaf spring having one end doubled over and interposed between the leg 96 of lever 89 and the base plate 20. This spring is shown in its entirety in Fig. 8.

The motive power for the curtain is provided by a coil spring 100 which is attached at one end to a lug 101 on the end of a leg 102 of impulse lever 79. The other end of the spring 100 is attached to the bracket 61 at a point 103 removed from its pivot. Due to this connection of the spring, it is obvious that when the bracket 61 is moved so as to increase the distance between the curtain-carrying reels 44 and 59, which will have the effect of widening the slit 70, the tension on the spring 100 is decreased, and this decreased tension will result in a less forcible impulse given to the curtain 46 by the lever 79 when it moves under the action of said spring after its latch portion 78 is released from the notch 88 of the trigger lever 89, thus increasing the length of the exposure.

While this construction represents a preferred

form, it is to be understood that, if desired, the tension of the spring and the spacing of the reels may be independently adjusted by suitable control means provided therefor.

The setting of the shutter is effected by means of a lever or crank 104, having a handle 104a, secured to a pin or stub shaft 105 journalled in a pocket 106 of the base plate 20. The upper end of the shaft 105 has a cam 107 fixedly secured thereo, while the gear 86, already referred to hereinabove, is mounted for free movement on the shaft 105 and underneath the cam 107. The latter has a slot 108 into which projects a pin 109 on the gear 86, whereby the movement of the gear relative to the cam is restricted.

The cam is further provided with a slot 110 into which extends a pin 111 carried by the bar 24. The slot is contoured to cause an advance of the bar 24 in a forward direction, as indicated by an arrow 112 in Fig. 10, whenever the crank 104 and the cam 107 are moved in a clockwise direction, as indicated by arrows 113 and 114 in Fig. 10. Once the bar 24 is in its forwardly advanced position, it is prevented from moving back by a concentric edge portion 115 of the cam 107 which engages the pin 111 on continued rotation of the cam 107. On the other hand, forward movement of the lever beyond the sphere of action of cam 107 is prevented by the rim 23 of the base plate, a portion of which acts as a stop for pin 111 which will keep it from traveling outside of the path of a projecting nose portion 116 of the cam 107.

A recess 121 in the cam 107 accommodates pin 85 under certain conditions.

The system of links and levers for setting and operating the shutter, and which is shown in Fig. 8 in perspective has already been described. This description will be completed by mention of an upstanding lug 117 on the setting lever 82, which serves to engage and move the lever 79 whenever lever 82 is moved by link 84 as a result of the movement of gear 86. The connection of the link 84 to gear 86 by the pin 85 has already been mentioned; at 118 in Fig. 7 is shown an opening to receive the end of this pin 85.

An end portion 119 of the leg 96 has a lower edge 120 inclined upwardly so as to serve as a cam surface which will ride on the upper edge of the portion 78 of the impulse lever 79, whereby, as the said portion is moved, the leg 96 will be raised against the tension of spring 99 until the portion 78 enters the notch 88, when the spring 99 will act to depress the leg 96 and prevent the portion 78 from leaving the notch until the leg 96 is raised, as by manually depressing the end 98 of the lever 89.

The operation of the device will now be described:

After operation of the shutter the parts thereof will be in the position shown in Figs. 1, 2, 4, 8 and 10 with the pressure plate 30 pressing against the film 32 and the pin 76 to the left of the pad 87 of the end 78 of impulse lever 79, and said end 78 being free of the notch 88 of the trigger lever 89, while the crank 104 will be in the position shown particularly in Figs. 1 and 10. The position of the cam 107 and the gear 86 appears from Fig. 10. The arm 61 is shown for purposes of illustration in its position of minimum slot width. The spring 100 has pulled the leg 102 of impulse lever 79 against the lug 117 of lever 82; the latter acts as a stop because it is prevented from moving by the link 84, which in turn is prevented from moving by the gear 86, held against rotation by pin 109 engaging one end of the slot 108 in the cam 107, which in turn is stopped by the pin 111.

In order to set the shutter, the crank 104 is moved in the direction of the arrow 114 in Fig. 10, that is clockwise, and the cam 107 moves clockwise in the direction of the arrow 113. This movement of the crank 104 is continued until the position of the parts shown in Fig. 11 is reached after which farther movement of the crank in a clockwise direction may be prevented by suitable stop means (not shown).

The first result of the movement of cam 107 is that it moves bar 24 forward, because of the action of cam slot 110 on pin 111 carried by the bar 24. This carries the member 25 with the curtain and its reels forward and serves to disengage the pressure plate 30 from the film 32. Until this disengagement is effected, the gear 86 has been idling because its pin 109 is free to travel in the cam slot 108 until the end of the cam slot 108 engages the pin and causes the gear 86 to move with it. When this happens, the pressure plate 30 has released the film 32 and the latter is now unwound for a fresh exposure by the action of gear 86 on the pinion 37, which through shaft 36 drives the take-up spool 35. At the same time the gear 86 moves link 84 and thereby sets lever 82 in a clockwise direction, and the lug 117 of lever 82 presses against leg 102 of the impulse lever 79, causing said lever to move into the position shown in Figs. 11 and 12, in which end 78 of lever 79 has entered the notch 88 of the trigger lever 89, where it has become locked. It is now situated to the left of pin 76. This movement of the pad 87 on the end of part 78 is possible because the bar 24 has moved the reel 44 forwardly to such an extent that the pin 76 is clear of the path of pad 87.

The spring 100 is under tension and ready to actuate the lever 79 when it is released.

The crank 104 is now moved in the reverse direction, that is in the counter-clockwise direction indicated by arrow 122 in Fig. 11, until it reaches its starting position again, as shown in Fig. 13. All of the parts, except the lever 79 and the spring 100, move back to their starting position of Fig. 10 with the crank 104. The lever 79 remains in its latched position in notch 88 of trigger lever 89, and the spring 100 is under tension.

It will be observed that the bar 24 has moved back into its initial position carrying with it the curtain reels 44 and 59, so that now the pin 76 is again in the path of the pad 87 at the end 78 of lever 79. Now, however, the pin 76 is to the right of the pad 87, instead of to the left thereof, as in Fig. 10. The pressure plate 30 also again presses against the film.

It is to be understood that the transmission between the shaft 36 and the film take-up spool 35 is unidirectional so that during the movement of the gear 86 from the position of Fig. 11 to that of Fig. 13 the film is not moved.

Operation of the shutter is effected by raising the end 119 of trigger lever 89, as by depressing its control end 98, which releases the lever 79. This lever, under the action of spring 100 gives an impulse to the curtain 46 in a counter-clockwise direction, as indicated by the arrow 76a of Fig. 1, and the slit 70 travels at substantially uniform speed across the apertures 28 and 29, thereby exposing the film 32.

The curtain 46 continues its movement at substantially uniform speed until the pin 76 strikes

the pad 87, which causes it to rebound into its initial position as shown in Fig. 1.

In order to cause the pin 76 always to return to its initial position I may provide a construction whereby the curtain 46 has a stable position from which it is readily displaced but to which it will tend to return when displaced a slight distance therefrom. Such a stable position may be caused, for instance, by the slit 70 which has a greater degree of flexibility than the curtain proper always returning to the same place around the outer curvature of the reel 44.

It will be understood that any suitable or preferred material can be used for the various parts. For the base plate 20 and the member 25 I have found aluminum satisfactory. The curtain 46 may be made of very thin sheet steel or spring hard phosphor bronze or nickel silver. The springs 47, 48 and 100 may be made of thin steel wire.

It is obvious that many changes of form, proportions and minor details of construction may be resorted to without departing from the principles or sacrificing any of the advantages of the invention as defined in the appended claims.

What I claim as new, is:

1. In a focal plane shutter for cameras, a curtain, anti-friction supports for said curtain, and mechanism to impart an impulse to said curtain, prior to exposure, to operate said curtain by its own inertia only during exposure, comprising a spring actuated member and means to release said member, said curtain having a contact surface adapted to receive the impulse of said member upon release and being disengaged from said member during exposure.

2. In a focal plane shutter for cameras, an endless belt forming a curtain, anti-friction supports for said curtain, and mechanism to impart an impulse to said curtain, prior to exposure, to operate said curtain by its own inertia only during exposure, comprising a spring actuated member and means to release said member, said curtain having a contact surface adapted to receive the impulse of said member upon release and being disengaged from said member during exposure.

3. In a focal plane shutter for cameras, an endless belt having an adjustable slit forming a curtain, anti-friction supports for said curtain, and mechanism to impart an impulse to said curtain, prior to exposure, to operate said curtain by its own inertia only during exposure, comprising a spring actuated member and means to release said member, said curtain having a contact surface adapted to receive the impulse of said member upon release and being disengaged from said member during exposure.

4. In a focal plane shutter for cameras, an endless belt forming a curtain, a pair of reels having said curtain wound around it, anti-friction supports for said reels, and mechanism to impart an impulse to said curtain, prior to exposure, to operate said curtain by its own inertia only during exposure, comprising a spring actuated member and means to release said member, said curtain having a contact surface adapted to receive the impulse of said member upon release and being disengaged from said member during exposure.

5. In a focal plane shutter for cameras, a curtain assembly consisting of an endless belt having an adjustable slit forming a curtain, a pair of reels having said curtain wound around it, anti-friction supports for said reels, and means to vary the distance between said reels for purposes of varying the width of said slit, and mechanism to impart an impulse to said curtain assembly, prior to exposure, to operate said assembly by its own inertia only during exposure, comprising a spring actuated member and means to release said member, said curtain assembly having a contact surface adapted to receive the impulse of said member upon release and being disengaged from said member during exposure.

6. In a focal plane shutter for cameras, a curtain having ends in spaced relation to each other forming a slit, elastic means connecting said ends forming an endless belt with said curtain, anti-friction supports for said curtain, and mechanism to impart an impulse to said curtain, prior to exposure, to operate said curtain by its own inertia only during exposure, comprising a spring actuated member and means to release said member, said curtain having a contact surface adapted to receive the impulse of said member upon release and being disengaged from said member during exposure.

7. In a focal plane shutter for cameras, a curtain having ends in spaced relation to each other forming a slit, elastic means connecting said ends forming an endless belt with said curtain, a pair of reels having said curtain wound around it, anti-friction supports for said reels, and mechanism to impart an impulse to said curtain, prior to exposure, to operate said curtain by its own inertia only during exposure, comprising a spring actuated member and means to release said member, said curtain having a contact surface adapted to receive the impulse of said member upon release and being disengaged from said member during exposure.

8. In a focal plane shutter for cameras, a curtain having ends in spaced relation to each other forming a slit, elastic means connecting said ends forming an endless belt with said curtain, a pair of reels having said curtain wound around it, said elastic means passing around said reels, anti-friction supports for said reels, and mechanism to impart an impulse to said curtain, prior to exposure, to operate said curtain by its own inertia only during exposure, comprising a spring actuated member and means to release said member, said curtain having a contact surface adapted to receive the impulse of said member upon release and being disengaged from said member during exposure.

9. In a focal plane shutter for cameras, a curtain having ends in spaced relation to each other forming a slit, elastic means connecting said ends forming an endless belt with said curtain, a pair of reels having said curtain wound around it, said elastic means passing around said reels, anti-friction supports for said reels, means to vary the distance between said reels for purposes of varying the width of said slit, and mechanism to impart an impulse to said curtain, prior to exposure, to operate said curtain by its own inertia only during exposure, comprising a spring actuated member and means to release said member, said curtain having a contact surface adapted to receive the impulse of said member upon release and being disengaged from said member during exposure.

10. In a focal plane shutter for cameras, a curtain, a pressure plate for film cooperating with said curtain and movable in unison therewith in a direction parallel to the optical axis of the camera lens, means to lift said plate off said film during rewinding, and mechanism to impart an impulse to said curtain, prior to exposure, to op-

erate said curtain by its own inertia only during exposure, comprising a spring actuated member and means to release said member, said curtain having a contact surface adapted to receive the impulse of said member upon release and being disengaged from said member during exposure.

11. In a focal plane shutter for cameras, an endless belt forming a curtain, a pressure plate for film cooperating with said curtain and movable in unison therewith in a direction parallel to the optical axis of the camera lens, means to lift said plate off said film during rewinding, and mechanism to impart an impulse to said curtain, prior to exposure, to operate said curtain by its own inertia only during exposure, comprising a spring actuated member and means to release said member, said curtain having a contact surface adapted to receive the impulse of said member upon release and being disengaged from said member during exposure.

12. In a focal plane shutter for cameras, an endless belt having an adjustable slit forming a curtain, a pressure plate for film cooperating with said curtain and movable in unison therewith in a direction parallel to the optical axis of the camera lens, means to lift said plate off said film during rewinding, and mechanism to impart an impulse to said curtain, prior to exposure, to operate said curtain by its own inertia only during exposure, comprising a spring actuated member and means to release said member, said curtain having a contact surface adapted to receive the impulse of said member upon release and being disengaged from said member during exposure.

13. In a focal plane shutter for cameras, an endless belt forming a curtain, a pair of reels having said curtain wound around it, a pressure plate for film cooperating with said curtain and movable in unison therewith in a direction parallel to the optical axis of the camera lens, means to lift said plate off said film during rewinding, and mechanism to impart an impulse to said curtain, prior to exposure, to operate said curtain by its own inertia only during exposure, comprising a spring actuated member and means to release said member, said curtain having a contact surface adapted to receive the impulse of said member upon release and being disengaged from said member during exposure.

14. In a focal plane shutter for cameras, an endless belt having an adjustable slit forming a curtain, a pair of reels having said curtain wound around it, means to vary the distance between said reels for purposes of varying the width of said slit, a pressure plate for film cooperating with said curtain and movable in unison therewith in a direction parallel to the optical axis of the camera lens, means to lift said plate off said film during rewinding, and mechanism to impart an impulse to said curtain, prior to exposure, to operate said curtain by its own inertia only during exposure, comprising a spring actuated member and means to release said member, said curtain having a contact surface adapted to receive the impulse of said member upon release and being disengaged from said member during exposure.

15. In a focal plane shutter for cameras, a curtain having ends in spaced relation to each other forming a slit, elastic means connecting said ends forming an endless belt with said curtain, a pressure plate for film cooperating with said curtain and movable in unison therewith in a direction parallel to the optical axis of the camera lens, means to lift said plate off said film during rewinding, and mechanism to impart an impulse to said curtain, prior to exposure, to operate said curtain by its own inertia only during exposure, comprising a spring actuated member and means to release said member, said curtain having a contact surface adapted to receive the impulse of said member upon release and being disengaged from said member during exposure.

16. In a focal plane shutter for cameras, a curtain having ends in spaced relation to each other forming a slit, elastic means connecting said ends forming an endless belt with said curtain, a pair of reels having said curtain wound around it, a pressure plate for film cooperating with said curtain and movable in unison therewith in a direction parallel to the optical axis of the camera lens, means to lift said plate off said film during rewinding, and mechanism to impart an impulse to said curtain, prior to exposure, to operate said curtain by its own inertia only during exposure, comprising a spring actuated member and means to release said member, said curtain having a contact surface adapted to receive the impulse of said member upon release and being disengaged from said member during exposure.

17. In a focal plane shutter for cameras, a curtain having ends in spaced relation to each other forming a slit, elastic means connecting said ends forming an endless belt with said curtain, a pair of reels having said curtain wound around it, said elastic means passing around said reels, a pressure plate for film cooperating with said curtain and movable in unison therewith in a direction parallel to the optical axis of the camera lens, means to lift said plate off said film during rewinding, and mechanism to impart an impulse to said curtain, prior to exposure, to operate said curtain by its own inertia only during exposure, comprising a spring actuated member and means to release said member, said curtain having a contact surface adapted to receive the impulse of said member upon release and being disengaged from said member during exposure.

18. In a focal plane shutter for cameras, a curtain having ends in spaced relation to each other forming a slit, elastic means connecting said ends forming an endless belt with said curtain, a pair of reels having said curtain wound around it, said elastic means passing around said reels, means to vary the distance between said reels for purposes of varying the width of said slit, a pressure plate for film cooperating with said curtain and movable in unison therewith in a direction parallel to the optical axis of the camera lens, means to lift said plate off said film during rewinding, and mechanism to impart an impulse to said curtain, prior to exposure, to operate said curtain by its own inertia only during exposure, comprising a spring actuated member and means to release said member, said curtain having a contact surface adapted to receive the impulse of said member upon release and being disengaged from said member during exposure.

ALFRED SIMMON.