May 13, 1941. E. S. HINELINE 2,242,124

SELF-CAPPING SHUTTER MECHANISM

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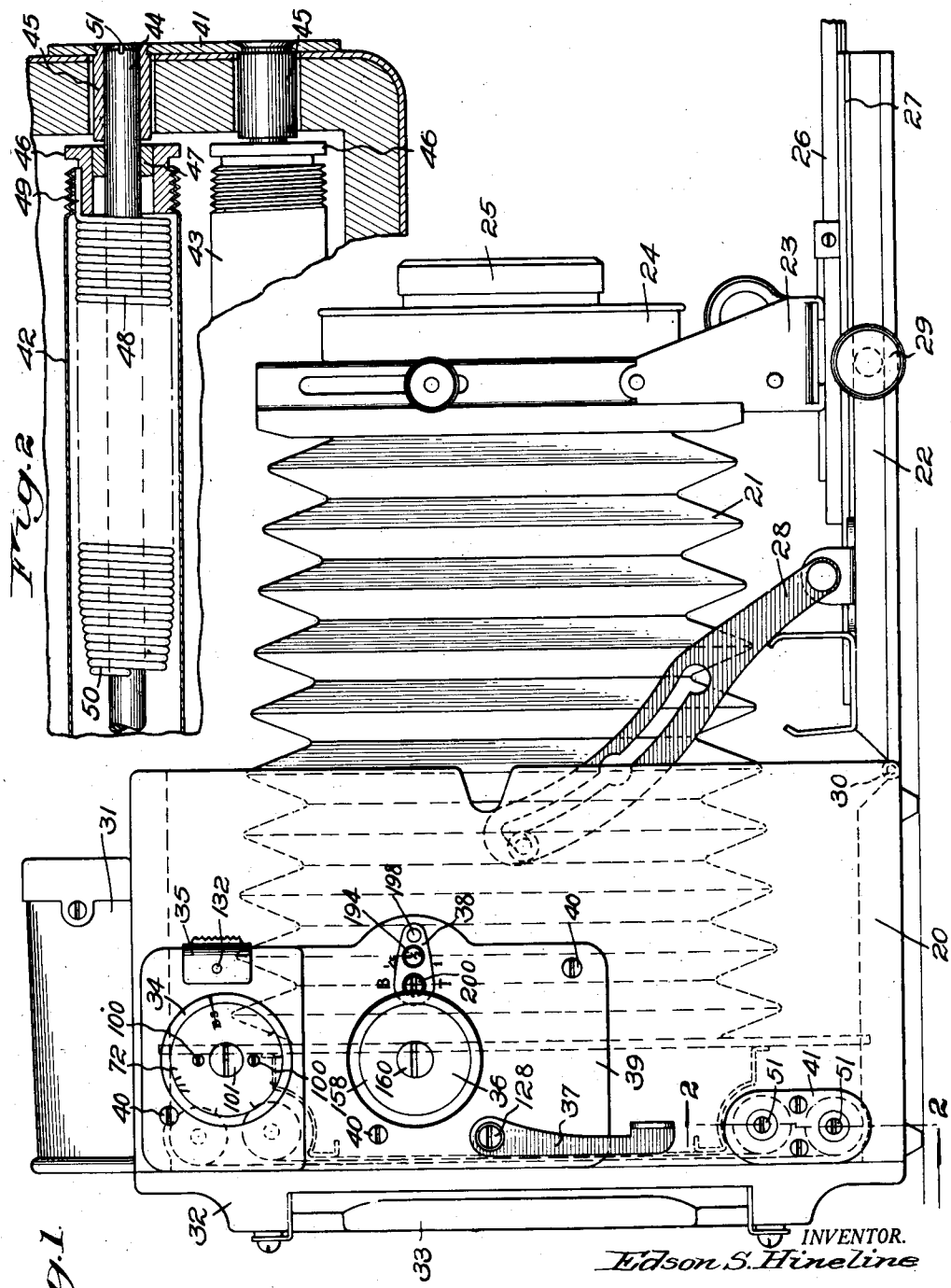


Fig. 2

Fig. 1

INVENTOR.
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May 13, 1941. E. S. HINELINE 2,242,124

SELF-CAPPING SHUTTER MECHANISM

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Fig. 3

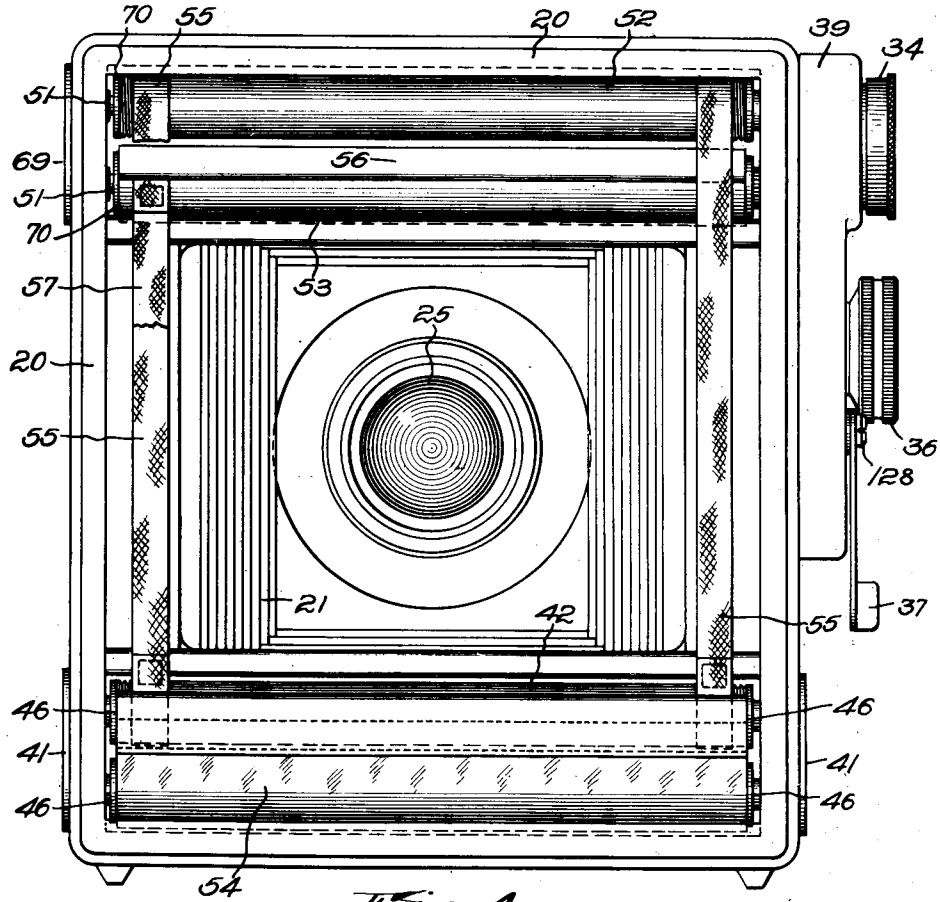
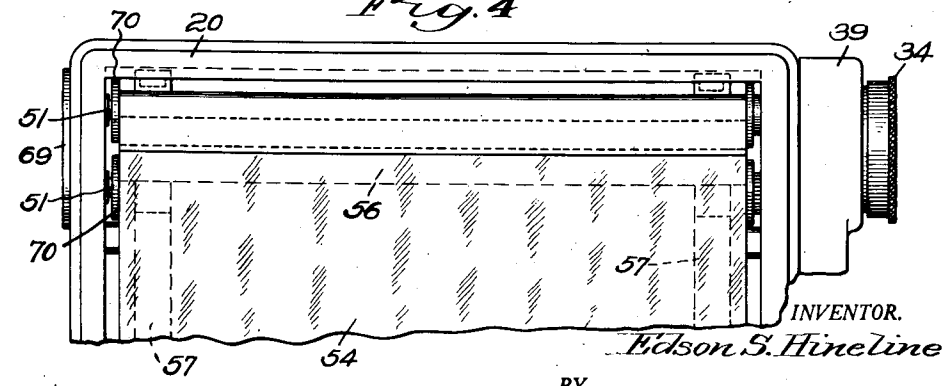


Fig. 4



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May 13, 1941. E. S. HINELINE 2,242,124

SELF-CAPPING SHUTTER MECHANISM

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Fig. 5

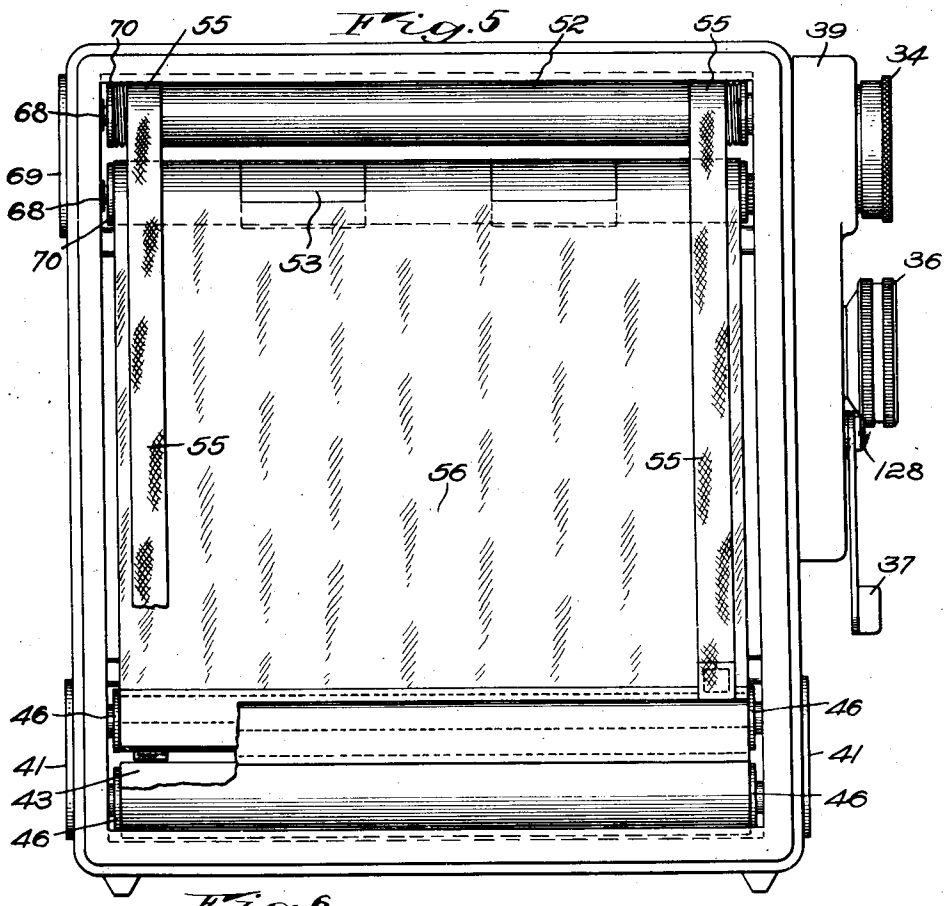
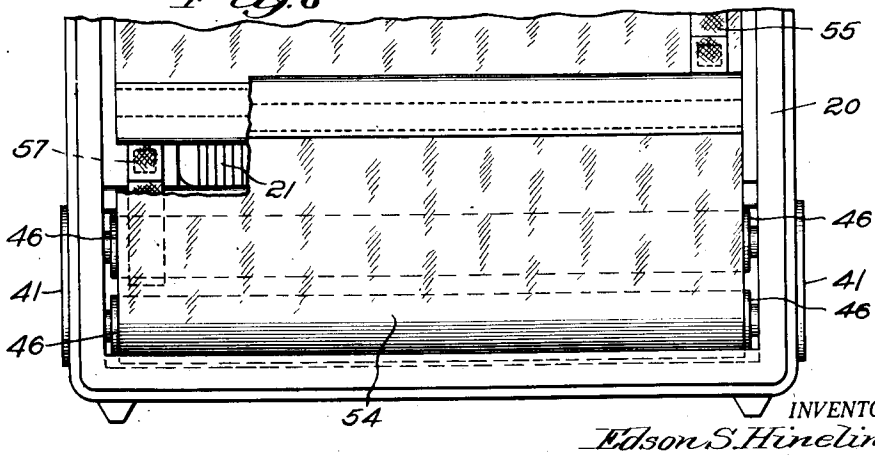


Fig. 6



INVENTOR.
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SELF-CAPPING SHUTTER MECHANISM

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Fig. 7

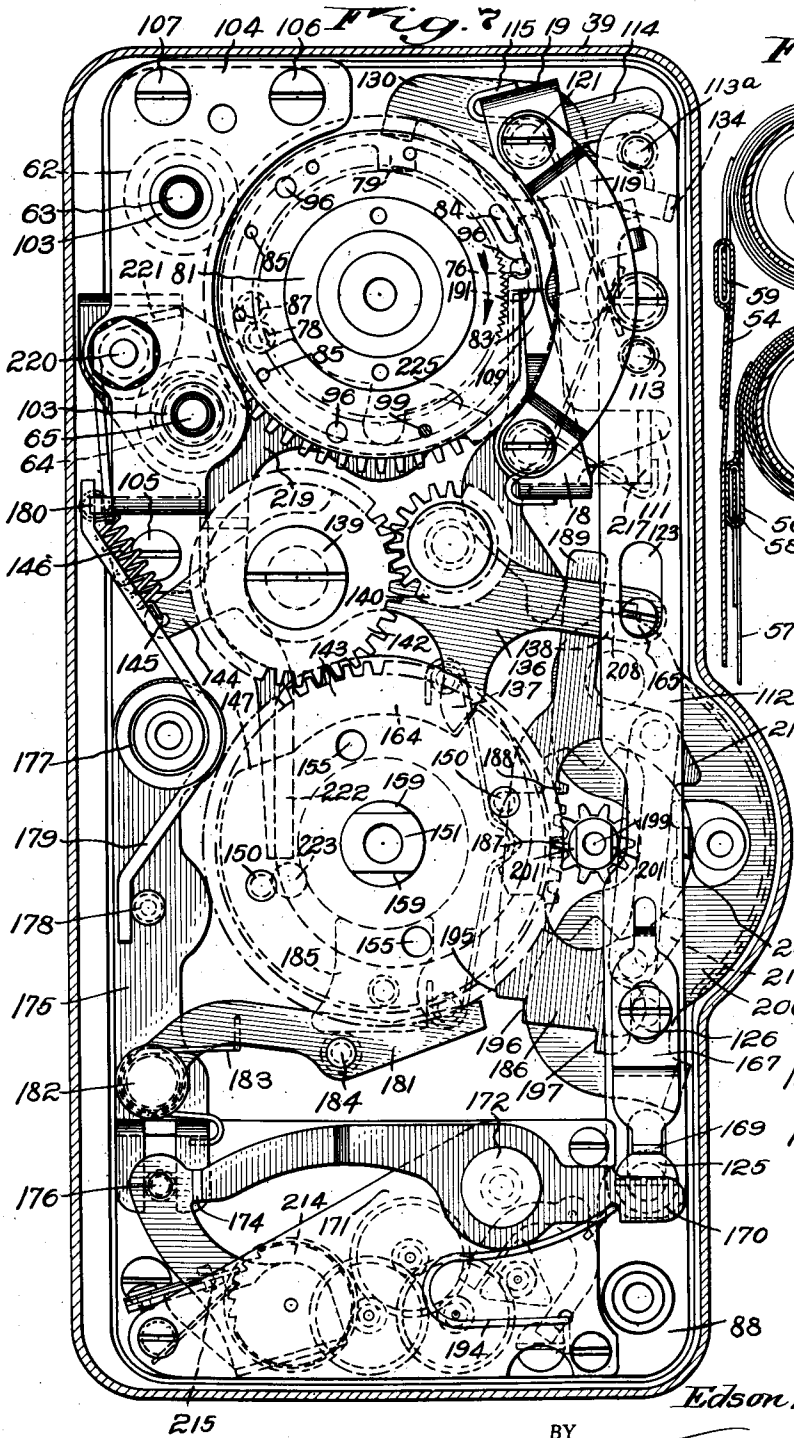


Fig. 8

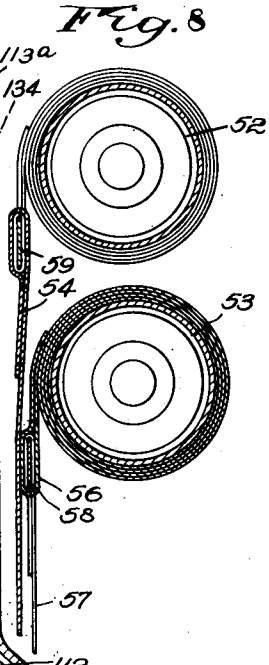
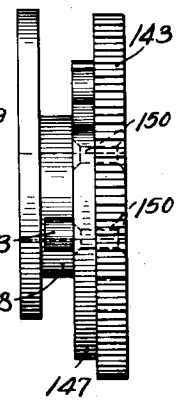


Fig. 32



INVENTOR.
Edson S. Hineline

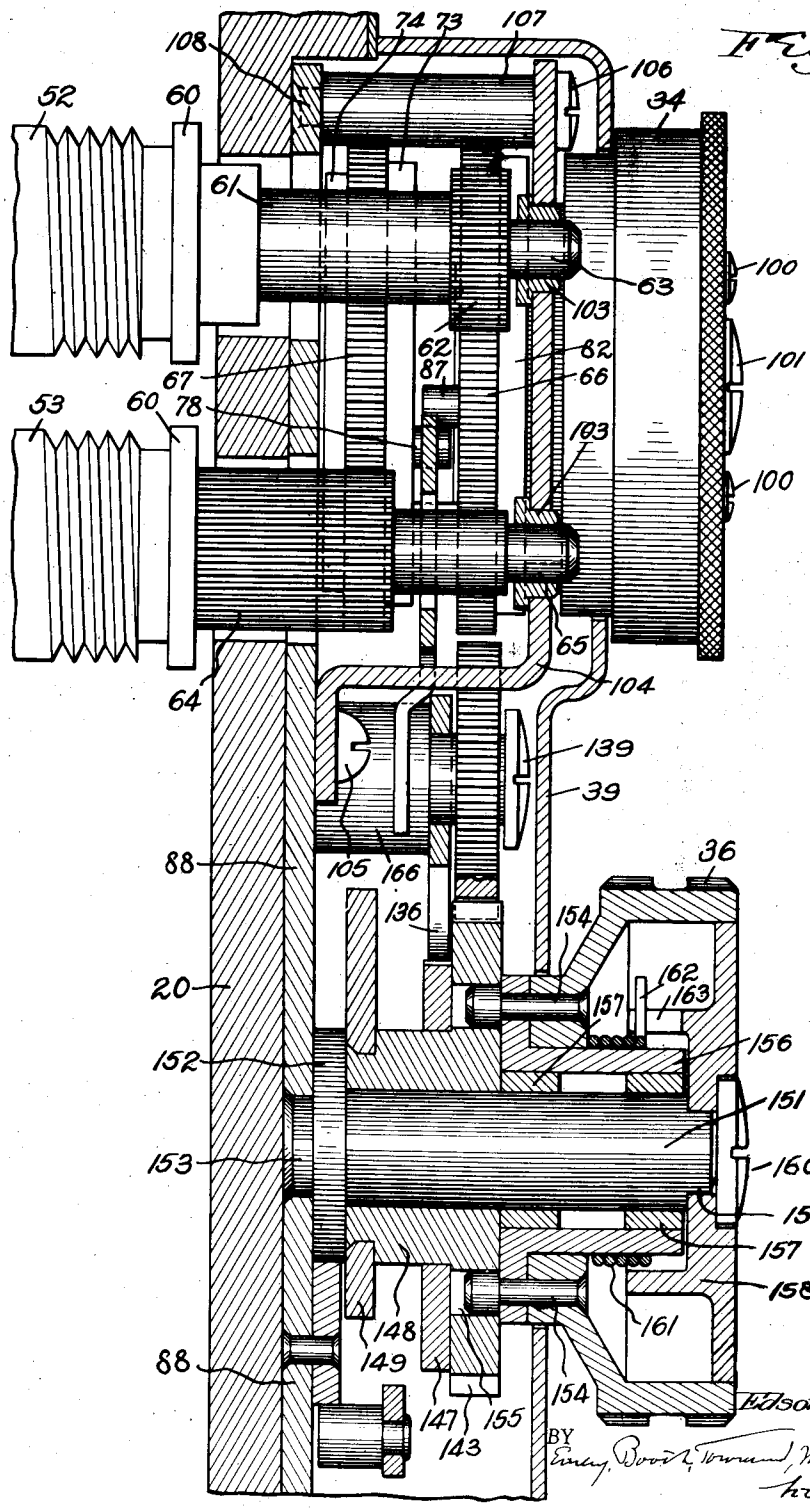
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SELF-CAPPING SHUTTER MECHANISM

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Fig. 9.



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SELF-CAPPING SHUTTER MECHANISM

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Fig. 10.

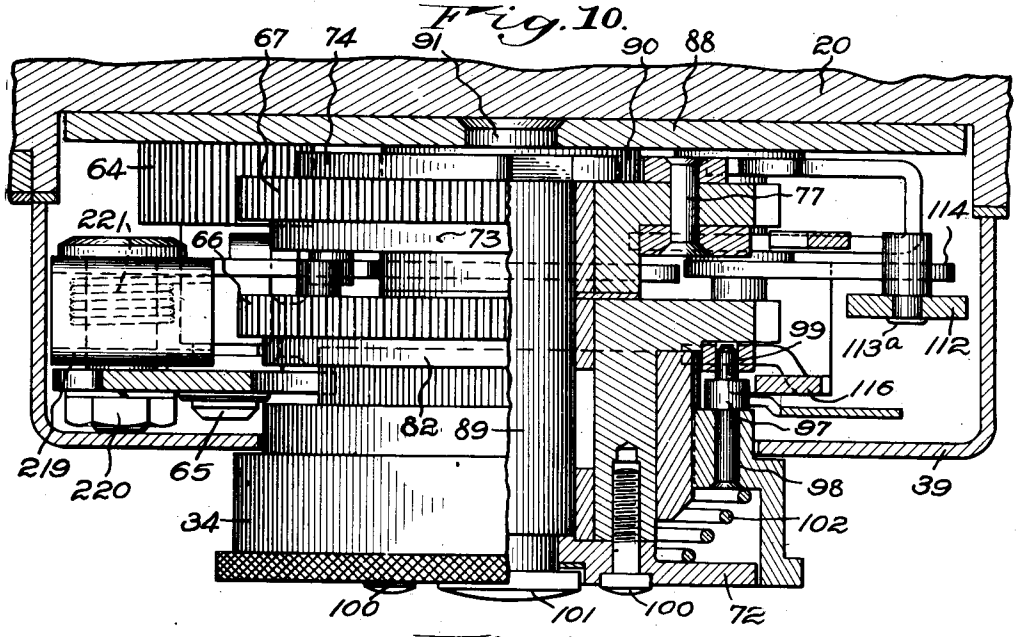
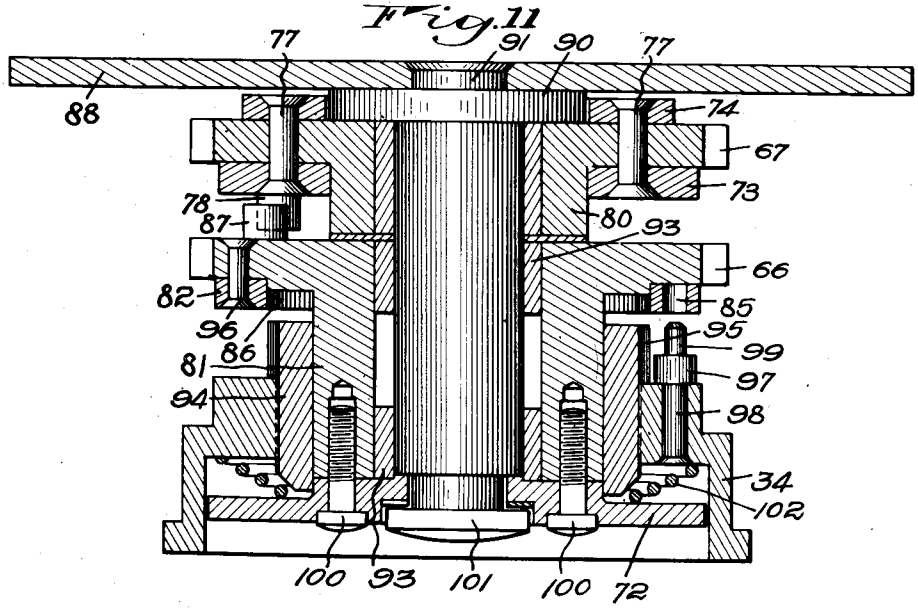


Fig. 11



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SELF-CAPPING SHUTTER MECHANISM

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Fig. 12

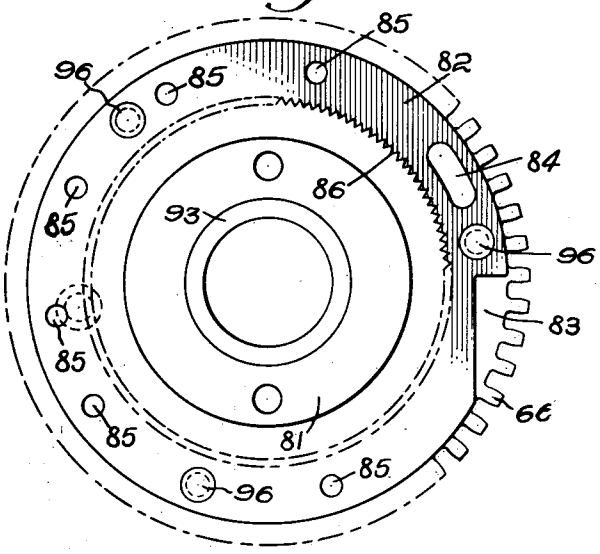


Fig. 13

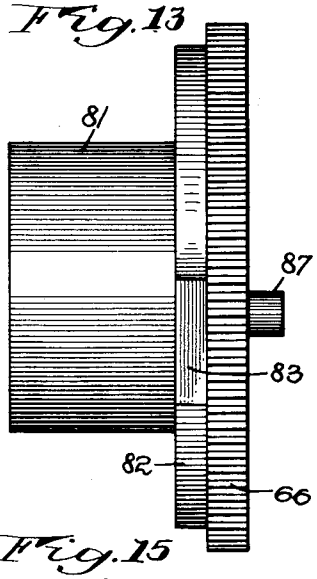


Fig. 14

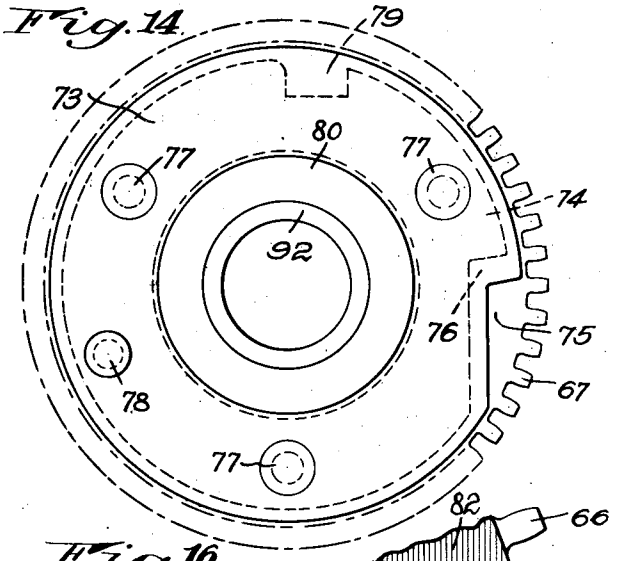


Fig. 15

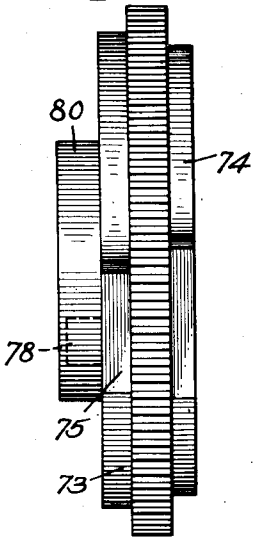
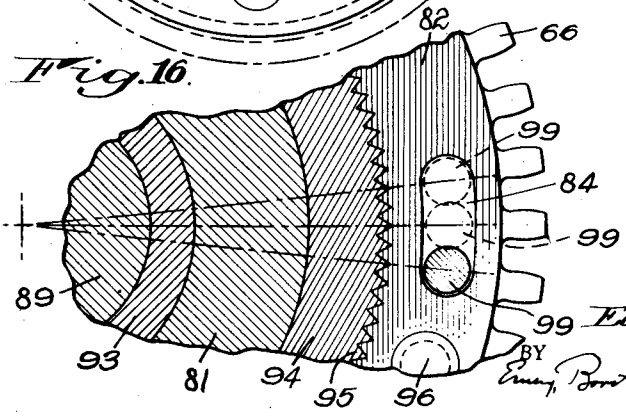


Fig. 16



INVENTOR,
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May 13, 1941. E. S. HINELINE 2,242,124

SELF-CAPPING SHUTTER MECHANISM

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Fig. 17

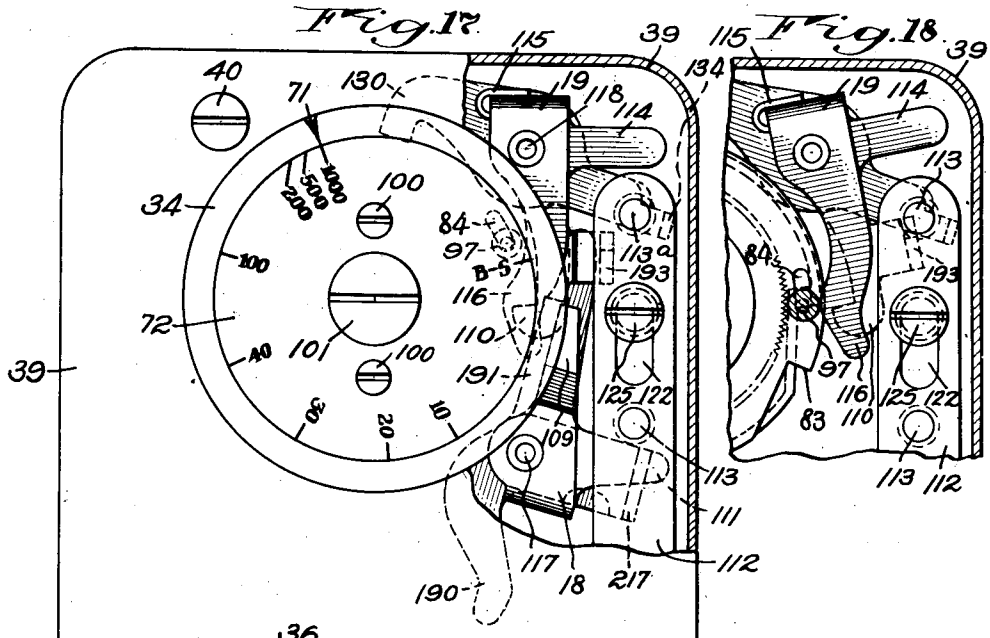


Fig. 18

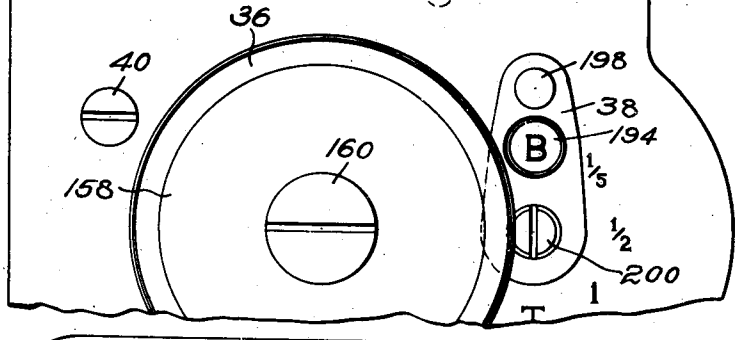
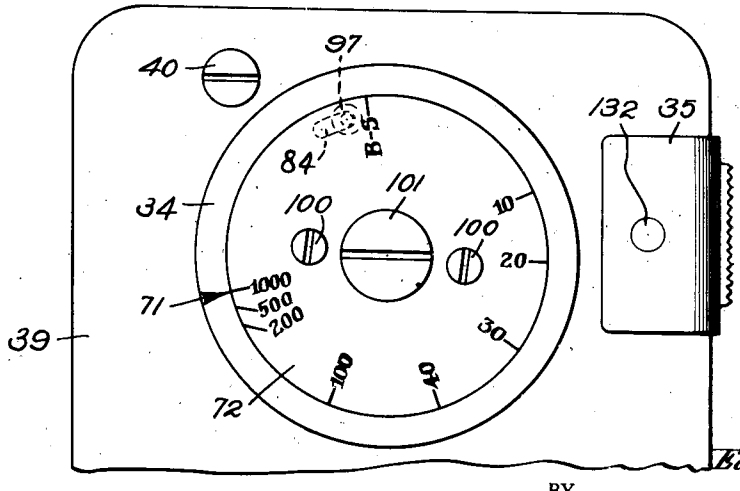


Fig. 19



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SELF-CAPPING SHUTTER MECHANISM

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Fig. 20

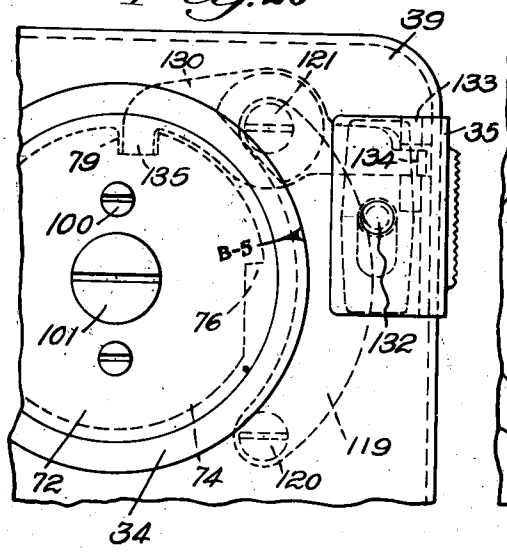


Fig. 21.

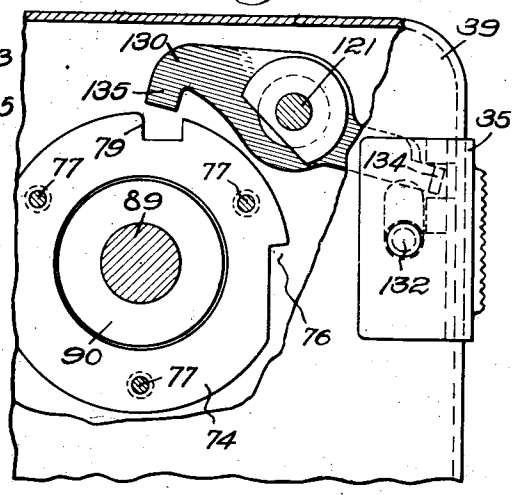


Fig. 22

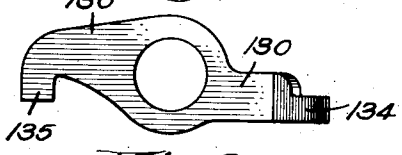


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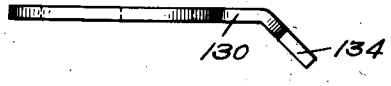


Fig. 24

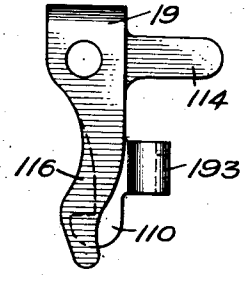


Fig. 25

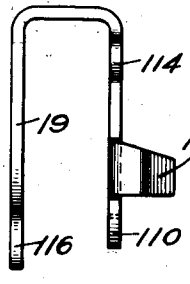


Fig. 26

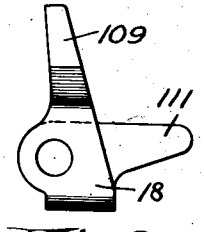


Fig. 27

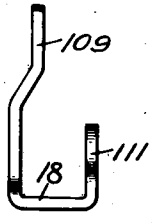


Fig. 28

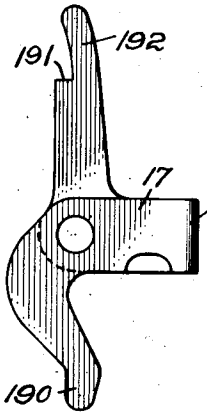
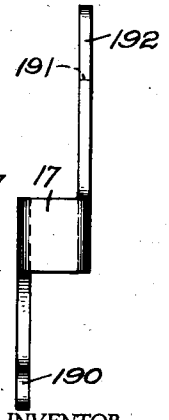


Fig. 29.



INVENTOR.
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Fig. 30

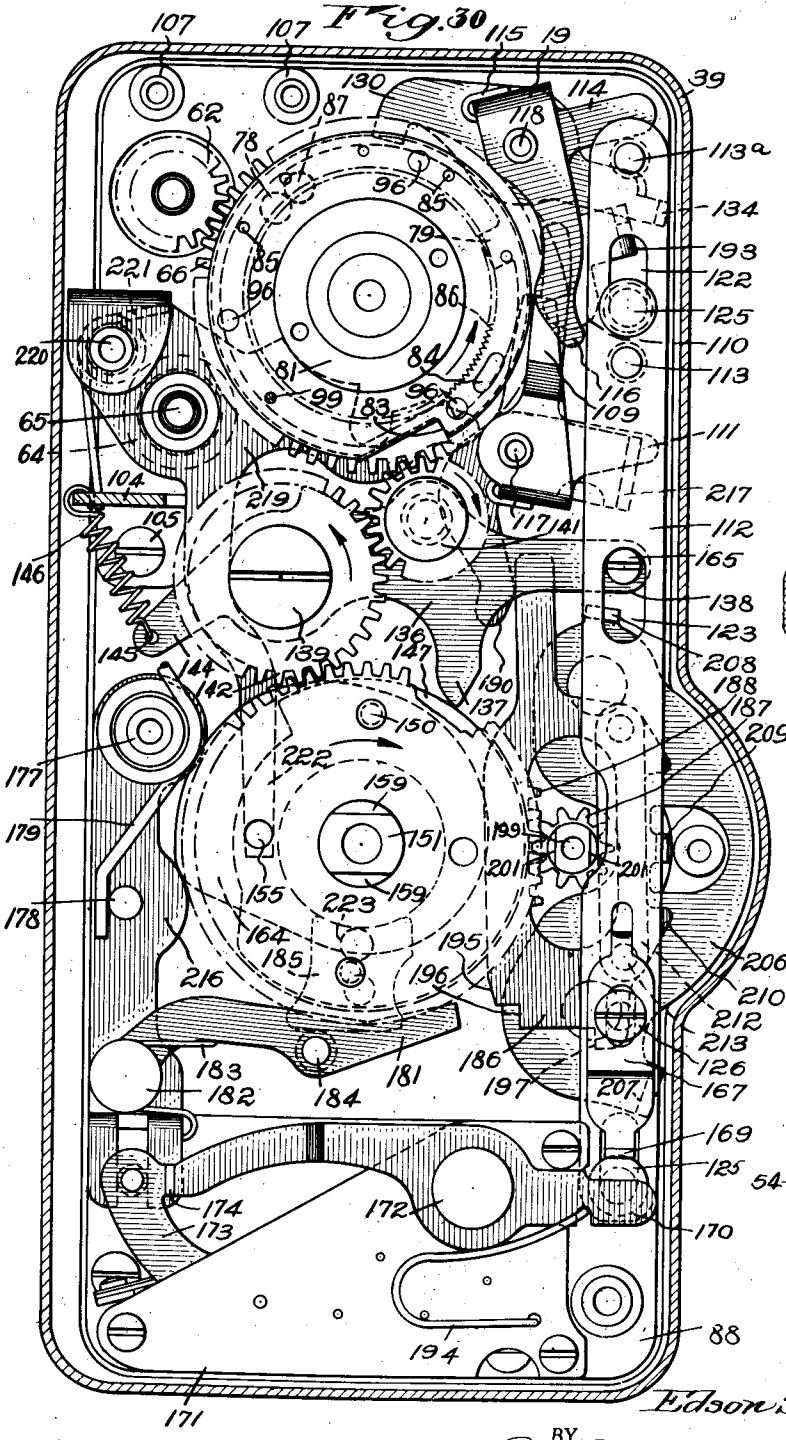
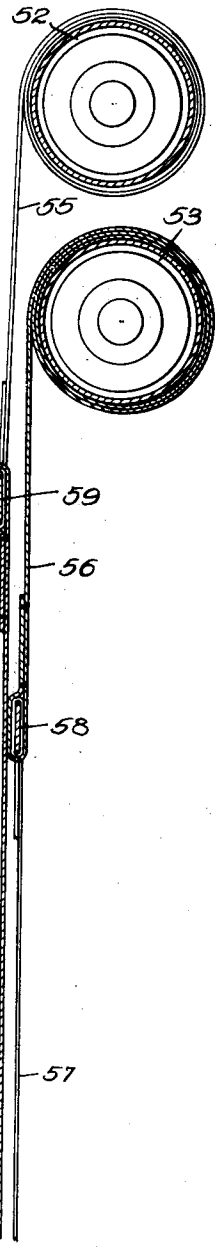


Fig. 31



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Fig. 33

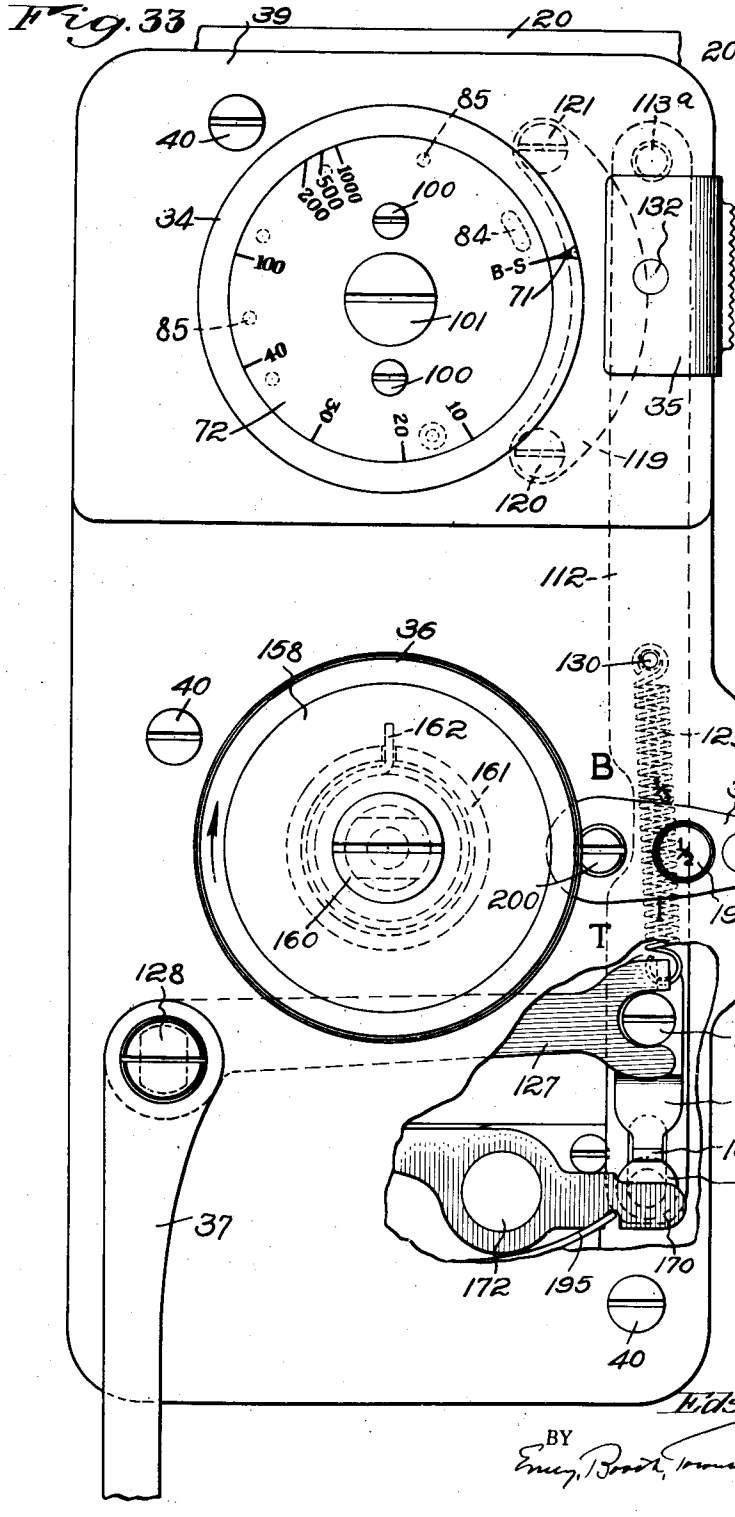
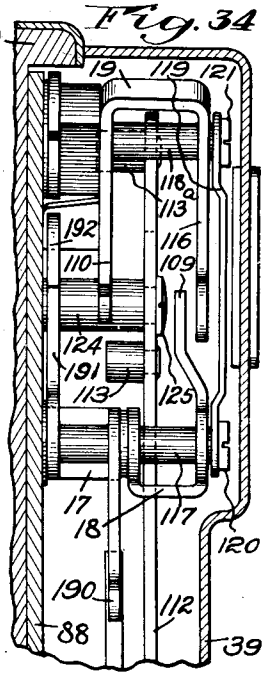


Fig. 34



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Fig. 35

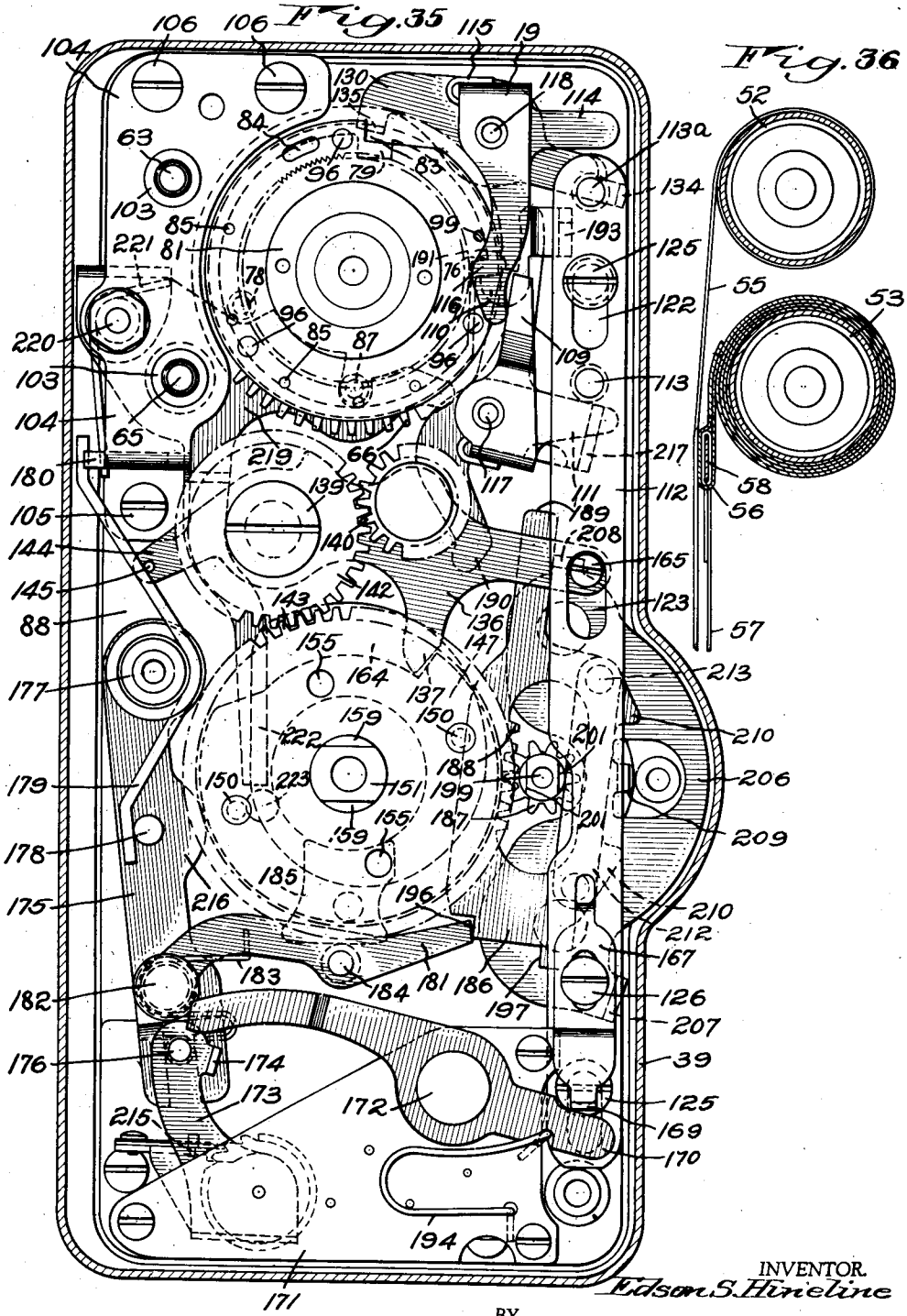


Fig. 36

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SELF-CAPPING SHUTTER MECHANISM

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Fig. 37

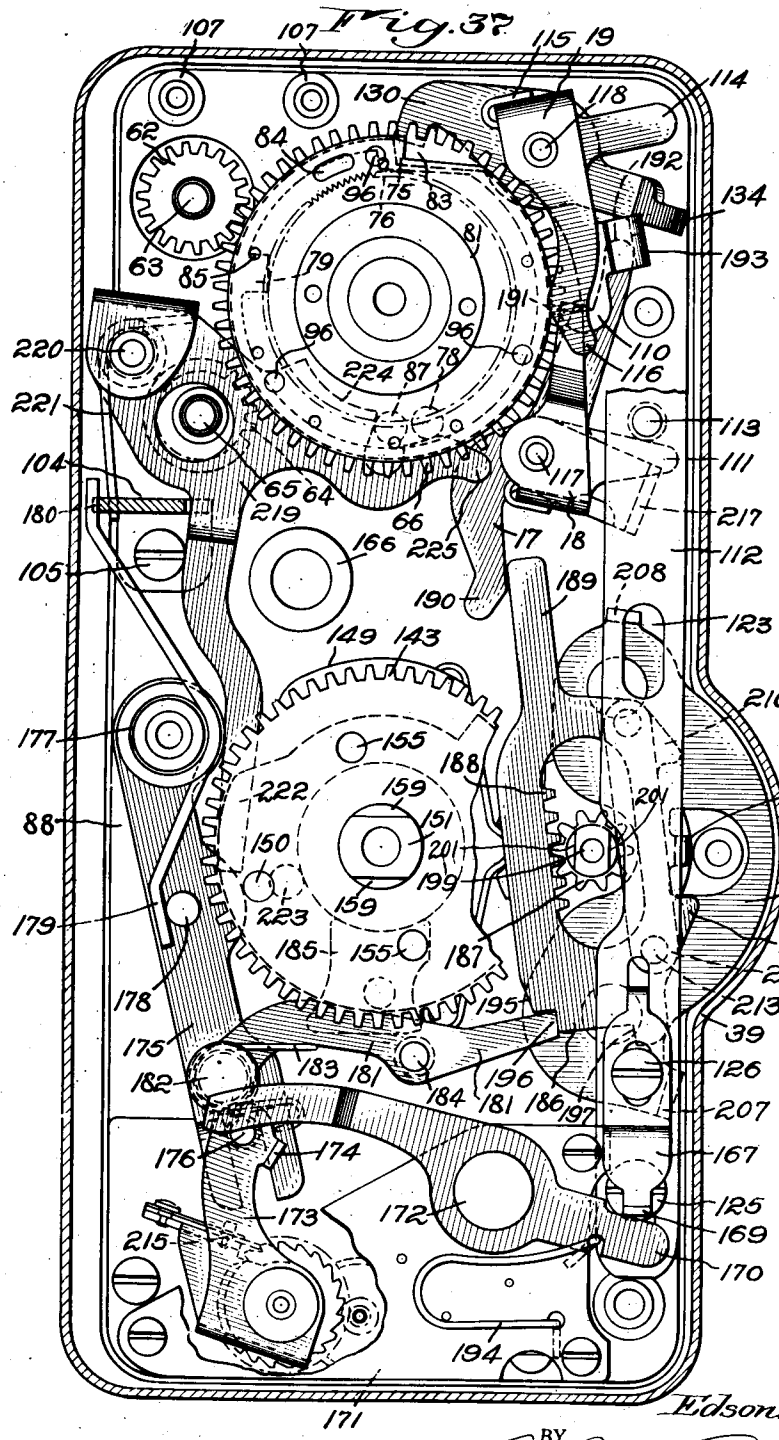


Fig. 38

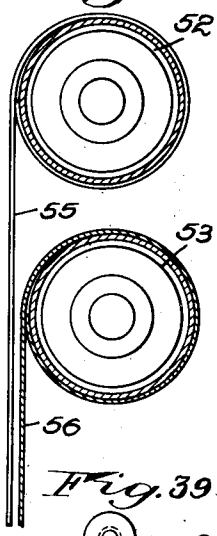
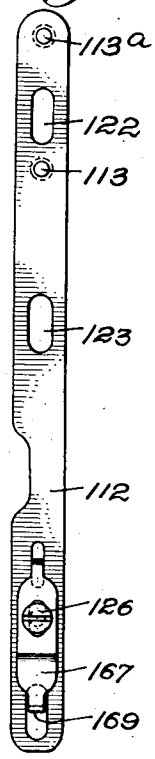


Fig. 39



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SELF-CAPPING SHUTTER MECHANISM

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Fig. 40

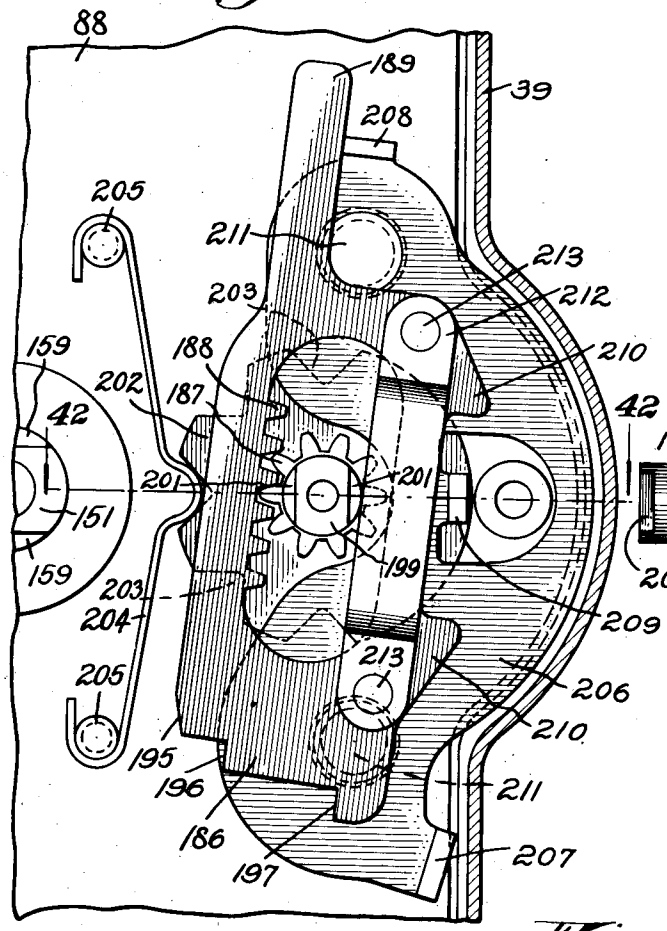


Fig. 41

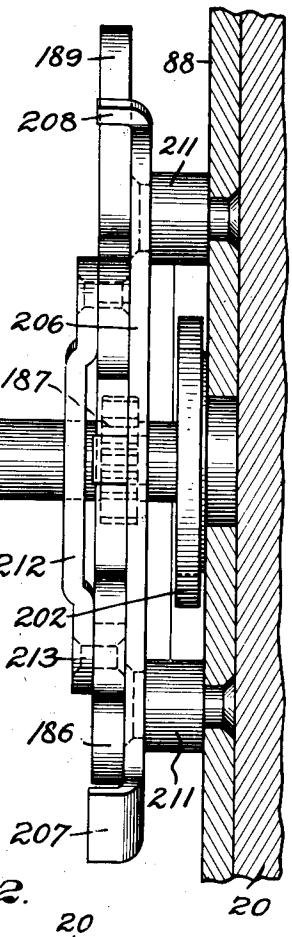
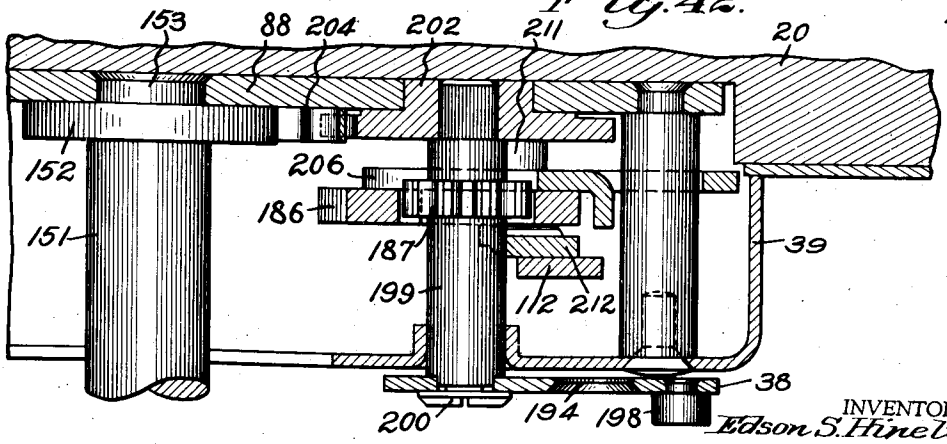


Fig. 42.



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Fig. 43

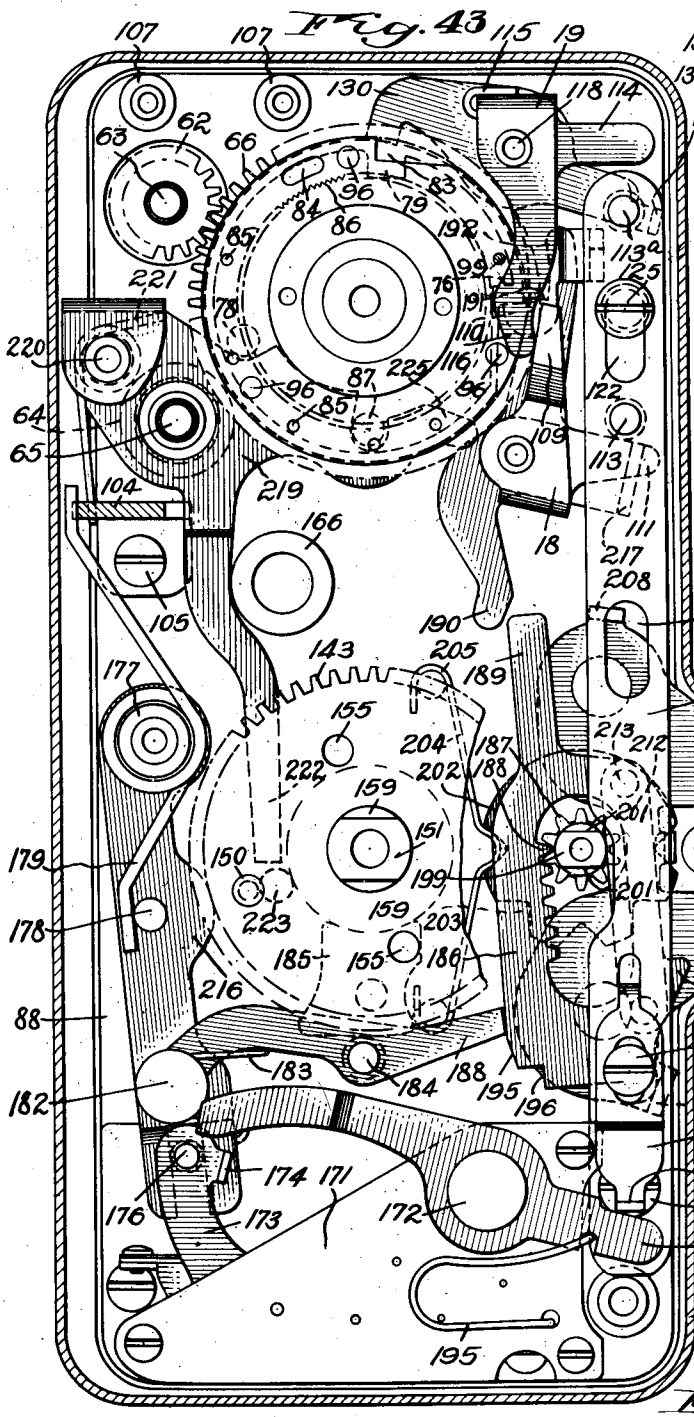
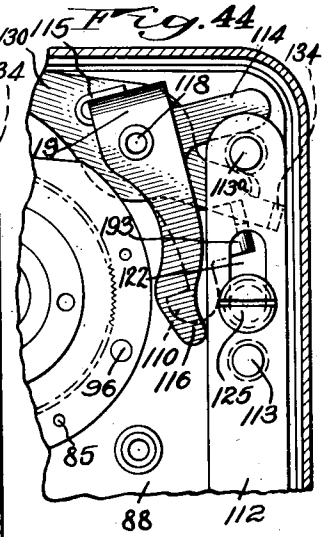


Fig. 44



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SELF-CAPPING SHUTTER MECHANISM

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Fig. 45

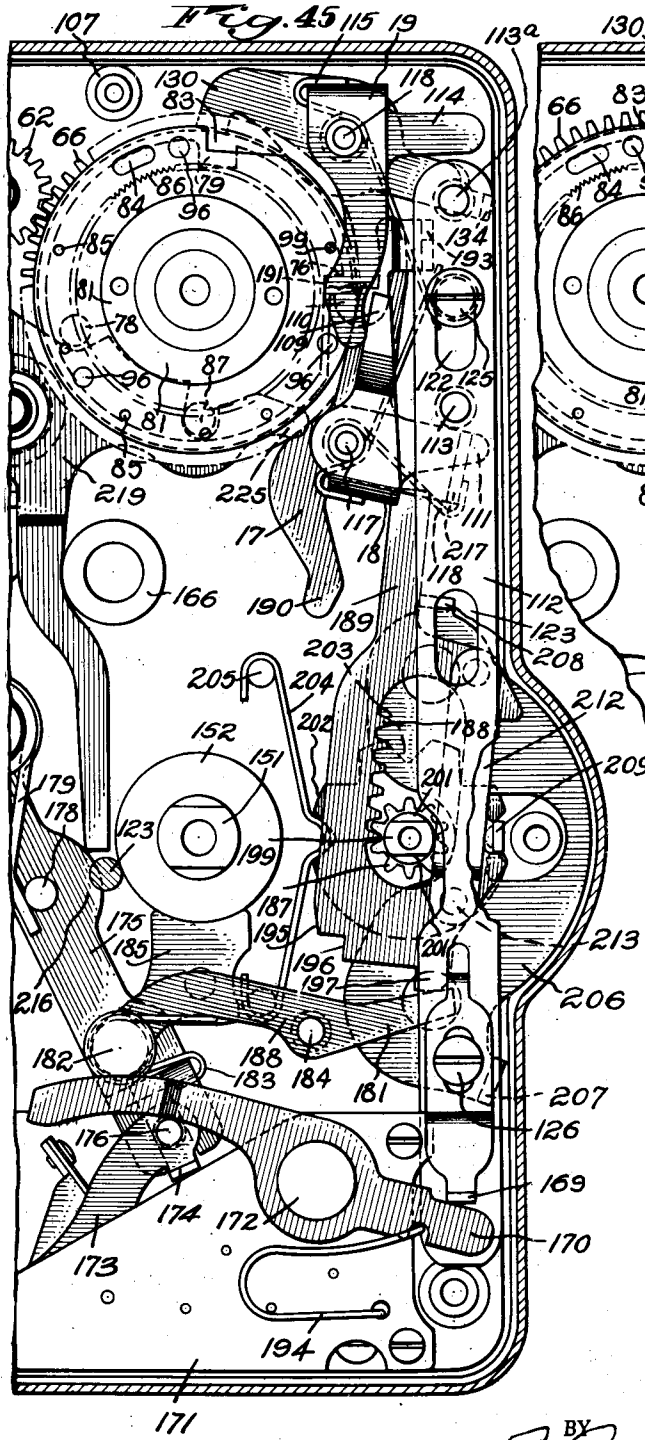
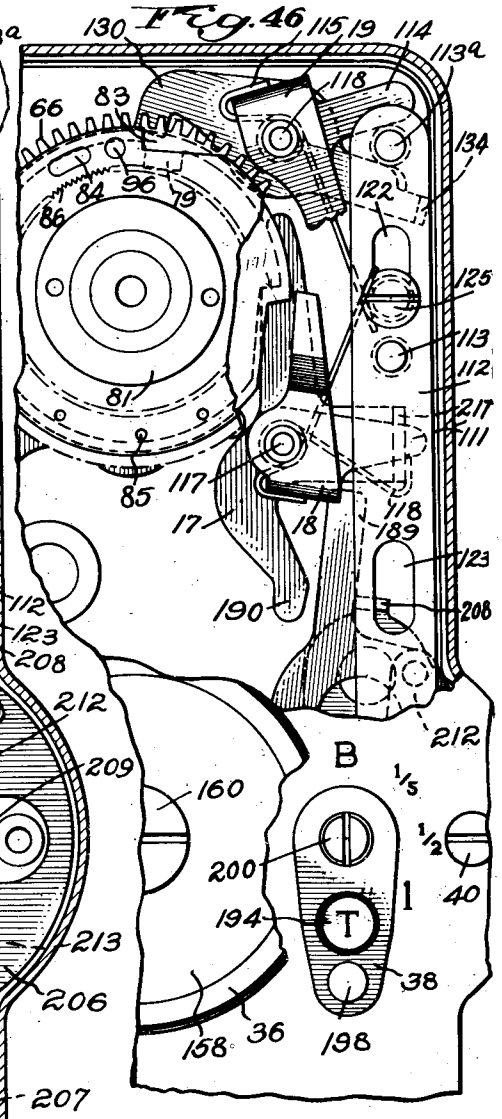


Fig. 46



INVENTOR.
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his ATTORNEYS

Patented May 13, 1941

2,242,124

UNITED STATES PATENT OFFICE

2,242,124

SELF-CAPPING SHUTTER MECHANISM

Edson S. Hineline, Rochester, N. Y., assignor to The Folmer Graflex Corporation, Rochester, N. Y., a corporation of Delaware

Application May 2, 1939, Serial No. 271,335

54 Claims. (Cl. 95—57)

This invention relates to photographic camera shutters, and particularly to self-capping shutters.

In order that the principle of the invention may be readily understood, I have disclosed a single embodiment thereof in the accompanying drawings, wherein—

Fig. 1 is a side elevation of a camera of the Speed Graphic type showing the shutter plate mounted thereon;

Fig. 2 is a detail of the curtain tension rollers, one of them being in section for clearness of illustration;

Fig. 3 is a rear elevation of the camera showing the shutter plate, shutter setting dial, winding knob, curtain rollers and curtains, the first curtain having been released and having run all the way down;

Fig. 4 is a similar fragmentary view showing the curtains wound all the way up;

Fig. 5 is a similar view to Fig. 3, but with both curtains all the way down, the first curtain being shown broken away so as to show the self-capping feature;

Fig. 6 is a view similar to Fig. 5 but with the curtains rewound, a portion of the first curtain being broken away to show the self-capping feature during rewinding;

Fig. 7 is a view of the shutter operating mechanism with the top portion of the shutter cover cut away, the shutter being fully wound and the mechanism set for instantaneous exposure;

Fig. 8 is a detail in section of the two curtain rollers just before the first curtain is released;

Fig. 9 is a vertical section through the shutter operating mechanism, show the relative positions of the several parts;

Fig. 10 is a top plan view of the shutter setting dial mechanism, with the cover plate partly cut away.

Fig. 11 is a transverse section through the shutter winding dial with the shutter operating mechanism removed;

Fig. 12 is a detail in plan of the first curtain gear assembly with the first curtain-release cam;

Fig. 13 is a side view of Fig. 12;

Fig. 14 is a detail in plan of the second curtain gear and release cams;

Fig. 15 is a side view of Fig. 14;

Fig. 16 is a detail in section through the shutter setting dial, showing the means used for obtaining narrow curtain slots;

Fig. 17 is a fragmentary elevation of the shutter cover, showing the shutter setting knob, shutter rewind knob, and slow shutter speed control, the cover being broken away to show the operating parts as having been released for an instantaneous exposure;

Fig. 18 is a detail in section showing the shutter in operation at the time the second curtain has been released.

Fig. 19 is a view similar to Fig. 17 but showing the position of the shutter winding knob after the curtain has run all the way down;

Fig. 20 is a detail of the shutter cover and shutter setting dial, showing the position in operation of the second curtain lock;

Fig. 21 is a view similar to Fig. 20, with portions of the shutter cover broken away to show the second curtain lock in released position;

Fig. 22 is a detail of the second curtain lock pawl;

Fig. 23 is an edge view of Fig. 22;

Fig. 24 is a detail of the second curtain release dog or latch;

Fig. 25 is an edge view of Fig. 24;

Fig. 26 is a detail of the first curtain release dog or lever;

Fig. 27 is an edge view of Fig. 26;

Fig. 28 is a detail of the slow shutter speed and "time" release lever;

Fig. 29 is an edge view of Fig. 28;

Fig. 30 is a vertical sectional view of the shutter plate showing the mechanism as positioned during the time of rewinding the shutter;

Fig. 31 is a detail in vertical section of the curtain rollers and curtains showing the position of the first curtain with respect to the second curtain during rewinding;

Fig. 32 is a detail in side elevation of the shutter-rewind gear together with the slow shutter speed-reset cam;

Fig. 33 is a view in side elevation of the shutter plate, showing the shutter setting dial, shutter winding knob, and slow shutter speed adjusting arm, the shutter release bar being shown in dotted lines, and a broken away portion of the shutter cover showing the connection between the shutter release lever and the shutter release bar;

Fig. 34 is a vertical sectional view of part of Fig. 33 with part of the cover broken away to show the position of certain levers;

Fig. 35 is a vertical sectional view of the shutter mechanism with the top of the cover cut away to show the mechanism at the time a slow shutter speed exposure is being made;

Fig. 36 is a detail in vertical section similar to Fig. 8, but wherein the first curtain has been released and has run all the way down;

Fig. 37 is a vertical sectional view similar to Fig. 35, but wherein the second curtain has been released by the slow speed mechanism;

Fig. 38 is a detail in vertical section but similar to Fig. 8, with both curtains shown as run all the way down;

Fig. 39 is a detail of a shutter releaser bar;

Fig. 40 is a detail partly in vertical section of the slow shutter speed "time" and bulb selecting mechanism;

Fig. 41 is a vertical section through Fig. 40 showing the positions of the various parts;

Fig. 42 is a section of Fig. 40 on the line 42—42 thereof;

Fig. 43 is a vertical sectional view of the shutter mechanism with the shutter cover plate removed to show the position of parts during the first part of a bulb exposure;

Fig. 44 is a detail in vertical section, similar to a part of Fig. 43, but showing the position of the parts during the second part of a bulb exposure;

Fig. 45 is a vertical sectional view of the shutter mechanism with the top of the shutter cover cut away and certain of the parts removed to show more clearly mechanism that would normally be hidden by such parts, the mechanism being in the position of a time exposure, and the first curtain having been released; and

Fig. 46 is a view similar to Fig. 45, with a part of the shutter cover cut away and some of the parts removed, the position of the mechanism being that at the time of the releasing of the exposure lever, and the first cycle of the time exposure showing the parts in position to be released upon the next operation of the exposure lever, thereby dropping the second curtain.

This invention relates to a new type of photographic camera shutter particularly adapted to but not limited to cameras of the Graphic and Graflex type wherein a self-capping shutter is provided having shutter speeds from .001 second to one second or longer, and also having bulb exposures and time exposures. The shutter has, in accordance with the invention, also been provided with means whereby it can be set for any predetermined shutter speed, and by a simple manipulation one of the curtains can be dropped for focusing or can be locked in this position when the front shutter is being used as on the Speed Graphic type camera. Thereupon by relasing the locking means and actuating the shutter release lever to close the second curtain, the shutter can then be restored to set position and be ready for use. The shutter speed that had been previously selected will follow upon shutter operation or, if the operator changes his mind, it is possible for him to reset to any other shutter speed. The shutter is provided with a number of interlocks making the operation of the shutter absolutely foolproof, as, for instance, if the shutter were set for "time" exposure, and upon the pressure of the shutter release lever, the first curtain would be allowed to drop. The shutter cannot again be rewound until the second curtain is also dropped. Therefore, the operator knows at all times the condition of the shutter mechanism with respect to its exposure cycle. Exposure cannot be made until the shutter is all the way rewound; that is, the shutter could not be partly wound and then the exposure lever pressed to release the curtain which would cause the loss of an exposure. This is automatically taken care of in this mechanism which will be more fully disclosed hereinafter. The shutter is provided with automatic means for winding the slow shutter speed mechanism simultaneously with the rewinding of the shutter. Moreover the shutter is of simple construction, and is such that all of the related parts can be made very rugged which assures a long life of shutter operating mechanism. The shutter herein disclosed can readily be applied to cameras of the roll film type wherein the film would be advanced at the same time the shutter is rewound.

I will now, without limiting my invention thereto, describe a preferred embodiment of a camera structure incorporating my new self-capping focal plane shutter. I have selected the Speed Graphic type of camera for the purpose of this disclosure, but I do not limit the application of this shutter to cameras of such type. As will be readily understood from the following description, this type of shutter is particularly suited for many other types of cameras, as, for instance, the reflex type wherein a mirror intercepts the light rays from the lens and projects them on a ground glass. It can equally well be used on cameras of the roll film type.

Referring first to Figs. 1 to 6, Fig. 1 represents in right side elevation a photographic camera having a camera body **20**, camera bellows **21**, camera bed **22**, front standard **23**, between-the-lens shutter **24**, lens **25**, sliding track **26**, sliding track guide **27**, camera bed support **28**, focusing knob **29**, bed hinge **30**, view finder **31**, camera back **32**, ground glass screen frame **33**, shutter setting dial **34**, shutter locking slide **35**, shutter winding knob **36**, shutter release lever **37**, slow shutter speed control **38**, shutter cover **39** held to the camera box with screws **40**, **40**, and curtain roller bearing plate **41** more fully disclosed in Fig. 2. The said parts may be of any suitable or usual construction, as my invention is not limited thereto, though cooperating therewith.

Fig. 2 shows the curtain tensioning rollers, namely, the first curtain roller **43** and the second curtain roller **42**. Curtain roller **42** is shown in section so as clearly to show curtain roller shaft **44**, curtain roller shaft bearing **45**, curtain roller flange **46**, curtain roller bearing **47** and curtain roller spring **48**. The curtain roller flange **46** is screwed into curtain roller **42** as clearly shown in Fig. 2 and is provided with a slot **49** into which an extended end of spring **48** fits. When flange **46** is screwed into curtain roller **42**, spring **48** is thereby locked to curtain roller **42**. The opposite end of spring **48** is anchored to shaft **44** through a hole **50** in said shaft, which is also provided with a slot **50***a* for adjusting spring **48** of curtain rollers **42** and **43**. Said rollers **42** and **43** are provided with curtains more clearly shown in Figs. 3 and 4. The camera is also provided with first-curtain take-up roller **52** and second-curtain take-up roller **53**, shown in Fig. 8 and elsewhere. The curtain used in this shutter are preferably of a familiar structure wherein each curtain is provided with ribbons. The curtain take-up roller in one instance is attached to the tension roll and the ribbons are attached to the take-up roll. In this instance, the body part of the first curtain **54** is attached to first-curtain tension roller **43** and the ribbons **55**, **55** are attached to the first curtain take-up roller **52**. The second curtain **56** is attached to take-up roller **53**, as clearly shown in Fig. 5. Curtain **56** is also provided with ribbons **57**, more clearly shown in Fig. 3, which are

attached to curtain tension roller 42. It will be seen from this description and illustration that the two curtains are independent of each other, each being provided with its own tension roller and its own take-up roll. The operation of these curtains will be more fully disclosed presently.

Curtains 54 and 56, best shown in Figs. 3, 4, 5 and 6, are respectively provided at one end with struts 58, 59, clearly shown in section in Fig. 8. These struts are provided to stiffen the curtains at their leading edges, and they also provide means for attaching curtain ribbons, as clearly shown in Fig. 8. In Fig 7 is shown the shutter mechanism as it would appear with the shutter cover removed or the outer portions cut away. The operation of this mechanism will be set.forth in detail presently.

Referring next to Fig. 9, which is a section through shutter mechanism showing the curtain take-up rolls 52 and 53 provided with flanges 60—60, it will be evident that first curtain roller 52 is provided with a stub shaft 61 and a pinion 62 with an extended spindle end 63. The second curtain 53 is provided with a stub pinion 64 and an extended spindle end 65. The pinion 62 meshes with the first curtain gear 66 and pinion 64 meshes with second curtain gear 67. The spindle ends 63 and 65 run in bushings 103, 103 in plate 104, which is fastened to shutter plate 88 with screw 105 and screw 106 in spacer 107, 107 which is riveted to shutter plate 88 at 108, as shown in dotted lines. The opposite end of each of the curtain rollers 52 and 53 are provided with flanged bushings 70, 70, shown in Figs. 3 and 4, which screw into curtain rollers 52 and 53, provided with holes for shafts 51, 51. Said shafts 51, 51 are supported in plate 69 on the left side of the camera as the same is viewed in Fig. 3. It will readily be seen that any motion of curtain roller 52 or 53 will cause curtain 56 or ribbons 55 to be wound up or let down. The operation of these curtains for an instantaneous exposure is as follows:

It will be assumed that both curtains are wound up on curtain rollers 52 and 53 as shown in Fig. 4, and that shutter setting dial 34 is in position as shown in Fig. 17, with index 71 in alignment with shutter speed 1000 on shutter speed dial 72. The mechanism of the shutter plate will now be positioned as in Fig. 7 and the curtains will be positioned as shown in Fig. 8.

Again referring to Fig. 9, the gear 67 carries an upper cam plate 73 and a lower cam plate 74. These cams are clearly shown in Figs. 14 and 15. Cam 73 has a notch 75 and cam 74, shown in dotted lines, has a notch 76. Cams 73 and 74 are attached to gear 67 by rivets 77, 77. Cam 73 also is provided with a pin 78 shown in Fig. 14, and in dotted lines in Fig. 15. Cam 74 is provided with a cut-out portion 79, shown in dotted lines in Fig. 14. The gear 67 is also provided with a hub 80, clearly shown in Figs. 14 and 15.

Referring to Figs. 9, 12 and 13, it will be observed that gear 66 is provided with a hub 81 and a cam plate 82 with notched out portion 83, elongated slot 84, and a series of index holes 85, 85. The inner portion of cam plate 82 is provided with a number of teeth 86, best shown in Figs. 12 and 16, the purpose of which will be more fully described presently. Gear 66 is also provided with a pin 87. The position and relative location of gears 66 and 67 is clearly shown in Figs. 10 and 11 wherein the shutter plate 88 with stud 89 is provided with a collar 90 and an extended portion 91 which is riveted into said plate 88. Gear 67 is provided with a bushing 92 and gear 66 is provided with two bushings 93, 93. It will be seen that gear assemblies 66 and 67 are free to rotate upon said stud 89. Assembled to gear 66 and free to turn thereon is a sleeve 94 provided with teeth 95 for engagement with teeth 86 in cam plate 82, as shown in Fig. 16, which shows that cam plate 82 is riveted to gear 66 with rivets 96, 96.

Sleeve 94 has fitted thereto the shutter setting knob or dial 34, as shown in Fig. 11. Attached to shutter setting knob 34 is a shoulder stud 97 having a rivet end 98 and a dowel end 99. Sleeve 94 and knob 34 constitute an assembly that is free to slide upon hub 81 of gear 66 (best shown in Fig. 13) and is prevented from being removed from hub 81 by shutter dial plate 72 attached to sleeve 81 with screws 100, 100. This assembly is prevented from being removed from shaft 66 by shoulder screw 101. The shutter setting dial assembly 34 with sleeve 94 is caused to move toward gear 66 under the influence of conical spring 102 engaging the teeth 95 of sleeve 94 with the teeth 86 of cam plate 82. The position of engagement is governed by shoulder stud 97 and dowel 99 engaging one of the several index holes 85 in the said plate 82. It will be noted that dowel 99 can be engaged with any one of the index holes 85 in plate 82, and gear teeth 86 and 95 are so spaced as to be in alignment at this time. To obtain a finer adjustment of dowel 99 with respect to plate 82, which is necessary on the narrower curtain openings (that is, for exposure of 1000, 750, etc.), inasmuch as the space of the ordinary index holes 85 is too great to allow the proper curtain adjustment, I have elected to employ the plan of using teeth 86 in plate 82 and teeth 95 in sleeve 94, which permit me to get a very slight dispersion for the settings of the narrow apertures. The first three apertures (that is, the narrowest of the three) function when dowel 99 enters slot 84 of plate 82. To get accurate settings on the rest of the speeds the dowel holes have been placed as shown in proper relation around plate 82 to engage other than the narrow openings. However, the teeth also engage, but the position in which the teeth engage is governed by holes 85 in plate 82. Therefore, it is not necessary to make a definite line to line setting between the shutter setting dial and the shutter index plate. This is a very clearly indicated in Fig. 16 wherein dowel 99, shown in section, is in position for one of the narrow slot openings, and it is shown in dotted lines for two other of the narrow openings.

As previously stated, all the shutter mechanism is now in position as shown in Fig. 7 ready to make an instantaneous exposure providing the dial has been set to one of the instantaneous exposures, as, for instance, in Fig. 17, where it is set for .001 second. Curtain roller 52 and curtain roller 53 tend to turn in a contraclockwise direction under tension of curtains 54, 56 and tension rollers 42, 43, but they are prevented from turning because of pinions 62, 64 meshing with gears 67 and 66 which are held in position by their respective cam plates and dogs which will now be described.

Referring now to Fig. 7, gear 66, which is the first curtain gear, is prevented from turning because of dog 109 engaging notch 83 in cam plate 82. Gear 66 also carries a pin 87 which is in the path of pin 78 of gear 67, thus preventing gear 67 from turning. If dog 109 is withdrawn from notch 83, the gear 66 is free to turn, thus allow-

ing first curtain roller 52 to revolve in a contra-clockwise direction. Gear 67 also would revolve if it were not restrained by dog 110 engaging notch 75 in cam plate 73 of gear 67, as clearly shown in Fig. 17. The dog 109 is clearly shown in detail in Fig. 26. As there shown, it has a projecting arm 111. Mounted on the shutter plate is a sliding bar 112 with a pin 113 (best shown in detail in Fig. 39 and also shown in Fig. 7). If bar 112 were pulled downward, said pin 113 would engage said arm 111, withdrawing dog 109 from notch 83, thus allowing gear 66 to revolve in the direction of the arrow adjacent thereto in Fig. 7. On the upper end of said bar 112 is a second pin 113a, which will also move downward on downward movement of bar 112. Dog 110 (clearly shown in detail in Figs. 24 and 25) has an extending arm 114. Said dog 110 is normally caused to move inward under the influence of spring 115 (shown in Figs. 37, 43, 44 and elsewhere) so as to engage notch 75 in cam plate 73 of gear 67. When the bar 112 is pulled downward, the dog 110 is allowed to move, engaging with notch 75 just before the dog 109 is caused to be disengaged from notch face 83, thus holding gear 67 from rotating but allowing gear 66 to rotate carrying with it the shutter-setting dial-knob 34 and the shoulder stud 97 previously referred to. Said shoulder stud 97 then engages a lip 116 constituting part of dog 110, causing said dog 110 to be withdrawn from notch 75 and thus allowing the second curtain to travel in a downward direction. This action is very clearly shown in Figs. 17 and 18.

Said dog 109 with its extending arm 111 rides upon pin 117 and dog 110 with its extending arm 116 rides upon pin 118. Pin 117 and pin 118 are riveted into shutter plate 88. Connecting pins 117 and 118, and thereby supporting them, in a bar 119 fastened to pin 117 with screw 120 and to pin 118 with screw 121. This structure is most clearly shown in Fig. 34. Sliding bar 112, as above stated, is most clearly shown in detail in Fig. 39, where it is shown as having slots 122 and 123. Said bar 112 is attached to the shutter plate 88 through shoulder studs 124, 124 with shoulder screws 125, 125. This structure is most clearly shown in Fig. 34, the upper stud and screw only being shown. The second stud 124 is at the lower part of the shutter plate 88 not shown in this view. Said bar 112 has attached thereto a screw stud 126 which engages an arm 127 (best shown in Fig. 33) and which in turn is keyed to the shutter release lever 37 and the whole is attached to the shutter mechanism cover by screw 128. Bar 112 is caused to be returned to its normal position by coiled spring 129 through a connection with arm 127 and a pin 130 on the shutter cover, all as most clearly shown in Fig. 33.

The foregoing description fully explains how the instantaneous exposures are obtained in this embodiment of my invention. The proper operating sequences of the "bulb," "slow shutter speed" and "time" settings together with the description of the manner of restoring the shutter to the "set" position will next be set forth.

It is most desirable in a shutter of this class to be able to drop the first curtain, so as to provide a means for focusing, also a means to lock the first curtain down to prevent the second curtain from being closed and to prevent rewinding when the front shutter is used. This is a condition that maintains frequently in a camera used in press photography. There are times when only the front shutter is wanted for use and at that time, of course, the back shutter must be in a fully open condition.

In shutter mechanism herein disclosed and which is merely the selected embodiment of the invention, I have provided novel means of accomplishing this. It is further desirable to have a ready means of opening the back shutter for focusing and then permitting the restoring of the shutter mechanism to a pre-set condition, that is, for instance, where it had been determined that an exposure would be made at 1/600 second. To reduce the time interval to an absolute minimum between the time of focusing and time of making the exposure itself, it is desirable to pre-set the shutter speed and to be able to open the shutter for focusing and to close the shutter and then to wind the shutter, and thus be ready for an exposure at a pre-selected shutter speed. This is also provided for in and by my invention herein disclosed in its preferred form. The operation of this part of the mechanism is as follows:

The cam plate 74 (best shown in Figs. 20 and 21) is provided with a notch 79 which is in the position shown in Fig. 20 when the shutter is fully wound. Pivoted on pin 118 (most clearly shown in Fig. 34) is a dog lever 130, clearly shown in Figs. 20, 21, 22 and 23. Attached to the cover plate 39 is the sliding member 35, previously referred to as the shutter locking slide, and which is secured to an L shaped sliding member 131 on the inside of the shutter cover (shown in dotted lines Figs. 20 and 21) by means of a shoulder screw 132. On the lower end of member 131 is a forked portion 133 which engages a tongue 134 of said dog lever 130. Said lever 130 is thereby caused to move in or out of engagement with the notch 79, according to the direction of movement of sliding member 35. If, for instance, I have selected an exposure of 1/600 second and have moved sliding member 35 upward, the dog 135 of lever 130 would engage notch 79 of cam plate 74, thereby preventing any movement of that cam plate, which in turn would prevent any movement of the second curtain, as has previously been explained. Then upon pressure of release lever 37, the first curtain would be allowed to open, and the second curtain would be prevented from moving, thereby causing an open condition of the back shutter. The shutter cannot be further operated at this time because an additional pressure on member 37 would have no effect. Neither could the shutter be rewound because of means hereinafter disclosed. It is necessary, therefore, to push said member 35 in a downward direction, unlocking the cam plate 74. The curtain would therefore remain open until lever 37 is again pushed, which would allow the shutter to close. Then upon rewinding the shutter, the mechanism would be restored and in the proper exposure setting previously selected.

I will now explain how the shutter is rewound or restored to the "set" position.

Referring to Fig. 30, therein is shown about mid-length thereof, an arm 136 having a projecting lip 137, and an extending arm 138, said arm 136 being pivoted on shoulder screw 139. Attached to said arm 136 is an idler gear 140 secured to said arm by shoulder rivet 141. Meshing with gear 140 is a second idler gear 142 which itself meshes with winding gear 143. Said arm 136 has an extending portion 144 having a hole 145 into which coiled spring 146 is hooked. The opposite end of spring 146 is hooked into plate 104. It will be noted that spring 146 tends to

keep the extended portion 137 of arm 136 riding on a cam face 147. The construction of winding gear 143 with cam 147 is clearly shown in detail in Fig. 32, wherein gear 143 is shown as having a hub 148, a rewind cam 147, and a slow shutter speed rewind cam 149. Said cam 147 is riveted to said gear 143 with rivets 150 shown in dotted lines in Fig. 32. Said cam 149 is staked or otherwise secured to hub 148. This construction is most clearly shown in Fig. 9.

This assembly is free to turn in a clockwise direction only, on a shaft 151 having a shoulder 152 and an extending portion 153 which is riveted into the shutter plate 88. This assembly is turned by winding knob 36 which is provided with two dowel rivets 154, 154 engaging holes 155, 155 in the gear 143. The dowels 154 are provided with extended ends which are also used as rivets to rivet a sleeve or bushing 156 to said winding knob 36. The sleeve 156 is provided with bushings 157, 157 which turn on shaft 151. The knob 36 is also provided with a cover plate 158 which is keyed to shaft 151 which has milled ends 159, and said cover plate 158 is provided with an opening to fit over these milled ends and is held stationary thereon by a large head screw 160. Wrapped around bushing 156 in a contraclockwise direction viewed from the top of the shaft 151 is a spring 161 having an extended end 162 engaging with a slot 163 of the cover plate 158. This construction allows knob 36 to be turned only in a clockwise direction. When knob 36 is turned in a clockwise direction, the extending portion 162 of spring 161 is held stationary in slot 163 of said cover plate 158. The sleeve or bushing 156 is turned in a clockwise direction with knob 36 which movement tends to open up spring 161, allowing it to turn freely on bushing 156. If knob 36 were turned in a contraclockwise direction, said spring 161 would wrap tightly around bushing 156, thereby preventing it from turning, and also preventing knob 36 from turning in a contraclockwise direction.

As shown most clearly in Fig. 30, the cam face 147 is provided with a raised portion for approximately 270 degrees of its circumference and a cut-away portion 164, shown in dotted lines. This serves as a means for engaging said gear 140 with the shutter winding gear 66 for rewinding and also provides a means to allow the disengagement of gear 140 with shutter winding gear 66. In Fig. 30, said knob 36 is represented as having been turned almost sufficiently completely to rewind shutter curtains. Since gear 66, as shown in Fig. 9, is provided with a stud 87 and gear 67 is provided with a stud 78, both of these studs would be in the position shown in Fig. 9, since any motion of gear 66 in a contraclockwise direction could cause gear 67 also to move in a contraclockwise direction. Due to contact of studs 78 and 87, the second curtain would be rewound at the same time the first curtain is rewound to their starting positions. Curtains 54 and 56 would then be in position as clearly shown in Fig. 31, wherein these curtains are represented as almost at their rewind or starting position. It will be noted that curtain 54 caps curtain 56, thus preventing any light that comes through the lens from reaching the sensitized material in position in the camera. When the knob 36 has been turned sufficiently, the cut-away portion 164 of cam 147 will be in the position shown in Fig. 7, which will allow extended portion 137 of the arm or lever 136 to drop into the lower portion 164 of cam 147 under the influence of spring 146. The extended arm 138 of arm or lever 136 is provided with a screw stud 165 which rides in slot 123 of shutter release bar 112 (Fig. 39), as shown in Fig. 7. Under normal operation the arm or lever 136 drops off cam plate 143 into the cut-away portion or recess 164 and will be in the position shown in Fig. 7. However, if, for any reason, gear 140 does not disengage from gear 66 under the influence of spring 146 only, the said stud 165 will be pulled downward when shutter release bar 112 is pulled downward, thus disengaging gear 140 from gear 66. The arm or lever 136 rides upon a stud 166, most clearly shown in Fig. 9. Said stud 166 is riveted into the shutter plate 88, having a shoulder to support arm or lever 136. The gear 142 is also carried by stud 166 and is held in place with shoulder screw 139. The curtains will now be restored to their initial position or in that condition shown in Figs. 7 and 8, ready for second exposure. If this exposure is one of the instantaneous speeds, the operation will take place as before mentioned.

I will next describe how a slow speed exposure is obtained. By slow shutter speed, I mean those speeds wherein the second curtain is held for a period greater than that time required for the first curtain to reach the "all the way open" position. To accomplish this I have introduced a retarding means for releasing the second curtain after the first curtain has been released and also means to vary the lapse of time between the releasing of the first curtain and the releasing of the second curtain.

Fig. 35 shows the condition of the mechanism at the time of making a so-called slow shutter speed exposure.

Fig. 36 shows the condition of the curtains after the first curtain has been released and has traveled all the way to the open position and the second curtain has not yet been released. The first part of this cycle is the same as the first part of the instantaneous exposure cycle, excepting that the setting knob 34 has been adjusted to a position shown in Fig. 33; that is, the designation B—S on the index plate 72 is in alignment with index marking 71 on the shutter setting knob 34. The designation B—S refers to "bulb" and "slow shutter speeds." The shutter setting knob 34 is always set to this position when either a slow shutter speed, a bulb exposure or a time exposure is being made. If lever 37 is pulled toward the back of the camera shutter, the release bar 112 will be caused to move downward in a manner previously described. This action disengages dog 109 through contact pin 113, allowing the first curtain to run down. When shutter setting knob 34 is adjusted to the position shown in Fig. 33, index pin 97 will be set in such position that it will not contact the extending arm 116 of lever 19, but will stop in the position indicated in Fig. 35, where index point 99 only of dowel 97 is shown. Therefore the first curtain is allowed to run all the way down, but the second curtain is not yet released and is held by dog 110, clearly shown in dotted lines in Fig. 35, through engagement with the cam face 75 of cam 73 on gear 67 meshing with pinion 64 which in turn is attached to curtain roller 53. At the same time the first curtain was released on the downward movement of the said shutter release bar 112, the slow shutter speed timing mechanism is also released in the following manner.

Attached to bar 112 by screw 126 is an adjustable plate 167 (shown in Figs. 7, 30, 35, 37, 43

and 45). Said adjustable plate 167 has an upturned end 169 which engages a rocker arm 170 held to the slow shutter speed gear train of mechanism generally designated as 171 by shoulder rivet 172, and is caused to be rotated in a contraclockwise direction by a spring 194 engaging rocker arm 170, and the slow shutter speed mechanism case 171. The slow shutter speed mechanism 171 is provided with an arm 173 having an upturned end 174. The function of these parts is to hold arm 173 in the position shown in Figs. 7 and 30. Figs. 35, 37, 43 and 45 show the rocker arm 170 disengaged from the face of the upturned portion 174 of the arm 173, which is coupled to an arm 175 through a shoulder rivet 176. Said arm 175 is in turn pivoted on a shoulder stud 177 and has attached thereto a small stud 178 on which a spring 179 rests. Said spring 179 is coiled around the stud 177 and is tensioned against a projection 180 of plate 104. Spring 179 is under tension and tends to move arm 175 in a forward direction as shown in Fig. 35. To said arm 175 is attached a dog 181 by a shoulder rivet 182, and it is caused to move in an upward direction under the influence of a spring 183. Said dog 181 has a stud 184 riveted thereto, as clearly shown in Fig. 35. The said stud rides against a cam plate 185 which serves as a guide in its forward travel. When the bar 112 moves in a downward direction, thereby releasing arm 173 as previously disclosed, dog 181 moves forward under the influence of spring 179 and contacts with a rocker plate 186, most clearly shown in Figs. 37 and 40. Said rocker plate 186 is caused to pivot on gear 187 at rack teeth 188, and it is also provided with an extending arm 189, best shown in Fig. 37, wherein is shown the mechanism as it appears after the second curtain has been fully released. Fig. 38 shows the curtain rollers in this condition, both curtains having been released and having run all the way down. Said extending arm 189 has now contacted with the extending arm 190 of dog 17, which is shown in detail in Figs. 28 and 29. The upper end of dog 17 is provided with a notched portion 191 which engages with lip 76 of cam 74 of the winding gear 67. In the position shown in Fig. 37, the notched portion 191 has been disengaged from the lip 76 of cam 74. The dog member 17 has an extending arm 192 which engages a bent down arm 193 on said second curtain release dog 19. A detail of the curtain release dog 19 is clearly shown in Figs. 24 and 25. The described construction allows the second curtain gear 67 to revolve, which in turn, being meshed with pinion 54 of curtain roller 53, allows curtain roller 53 to revolve, thus allowing curtain 56 to run down, and thereby completing the exposure.

I have just described one of the slow shutter speeds (namely, for ½ second). The structure is such that a speed of almost any time interval may be obtained.

In Fig. 17 is shown a slow shutter speed adjustment are 38 and a series of designations calling for "Bulb" 1/5, ½ 1 and "Time." In the exposure just described, the arm 38 would have been adjusted so that indicator hole 194 would have overlain the ½ second designation. In Fig. 17 hole 194 overlies "Bulb," and when in this condition a "Bulb exposure would be obtained. In Fig. 1, the hole 194 overlies ½ second, which is the exposure just described. In Fig. 13, the hole 194 also overlies the ½ second marking. In the exposure just described the index knob 34 and arm 33 would be adjusted as shown in Fig. 38. It will be noted that the rocker plate 186 is provided with several steps, 195, 196 and 197. This construction is most clearly shown in Fig. 40. Step 191 is for use in 1/5 second, step 196 is for use on ½ second, and step 197 is for use on 1 second. It can readily be seen from the foregoing description and from the construction of parts that if provision is made for raising rocker plate 186, any one of the faces 195, 196 and 197 can be brought into the path of dog 181.

I will now describe the means for making this adjustment.

In Fig. 40, the rocker plate 186 is provided with a series of rack teeth 188, meshing with the gear 187. If gear 187 is turned in a contraclockwise direction, the rocker plate 186 will be caused to move downward and if pinion 187 is turned in a clockwise direction, rocker plate 186 will be caused to move upward, thus providing means for selecting any one of the said several steps. Arm 38, as shown in Fig. 42, is provided with a knob 198 and said arm 38 is held to a shaft 199 by a flathead screw 200, said shaft 199 being provided with flats 201, 201. Said arm 38 is provided with a hole so shaped as to engage flats 201, 201. On the lower end of shaft 199 is attached a selector plate 202, which is provided with notches 203, 203, clearly shown in Fig. 40, and which are engaged by spring 204 held in place with studs 205, 205. When the arm 38 is turned in either a clockwise or contraclockwise direction, one or the other of the notches 203, 203 will be engaged by spring 204, thus holding shaft 199 and pinion 187 in whatever position is selected. Said rocker plate 186 is provided with a supporting plate 206 having upturned ends 207 and 208. These upturned ends serve to limit the movement of the said rocker plate 186. The said plate 206 has a third upturned end 209 which through engagement of bosses 210 serves to impart a rocking action to rocker plate 186, when boss 210 contacts with upturned end 209. The said plate 206 is riveted to shoulder studs 211, 211, and they are in turn riveted to the shutter plate 33. Said rocker plate 186 has attached thereto a guide plate 212 by rivets 213, 213. This serves to hold the assembly just described in position under shutter release bar 112.

From the above description, it is very clear that the shifting of arm 38 causes a corresponding shift of rocker plate 186, thereby providing means for selecting any one of the several faces 195, 196, 197 to provide for shutter speeds of various durations.

The slow shutter speed retarding mechanism, designated 171 in Figs. 7, 30, 35, 37, 42 and 45, consists of a train of gears and retarding means. This structure is well known and needs no further description here, but a very clear showing thereof is made in Fig. 7, wherein arm 173 is shown as kept from moving forward rapidly under the influence of spring 179 and arm 175, because of the engaging of ratchet wheel 214 by pawl 215 carried by arm 173. When said arm 173 moves forward, ratchet wheel 214 is caused to revolve driving the several gears of this mechanism, which causes a retarding of the forward motion of the arm 173. When arm 173 is returned to its initial position, pawl 215 slides over the teeth of the ratchet wheel 214, and does not revolve gears of the mechanism 171.

After a slow shutter speed exposure has been made, the shutter is restored to rewound position exactly as previously disclosed, but it now has an additional function to carry out, that is,

the restoring to position of arm 175 and arm 173 and tensioning spring 179. Arm 175 is provided with a lobe or swell 216 which is engaged by cam 149, most clearly shown in Fig. 32. Since winding knob 36 is turned in a clockwise direction, cam 149 is also turned in a clockwise direction. Said cam 149 has a raised portion, most clearly shown in Fig. 37. The arm 175 will be thrust to the rear when the knob 36 has made a complete revolution. This restores the winding mechanism to its initial position, and also withdraws dog 181 from contact with the rocker plate 186. As the shutter is again released, an exposure will be made just as previously described, since no shutter speed controls have been changed. If a faster slow-shutter speed is desired, arm 38 will be moved to a position where "⅛ sec." underlies hole 194 and arm 38. If a slower exposure is required, said arm 38 will be moved into a position where "1 sec." underlies hole 194 and arm 38. The moving of rocker plate 186 upward causes cam face 197 to be engaged by dog 181, which allows arm 173 to travel its greatest distance, thereby consuming the greatest amount of time.

It is often desirable to have in a shutter structure of this type a so-called bulb exposure,—by which I mean that upon releasing the shutter by pressure on the arm 37 indicated in Fig. 33, the first curtain will open and remain open. The second curtain will not be released until pressure on arm 37 has been released, at which time the second curtain closes, thus completing the exposure.

When bulb exposure is desired, the shutter setting dial 34 is left in the position indicated in Fig. 33, and arm 38 is placed in the position indicated in Fig. 17. Movement of the arm 38 to this position will cause the rocker plate 186 to be in the position shown in Fig. 43, contacting with arm 190 of the second curtain release lever 18, pivoted on stud 117, withdrawing time notch 191 from the cam face 76 of the cam 74. The reason for this will be disclosed presently in the description of the means for obtaining a "time" exposure, as the release lever 18 has no function excepting for "time" exposures and slow shutter speed exposures.

However, for a bulb exposure, it is necessary to retract the dog 109 to allow the second curtain to close in a manner hereinafter disclosed. In making a bulb exposure, the exposure knob 34 is set to index 71 opposite "B and S" as in Figs. 1, 20 and 23. The slow speed lever 38 is set as indicated in Fig. 17. The position of the shutter mechanism parts will then be as indicated in Fig. 43. The lever 37 (Fig. 33) will have been pulled, pulling down the shutter release bar 112 (Figs. 33 and 43), disengaging dog 109, and first curtain release lever 18 through the interengaging of pin 113 with lip 111 on lever 18, thus allowing the first curtain to run down as previously disclosed in instantaneous and slow shutter speed exposures. When said bar 112 is depressed and held down, the pin 113a traveling with bar 112 allows the second curtain lever 19 to turn in a clockwise direction on pin 118 under the influence of spring 115, thus allowing dog 110 to engage cam face 75 of cam 73 on gear 67. Dog 110 moves in advance of dog 109, so that it engages with cam face 76 before dog 109 is fully withdrawn. Therefore, as long as pressure is maintained on lever 37, the bar 112 is held downward, and the second curtain cannot close. Upon release of pressure on lever 37, the shutter release bar 112 will be caused to move upward (under the tension of spring 129 shown in Fig. 33) as previously described, carrying with it pin 113a, which engages arm 114 of lever 19, thereby causing the withdrawal of dog 110 from cam face 75 and allowing the second curtain to close as hereinbefore described. This completes the operation of a bulb exposure, and upon the rewinding the shutter and the second release of lever 37, a like type of exposure would be made so long as the shutter controls remains in the described position. It will be noted that when a bulb exposure is made, the slow shutter mechanism is also released, but will only travel a short distance because of the position of the rocker plate 186 in the path of the rack teeth 188. However, this mechanism will be restored to its starting position on the rewinding of the shutter.

The making of a "time" exposure requires the shutter setting knob to be set with the index marking 71 as shown in Fig. 33, and lever 38 to be set as shown in Fig. 46. In Fig. 45 is shown the shutter mechanism after the first curtain has been released by a downward movement of release bar 112. The movement of said release bar 112 carries with it pin 113 which engages the extending end 217 of lever 17 causing it to revolve in a clockwise direction, thereby tensioning spring 118 and withdrawing second curtain notch 191 from second curtain cam face 76. The lever 18 also has been withdrawn, thereby withdrawing dog 109 in the same manner as on all other exposures.

However, just prior to the withdrawal of the notch 191 and dog 109, the dog 110 has been allowed to engage cam face 75 of cam 73. Thus the first curtain has been released and is allowed to run down, but the second curtain is held so long as the shutter release bar 112 is held in the "down" position by the shutter operating lever 37. Upon the release of operating lever 37, the shutter release bar 112 travels upward, thus allowing "time" exposure lever 17 to engage cam face 76 of cam 74. Continued movement of said bar 112 carrying with it pin 113a causes engagement of arm 114 of the second curtain lever 19, thereby disengaging dog 110 from cam face 75. The second curtain cannot yet run down because it is still being held by notch 191. A second movement of said bar 112 in a downward direction will withdraw notch 191 from cam face 76 of cam 74, thereby allowing the second curtain to run down, thus completing a "time" exposure.

Upon the release of the shutter curtain for "Time" exposure, the slow shutter speed mechanism is also released and is allowed to run down as indicated in Fig. 45. This, however, serves no function, and said mechanism will be restored upon the rewinding of the curtains, after which a second time exposure can take place if the shutter controls are left in the same setting as just referred to.

The camera shutter mechanism is also provided with an interlocking means, best shown in Fig. 43 as comprising an arm 219 pivoted on a stud 220 and caused to move in a contraclockwise direction under the influence of a spring 221. Said arm 219 has an extended leg 222, shown in dotted lines in Fig. 43 and in solid lines in Fig. 45. Winding gear 143, shown separately in Fig. 32, has a pin 223, shown in dotted lines in Fig. 43 and in section in Fig. 45. This structure is to prevent the rewinding of a curtain until after the second curtain has run down. Said arm 219

will be riding pin 78 as shown in Fig. 37, thus withdrawing the leg 222 from pin 223, thereby allowing shutter to be rewound.

As previously described, the first curtain gear 66 carries a pin 87. The said arm 219 has an extended portion 224 shown in dotted lines in Fig. 37. When the first curtain is released, the said pin 87 stops against said portion 224 having first bumped the cam face 225 of Fig. 43, thereby causing arm 219 to rotate in a clockwise direction, allowing pin 87 to pass. Said arm 219 is caused under the influence of spring 221 to return to the position shown in Fig. 43, thereby locking gear 66 from turning in either direction, and thus preventing curtain "bounce." When the second curtain runs down, the pin 78 disengages arm 219 from pin 87 under the influence of pin 78 which is attached to the second curtain gear 67. The cam face 225 also serves as a means of absorbing a portion of the shock of the curtain mechanism as it runs down.

I have herein disclosed a new shutter mechanism having a minimum number of controls so arranged as to eliminate improper settings. I have also provided proper means of interlocking if the wrong sequence of operation were to take place. While the mechanism just disclosed has a large number of parts, the structure is such that no delicate parts need be used. Therefore, a long life is assured. It is common knowledge that shutters heretofore manufactured to accomplish a similar or like action have been very delicate and readily thrown out of adjustment. I have disclosed mechanism that entirely eliminates those faults.

In further explanation of the term "curtain bounce," above referred to, it is noted that when a shutter curtain is taken up on a tension roller and is suddenly stopped or snubbed, the tension roller will stop, then, under the influence of the tension roller spring, the curtain will tend to revolve in the opposite direction, causing so-called "curtain bounce." If this bounce is not prevented in some way, the curtain will partially close the lower portion of the aperture, thus cutting off some of the light in this portion of the picture. The means herein disclosed effectively prevent the curtain roller from rotating in either direction after the curtain has reached its limit of travel. In certain constructions heretofore employed in Graflex cameras, a small spring has been provided, over-riding one of the pins in the curtain shutter setting disk. In other cases the curtain bounce has been taken care of by mounting the curtain rollers sufficiently far apart so that the bounce, even though it occurs, does not reach the picture opening. In the present invention, however, I have provided novel means for preventing curtain bounce, and in combination therewith have provided interlocking means for preventing the rewinding of the curtain until the second curtain has been released.

It will be evident from the foregoing description and from the drawings that the parts are very compactly arranged and that I have provided means to prevent erroneous operation of the camera under substantially all conceivable conditions. Moreover, I have provided a construction whereby with absolutely the minimum expenditure of time the picture that is to be taken can be focused with the first curtain open and then restored to position for making the exposure.

Having thus described one illustrative embodiment of the invention, it is to be understood that although specific terms are employed, they are used in a generic and descriptive sense and not for purposes of limitation, the scope of the invention being set forth in the following claims.

I claim:

1. Shutter mechanism for photographic cameras including two separate, adjacent, sliding curtains of a self-capping shutter mechanism, means for separately controlling the movements of said curtains and including means for setting the curtains for predetermined shutter speeds, means to drop the first curtain for focusing purposes, means to open the second curtain while said first curtain is in a dropped condition, locking means to lock said first curtain in dropped position, and means cooperating therewith to prevent the second curtain from closing while the first curtain is locked, and means to release said locking means.

2. Shutter mechanism for photographic cameras including two separate, adjacent, sliding curtains of a self-capping shutter mechanism, means for separately controlling the movements of said curtains and including means for setting the curtains for predetermined shutter speeds, means to drop the first curtain for focusing purposes, means to open the second curtain while said first curtain is in a dropped condition, locking means to lock said first curtain in dropped position, and means cooperating therewith to prevent the second curtain from closing while the first curtain is locked, means to release said locking means, and means permitting the operator to reset the curtains for any other shutter speed before making the exposure.

3. Shutter mechanism for photographic cameras including two separate, adjacent, sliding curtains of a self-capping shutter mechanism, means for setting the curtains for predetermined shutter speeds, including time exposure, means for dropping the first curtain for focusing purposes, means to open the second curtain while said first curtain is in a dropped condition, and means to prevent rewinding of the shutter until the second curtain thereof has also been opened.

4. Shutter mechanism for photographic cameras including two separate, adjacent, sliding curtains, means to set the curtains for predetermined shutter speeds, means permitting the dropping of the first curtain for focusing means to open the second curtain while said first curtain is in a dropped condition, and means preventing exposure until the shutter has been completely rewound after the last preceding exposure.

5. Shutter mechanism for photographic cameras icluding two separate, adjacent, sliding curtains, means to set the curtains for predetermined shutter speeds including slow shutter speed, slow-shutter speed retarding mechanism, means for rewinding the curtains, and automatic means operatively connecting the said curtain rewinding means and said retarding mechanism to compel winding of the slow shutter speed mechanism simultaneously with the rewinding of the shutter.

6. Shutter mechanism for photographic cameras including two separate, adjacent, sliding curtains, said two curtains being independent of each other and each having its own tension roller and take-up roller, means providing for instantaneous exposures, for slow speed, bulb, and time exposures, means for dropping the first curtain for focusing and for locking the same in dropped position, means to open the second curtain while

said first curtain is in a dropped condition, said locking means preventing said second curtain from closing while said second curtain is locked, means for releasing the locking means, and means permitting resetting for any other shutter speed than the already predetermined one, prior to making the exposure.

7. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, each of said two curtains having a gear, cam means movable with each of said gears respectively, and interconnected means which respectively engage the cams of said gears to control the opening of said curtains respectively.

8. In a shutter mechanism for photographic cameras including a first curtain and a second curtain, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting the interval between release of the first curtain and release of the second curtain, the combination of manually adjustable means mounted adjacent said holding means, and independent of said interval adjusting means, for blocking release of said second curtain by said member, whereby said exposure area may remain open for focusing purposes while said adjusting means remains adjusted for any exposure for which the shutter has been preset.

9. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, time-exposure means operatively related to and for controlling said curtains, and means independent of the said time-exposure means for moving one of said curtains across an exposure area while the other curtain is held from moving across said exposure area.

10. Shutter mechanism for photographic cameras including two separate, adjacent, sliding curtains, means for presetting the shutter speed, means for opening the shutter for focusing by dropping the first curtain, means to open the second curtain while said first curtain is in a dropped condition, means for closing the shutter, and means for winding the shutter, thus making ready to effect an exposure at the pre-selected shutter speed.

11. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, winding gears for said curtains respectively, cams associated with said gears respectively and respectively meshing with the pinions on the shafts of said curtains respectively, for controlling the rotation thereof, holding means to engage said cams respectively, and means associated with one of said winding gears to prevent curtain bounce.

12. Shutter mechanism for photographic cameras including two separate, adjacent, sliding curtains, winding gears associated with said curtains respectively, means whereby the curtains may be operated either for instantaneous work or slow shutter speed including slow shutter speed retarding mechanism, and means operatively connecting the shutter rewinding means and the retarding mechanism for causing the rewinding of the shutter to effect at the same time the rewinding of the slow shutter speed retarding mechanism thereof.

13. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, winding gears associated with said curtains and respectively meshing with the pinions on the shafts of said curtains respectively, cams respectively associated with said gears for controlling the rotation thereof, holding means to engage said cams, shutter locking mechanism, and interlocking means to prevent shutter curtain bounce and to lock the shutter mechanism against rewinding until the second curtain has been released.

14. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, winding gears for said curtains respectively, and respectively meshing with the pinions on the shafts of said curtains respectively, means to lock the second curtain so that when the first curtain is opened, the shutter operating mechanism is locked, thereby preventing the rewinding of either curtain or the release of the second curtain prior to unlocking the locking means.

15. A shutter mechanism for photographic

cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, the first curtain having gear **66** meshing with the pinion on the shaft of such first curtain and provided with cam plate **82** for controlling its rotation, and the second curtain having gear **57** meshing with the pinion on the shaft of said second curtain and provided with cam plates **73**, **74** for controlling its rotation.

16. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, the first curtain having gear **66** meshing with the pinion on the shaft of such first curtain and provided with cam plate **82** for controlling its rotation, and the second curtain having gear **67** meshing with the pinion on the shaft of said second curtain and provided with cam plates **73**, **74** for controlling its rotation, said cam plate **82** having notched portion **83**, slot **84**, index holes **85** and pin **87**, and said cam plates **73**, **74** having respectively notch **75** and notch **76** for controlling the turning movements of said cam plates respectively.

17. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, the first curtain having a gear **66** meshing with the pinion on the shaft of such first curtain and the second curtain having a gear **67** meshing with the pinion on the shaft of said second curtain and a stud supporting both said gears, and a shutter plate supporting the said operating parts.

18. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, the first curtain having gear **66** meshing with the pinion on the shaft of such first curtain and a sleeve **94** within said gear, said sleeve and gear for the purpose of effecting fine adjustment having teeth adapted to mesh in different positions of adjustment.

19. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, the first curtain having gear **66** meshing with the pinion on the shaft of such first curtain and having teeth for adjustment and the second curtain having gear **67** meshing with the pinion on the shaft of said second curtain, and cam plates carried respectively by said gears, a support for the gear assemblies, the shutter setting dial and a toothed sleeve **94** associated with the said shutter setting dial and adapted to engage said teeth upon the said gear **66** for effecting adjustment.

20. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, a gear assembly for the first curtain including gear **66** meshing with the pinion on the shaft of such first curtain and provided with cam plate **82** for controlling its rotation and a supporting hub, and a gear assembly for the second curtain including gear **67** meshing with the pinion on the shaft of said second curtain and provided with opposite cam plates **73**, **74** for controlling its rotation.

21. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, a gear assembly for the first curtain including gear **66** meshing with the pinion on the shaft of such first curtain and provided with cam plate **82** for controlling its rotation and a supporting hub, and a gear assembly for the second curtain including gear **67** meshing with the pinion on the shaft of said second curtain and provided with opposite cam plates **73**, **74** for controlling its rotation, a shutter setting knob, a toothed sleeve associated therewith, one of said curtain gears having teeth

adapted to engage with the teeth of said sleeve in varying positions of circumferential adjustment for effecting fine adjustment.

22. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, gear 66 for one of said curtains, said gear 66 meshing with the pinion on the shaft of such curtain, a notched cam plate carried by said gear for controlling the rotation thereof, a dog to engage said notched cam plate, and means to withdraw said dog to permit rotative movement of said gear.

23. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, gears 66, 67 for controlling the movement of said curtains respectively, said gears respectively meshing with the pinions on the shaft of said curtains respectively, cam plates respectively carried by said gears for respectively controlling the rotation thereof, dogs respectively engaging said cam plates, and means to withdraw said dogs from their operative positions.

24. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, gears 66, 67 for controlling the movements of said curtains respectively, said gears respectively meshing with the pinions on the shaft of said curtains respectively, cam plates respectively carried by said gears for controlling the rotation of said gears respectively, dogs respectively engaging said cam plates, and a movable bar 112 having formations respectively engageable with the said dogs and controlling them in the movement of said bar.

25. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, gear 66 for the first curtain, gear 67 for the second curtain, said gears respectively meshing with the pinions on the shaft of said curtains respectively, cams respectively carried by said gears for controlling the rotation thereof respectively, dogs respectively engaging said cams, and a movable bar 112 having formations for engaging and withdrawing said dogs respectively from the said cams upon movement of said bar.

26. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, gears 66, 67 for said curtains respectively, said gears respectively meshing with the pinions on the shaft of said curtains respectively, cams respectively carried by said gears for controlling the rotation thereof respectively, dogs respectively engaging said cams, bar 112 supported in position for operating said dogs, and means associated with said bar whereby said dogs act in sequence.

27. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, gear 66 meshing with the said pinion for the first curtain, a cam carried by said gear for controlling its operation and having notch 83, a dog 109 to engage said notch, gear 67 meshing with said pinion for said second curtain, a cam plate 73 with notch 75 carried by gear 67 for controlling the rotation thereof, a dog 110 to engage said notch 75, and means first to release said dog 109 and then to release dog 110, whereby the curtains travel down separately.

28. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, gears 66, 67 associated with said curtains respectively, said gears respectively meshing with the pinions on the shaft of said curtains respectively, a movable bar 112 for controlling the rotative movement of said gears by its movement, and a shut-

ter release bar 37 operatively connected with said bar 112 to move said bar.

29. Shutter mechanism for photographic cameras including two separate, adjacent, sliding curtains, means permitting the dropping of the first curtain for focusing purposes, means to open the second curtain while said first curtain is in a dropped condition, means to lock the first curtain down and to prevent the second curtain from being closed, means for unlocking said dropped first curtain, and means for resetting said curtains before making an exposure.

30. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, gear 66 for the first curtain, gear 67 for the second curtain, said gears respectively meshing with the pinions on the shaft of said curtains respectively, cam plates respectively associated with said gears for controlling the rotation thereof respectively, the cam plate associated with said gear 67 having a formation to be engaged when the shutter is fully wound, and a dog to engage said formation at said time, thereby locking the second curtain, and means to operate said dog.

31. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, a gear meshing with said pinion for the first curtain and having a cam plate for controlling the rotation thereof, gear 67 meshing with said pinion for said second curtain and having cam plate 74 for controlling the rotation thereof, and provided with notch 79, a dog lever 130 to engage notch 79 when the shutter is fully wound and a member to operate said dog lever 130.

32. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, gear 66 meshing with said pinion for the first curtain and having a cam plate for controlling the rotation thereof, gear 67 meshing with said pinion for said second curtain and having cam plate 74 for controlling the rotation thereof, and provided with notch 79, a dog lever 130 to engage notch 79 when the shutter is fully wound and a member to operate said dog lever 130, a shutter release lever 37, and means connecting the same to the first curtain to allow the first curtain to open while the second curtain is held from moving by said dog lever 130.

33. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, gear 66 meshing with said pinion for the first curtain, gear 67 meshing with said pinion for the second curtain, cam plate 74 associated with gear 67 for controlling the rotation thereof, lever 130 to engage a holding formation on said cam plate to prevent movement of the second curtain, and a shutter release lever 37 operatively connected with the first curtain, whereby the first curtain is permitted to open while the second curtain is held from moving.

34. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, gear 66 meshing with said pinion for the first curtain, gear 67 meshing with said pinion for the second curtain, cam plate 74 associated with gear 67 for controlling the rotation thereof, lever 130 to engage a holding formation on said cam plate to prevent movement of the second curtain, and a shutter release lever 37 operatively connected with the first curtain, whereby the first curtain is permitted to open while the second curtain is held from moving, and means to prevent rewinding of the shutter while the parts are in said condition.

35. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, gear 66 meshing with said pinion for the first curtain, gear 67 meshing with said pinion for the second curtain, cam plate 74 associated with gear 67 for controlling the rotation thereof, lever 130 to engage a holding formation on said cam plate to prevent movement of the second curtain, and a shutter release lever 37 operatively connected with the first curtain, whereby the first curtain

is permitted to open while the second curtain is held from moving, and means to prevent rewinding of the shutter when in said condition including a shutter locking member 35, a member 131 associated therewith for engaging said lever 130, thereby permitting the shutter to close, and means for rewinding the shutter, thereby restoring the mechanism to proper exposure setting position.

36. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, gear 66 meshing with said pinion for the first curtain, gear 67 meshing with said pinion for the second curtain, and studs on said gears respectively, so positioned that said studs contact with each other in the rewinding of the first curtain, and such contact causes the second curtain to be rewound at the same time the first curtain is rewound.

37. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, gear 66 meshing with said pinion for the first curtain, gear 67 meshing with said pinion for the second curtain, cam plates respectively associated with said gears for controlling the rotation thereof, holding means to engage formations upon the said cam plates and thereby hold them from movement, and slow speed means for holding the second curtain for a period greater than the time required for the first curtain to reach the all-the-way open position, said slow speed means including a retarding means, and means for varying the action of said retarding means.

38. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, gear 66 meshing with said pinion for the first curtain, gear 67 meshing with said pinion for the second curtain, cams respectively carried by said gears for respectively controlling the rotation thereof, dogs respectively engaging said cams to control their movements, a release bar 112 controlling the positions of said dogs, and means co-acting with said bar whereby the dog for the first curtain is released allowing said first curtain to run down, but the dog for the second curtain is not then released, and means for subsequently releasing said second dog.

39. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, gear 66 meshing with said pinion for the first curtain, gear 67 meshing with said pinion for the second curtain, a cam carried by each gear for controlling the rotation thereof, a movable release bar 112 for effecting release of said gears, and shutter release pulling lever 37 for operating said release bar 112.

40. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, gears for said curtains respectively and respectively meshing with the pinions on the shafts of said curtains respectively, a cam associated with each of said gears to control the rotation of said gears, and slow shutter speed-retarding means controlling the movement of the second curtain, and including movable arm 175 operatively connected with said speed-retarding means, dog 181 pivoted to said arm, movable shutter release bar 112, and arm 173 operated by said release bar 112 and itself operating dog 181.

41. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, gears respectively controlling said curtains and respectively meshing with the pinions on the shafts of said curtains respectively, cam plates respectively associated with said gears for controlling the rotation thereof, and slow shutter speed mechanism including rocker plate 186 and gear 187, said plate and gear having inter-meshing teeth, a dog 181 positioned to engage said rocker plate, said plate having a plurality of different formations to be engaged by said dog, the latter being connected with an element of a slow shutter speed retarding mechanism and operated thereby.

42. A shutter mechanism for photographic

cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, gears for said curtains respectively and respectively meshing with the pinions on the shafts of said curtains respectively, cams associated with said gears respectively for controlling the operation thereof, a movable shutter release bar 112, an arm 173 supported in position to be released by the movement of said bar 112, a dog 181 supported in position to be moved through the movement of arm 173, and rocker plate 186 to cooperate in controlling slow shutter speeds and having a plurality of formations to be engaged by said dog.

43. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, gears for said curtains respectively and respectively meshing with the pinions on the shafts of said curtains respectively, cam plates connected to said gears respectively for controlling the operation thereof, dogs engaging said cam plates respectively to control their movements, a rocker plate 186 to cooperate in controlling slow shutter speeds and having a plurality of formations, and a dog 181 to engage any of said formations, and means to move said rocker plate, the latter when moved controlling the slow shutter speed.

44. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, winding gears for said curtains respectively and respectively meshing with the pinions on the shafts of said curtains respectively, cams associated with said gears respectively, for controlling the rotation thereof, dogs to engage said cams to control their movements, a dog 181, rocker plate 186 to cooperate in controlling slow shutter speeds and having a series of formations for different time exposures, and means for varying the time exposures, said means including means to adjust said rocker plate to and fro, and a manually manipulatable arm 38 for moving said rocker plate.

45. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, winding gears for said curtains respectively and respectively meshing with the pinions on the shafts of said curtains respectively, for controlling the rotation thereof, cams attached to said gears respectively, dogs engageable respectively with said cams, rocker plate 186 to cooperate in controlling slow shutter speeds and having a plurality of formations, dog 181 to engage said formations, and means to vary the position of said rocker plate, so as thereby to vary the slow shutter speed.

46. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, winding gears for said curtains respectively and respectively meshing with the pinions on the shafts of said curtains respectively, for controlling the rotation thereof, cams attached to said gears respectively, dogs engaging said cams respectively to control their movements, a reciprocable shutter release bar 112 having two formations to engage and control said dogs respectively, and means for effecting bulb exposure by permitting the first curtain to run down as for instantaneous exposure, and means whereby the retaining of bar 112 in one position prevents the closing of the second curtain.

47. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, winding gears for said curtains respectively and respectively meshing with the pinions on the shafts of said curtains respectively, for controlling the rotation thereof, cams attached to said gears respectively, dogs to engage said cams respectively, to control their movements, movable bar 112 having formations to engage and control the position of said dogs respectively, a lever 37 to operate the bar 112, and means whereby through pressure on lever 37 the bar 112 is held in one position, thereby preventing the second curtain from closing until pressure is released on said lever 37.

48. A shutter mechanism for photographic

cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, winding gears for said curtains respectively, cams associated with said gears respectively for controlling the rotation thereof, dogs to engage said cams respectively and respectively meshing with the pinions on the shafts of said curtains respectively, to control their movement, a movable shutter release bar 112 having means to operate said dogs respectively, and co-acting means for effecting time exposure including a shutter setting knob, a manually manipulatable lever 38 coacting therewith, and levers 17 and 18 respectively coacting with said dogs in effecting time exposures.

49. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, winding gears for said curtains respectively and respectively meshing with the pinions on the shafts of said curtains respectively, cams associated with said gears respectively for controlling the rotation thereof, holding dogs for said cams respectively, movable shutter release bar 112, means whereby the first curtain may be released but the second curtain is held unreleased through movement of said bar 112, and means whereby the return movement of bar 112 withdraws one of said dogs from the corresponding cam, thereby permitting movement of said second curtain.

50. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, winding gears 66, 67 for said curtains respectively, and respectively meshing with the pinions on the shafts of said curtains respectively, gear 66 having integral teeth, a shutter plate 88 having stud 89 supporting said winding gears for free rotation thereon, cams respectively secured to said winding gears for controlling the rotation thereof, a sleeve 94 supported on gear 66 and provided with external teeth engaging with said internal teeth of gear 66 for rotative adjustment, a shutter setting knob 34 also supported on said stud 89, said setting knob having a formation to engage the cam secured to gear 66.

51. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, winding gears 66, 67 for said curtains respectively, and respectively meshing with the pinions on the shafts of said curtains respectively, gear 66 having integral teeth, a shutter plate 88 having stud 89 supporting said winding gears for free rotation thereon, cams respectively secured to said winding gears for controlling the rotation thereof, a sleeve 94 supported on gear 66 and provided with external teeth engaging with internal teeth of gear 66 for rotative adjustment, a shutter setting knob 34 also supported on said stud 89, said setting knob 34 having pin 99 and the said cam of gear 66 having a series of index holes with any of which said pin 99 may engage in the setting movement of the setting knob 34.

52. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, winding gears 66, 67 for said curtains respectively, and respectively meshing with the pinions on the shafts of said curtains respectively, gear 66 having integral teeth, a shutter plate 88 having stud 89 supporting said winding gears for free rotation thereon, cams respectively secured to said winding gears for controlling the rotation thereof, a sleeve 94 supported on gear 66 and provided with external teeth engaging with said internal teeth of gear 66 for rotative adjustment, a shutter setting knob 34 also supported on said stud 89, said setting knob 34 and the said cam of gear 66 having formations adapted to be inter-engaged in the setting operation, and the cams of said gears 66, 67 having engageable pins 87, 78.

53. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, winding gears 66, 67 for said curtains respectively, and respectively meshing with the pinions on the shafts of said curtains respectively, a shutter plate 88 having a stud 89 supporting said winding gears for free rotation thereon, a shutter setting knob 34 also supported on said stud, said

setting knob **34** having a formation engaging and coacting with said gear **66** in the setting operation, said shutter plate **88** having stud shaft **151**, a winding knob **36** supported upon said stud shaft, a winding gear carried by said winding knob and gearing between said last mentioned gear and the curtain winding gears **66, 67**.

54. A shutter mechanism for photographic cameras including a first curtain and a second curtain, each curtain having a shaft with a pinion thereon, spring means for moving said curtains across an exposure area, means for holding each of said curtains in a set position against the tension of said spring means, manually operable means for releasing the holding means of said first curtain, a member operable by said first curtain for releasing the holding means of said second curtain, and means for adjusting or controlling the interval between release of the first curtain and release of the second curtain, winding gears respectively associated with said two curtains, and respectively meshing with the pinions on the shafts of said curtains respectively, cams attached to said winding gears respectively for the purpose of controlling the rotation of said gears, holding means to engage said cams respectively, curtain releasing mechanism, shutter locking mechanism and interlocking means to prevent shutter curtain bounce including a pivoted arm **219**, and means cooperating with the curtain releasing mechanism to move said arm **219** to engage the gear for the first curtain to prevent curtain bounce.

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