

March 26, 1940.

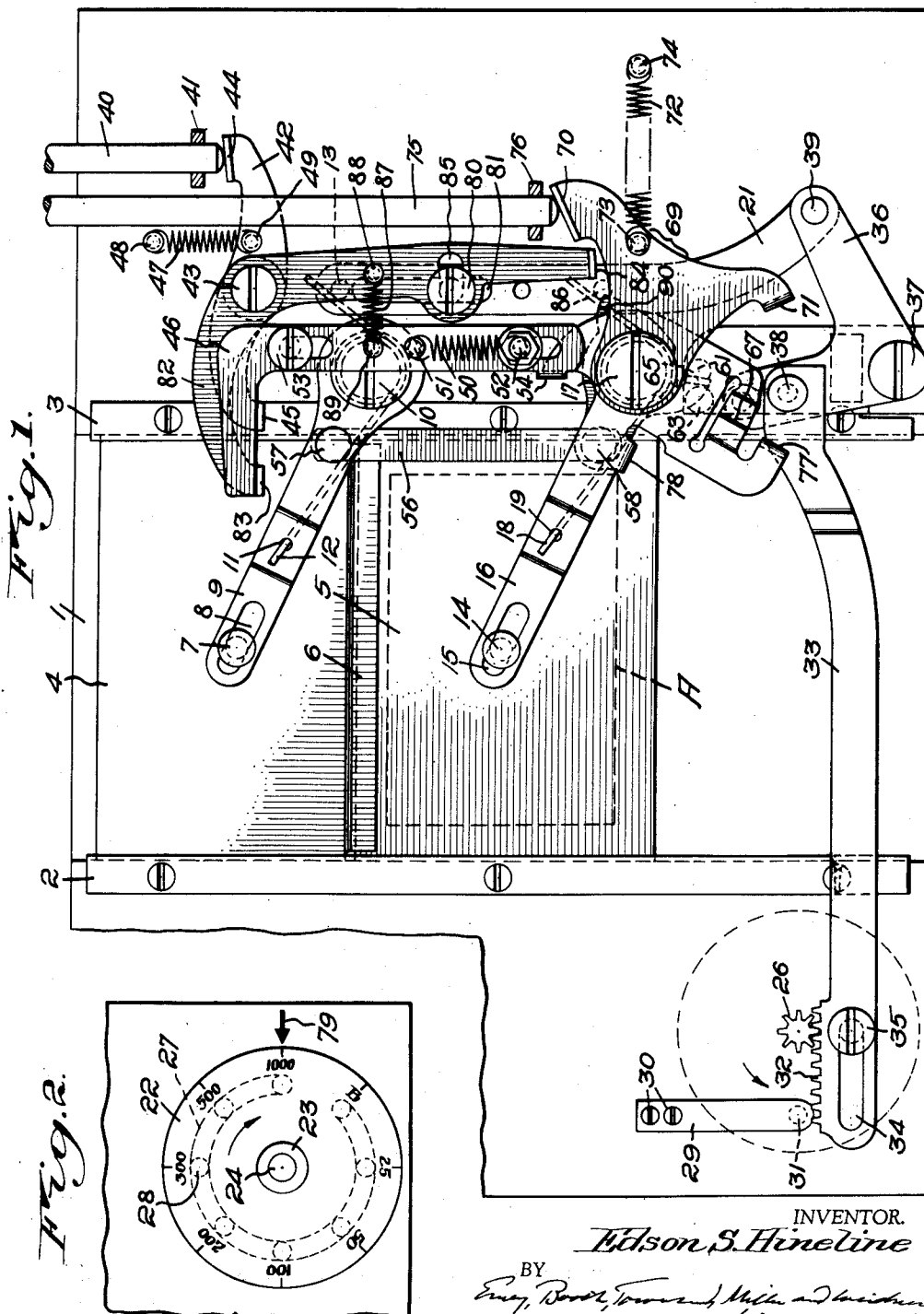
E. S. HINELINE

2,195,330

FOCAL PLANE SHUTTER OF VARIABLE APERTURE TYPE

Filed Jan. 14, 1938.

8 Sheets-Sheet 1



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FOCAL PLANE SHUTTER OF VARIABLE APERTURE TYPE

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8 Sheets-Sheet 2

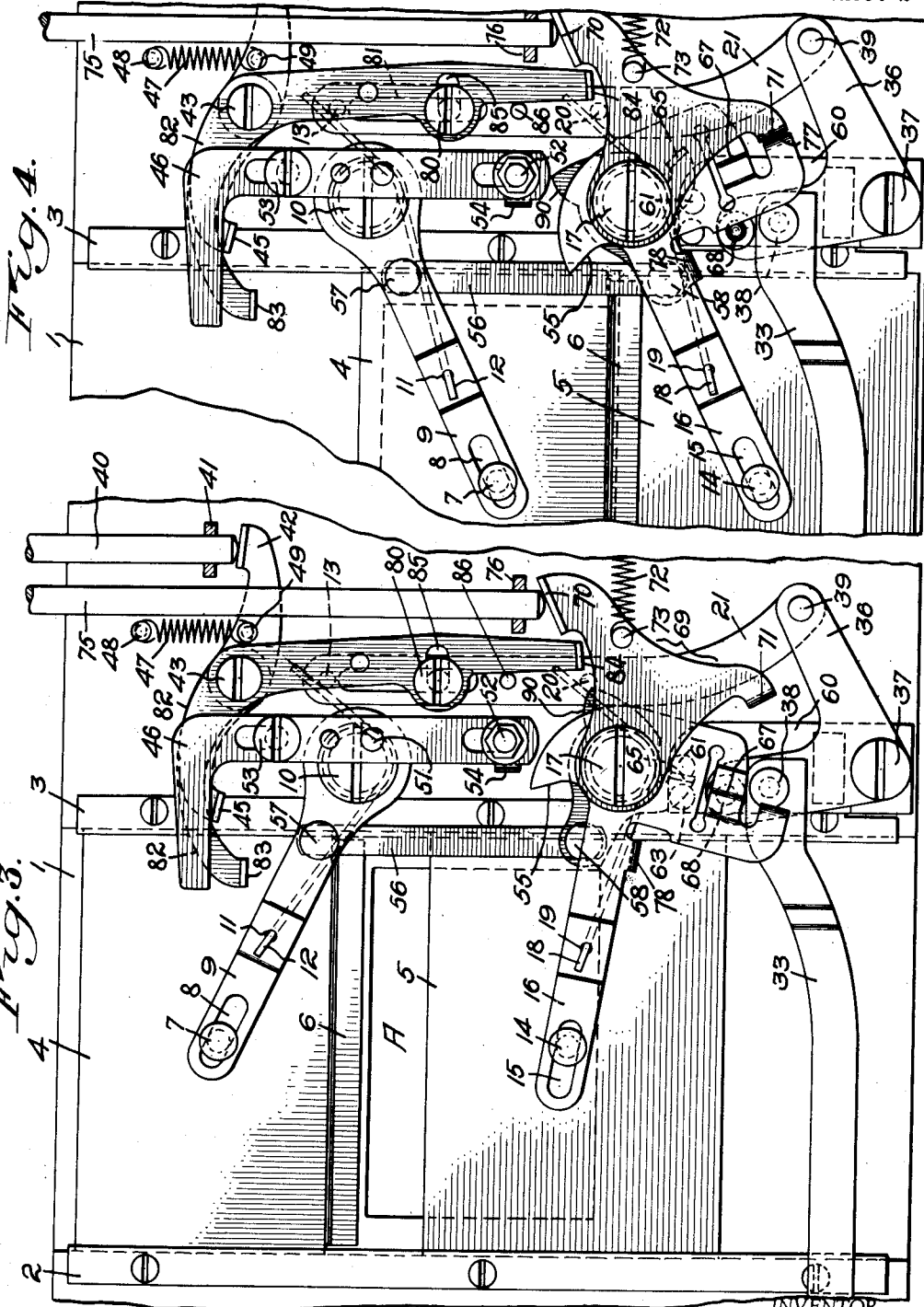


Fig. 3.

Fig. 4.

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Fig. 5.

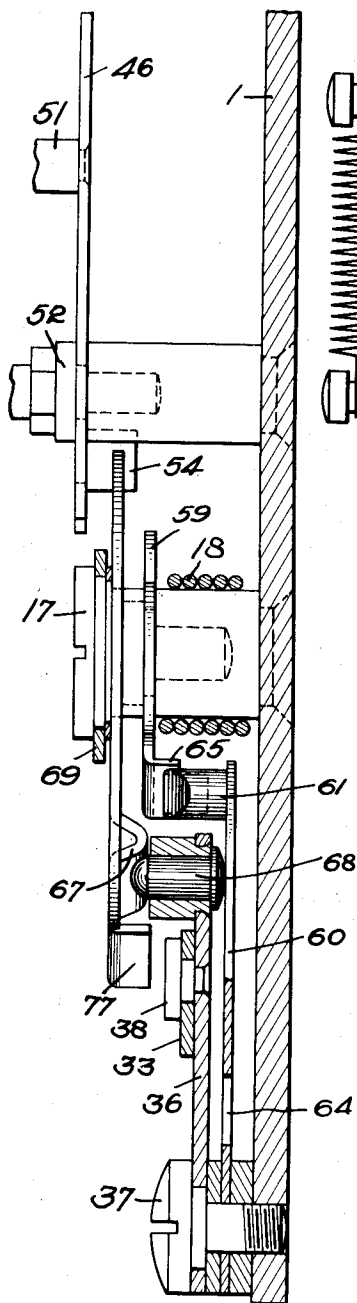


Fig. 6.

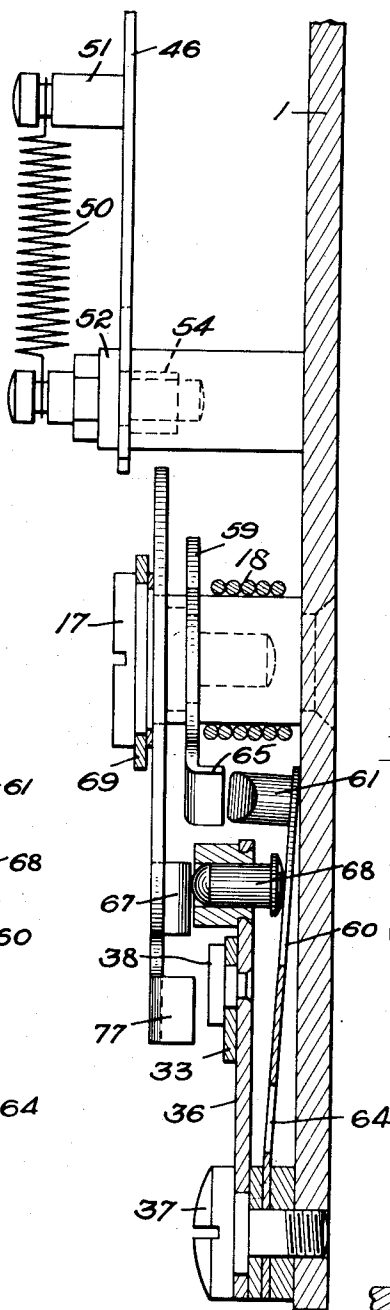


Fig. 7.

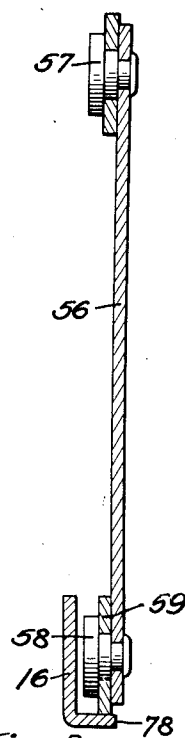


Fig. 8.

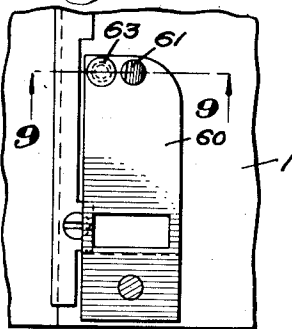
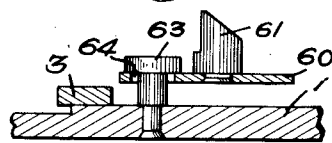


Fig. 9.



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Fig. 11.

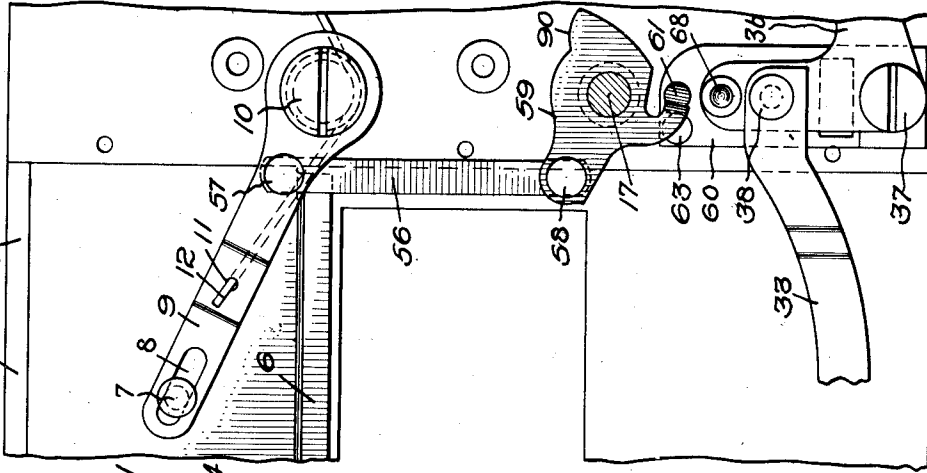
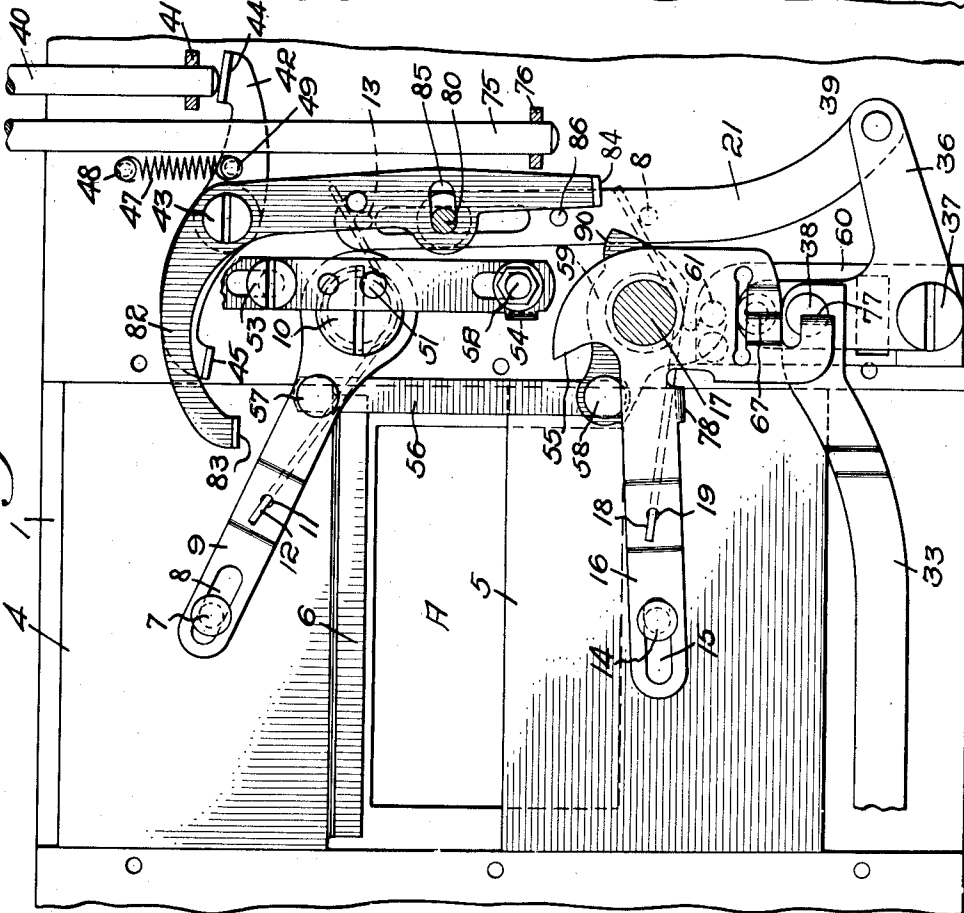


Fig. 10.



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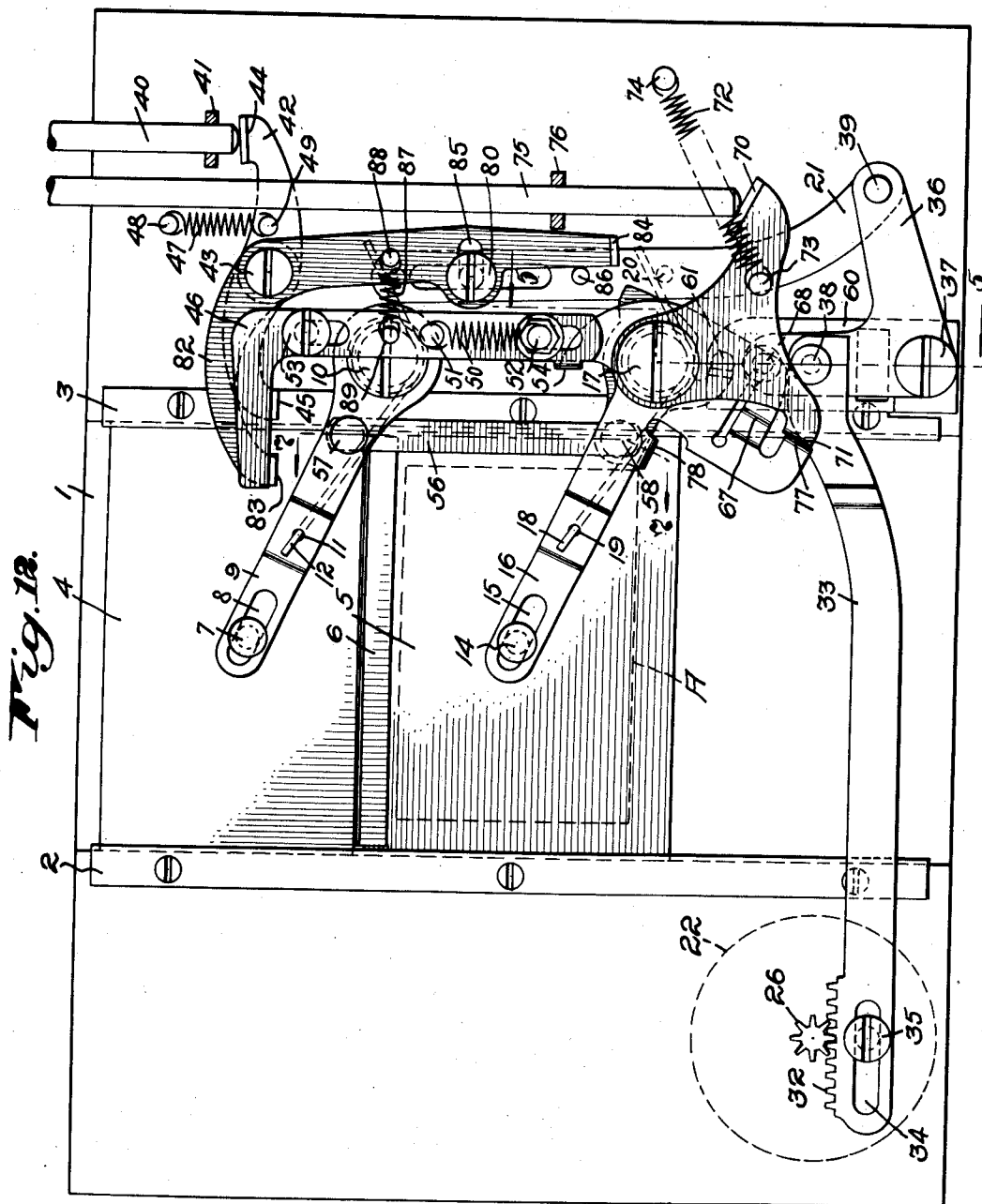
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FOCAL PLANE SHUTTER OF VARIABLE APERTURE TYPE

Filed Jan. 14, 1938

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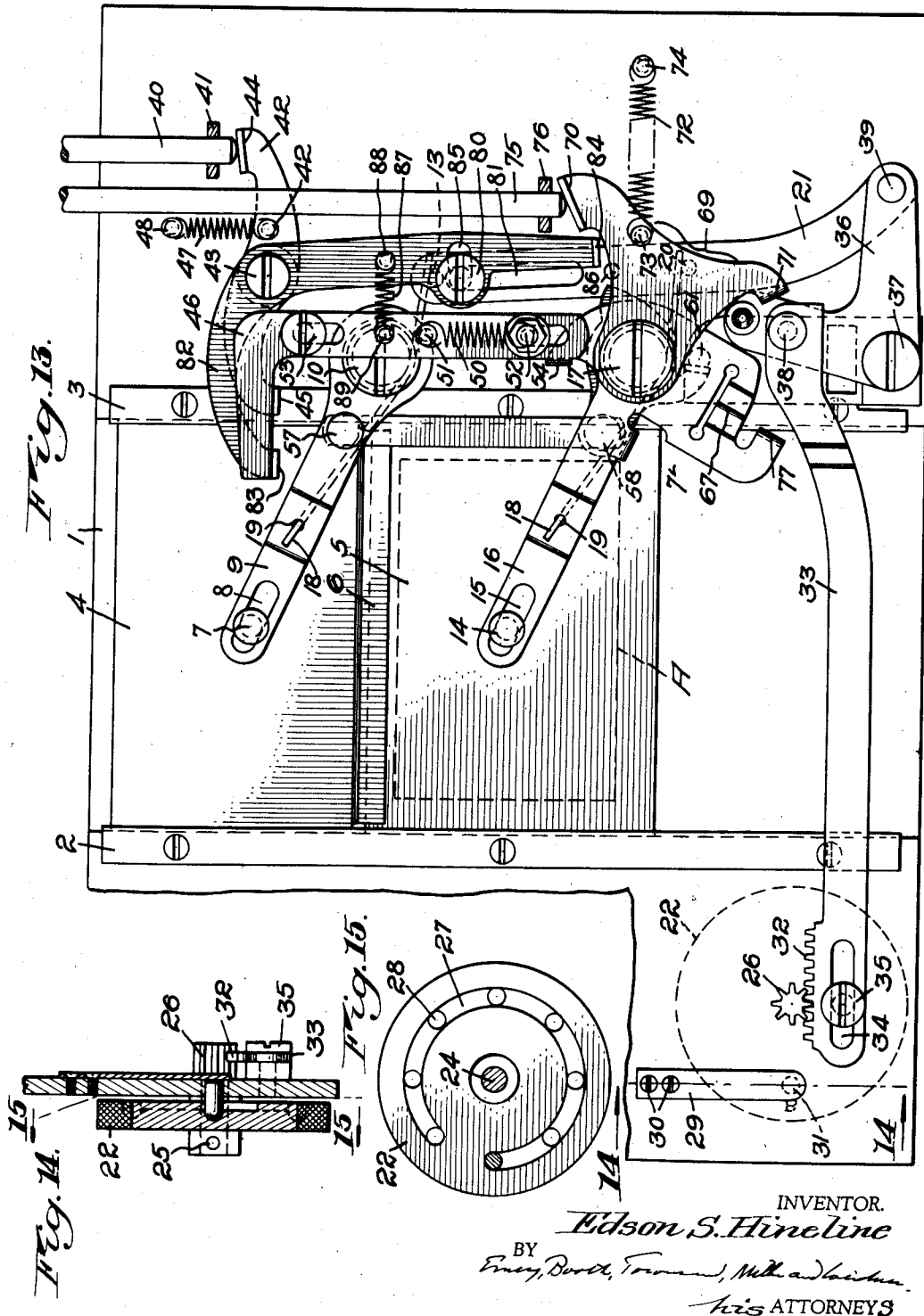
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FOCAL PLANE SHUTTER OF VARIABLE APERTURE TYPE

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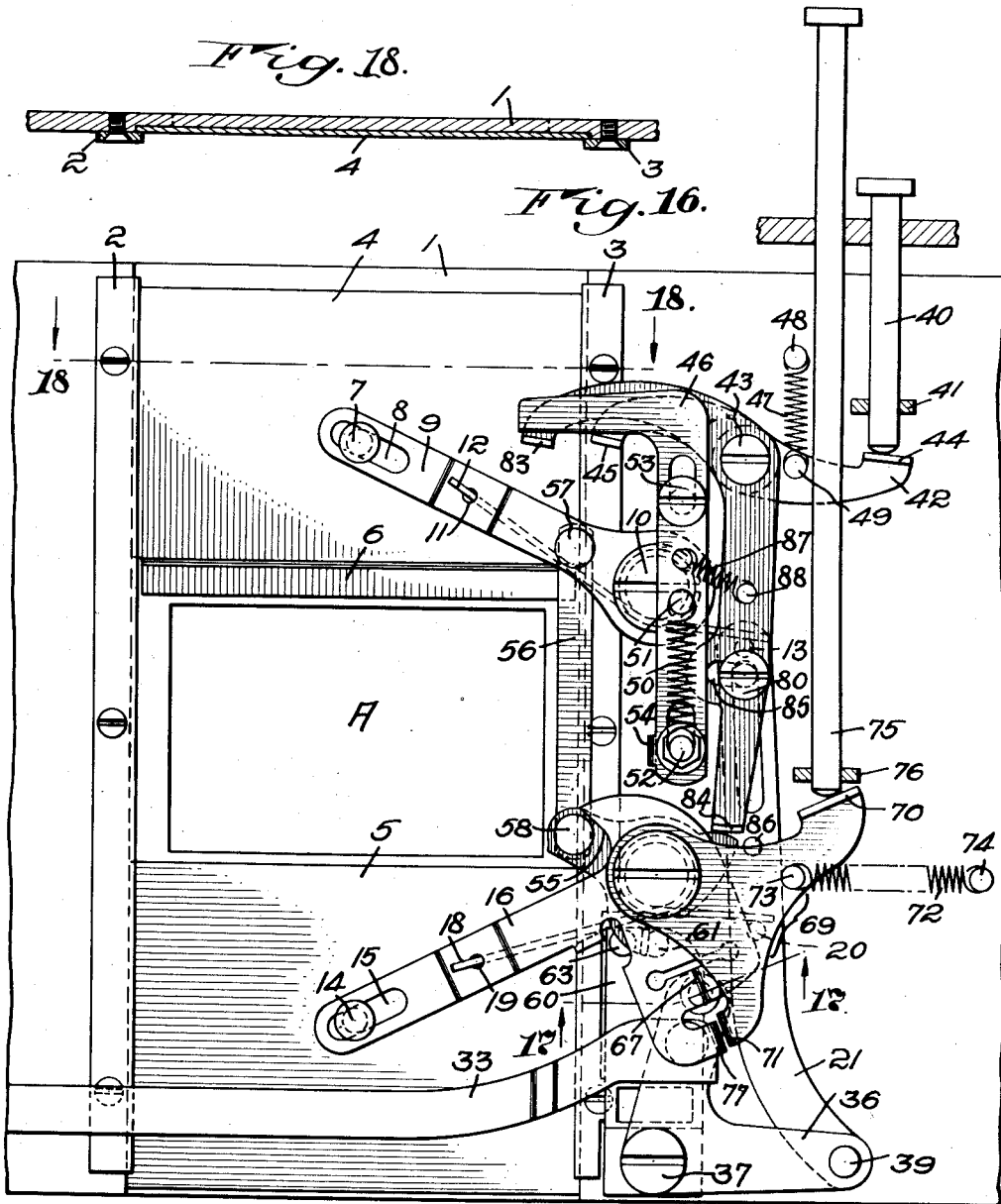
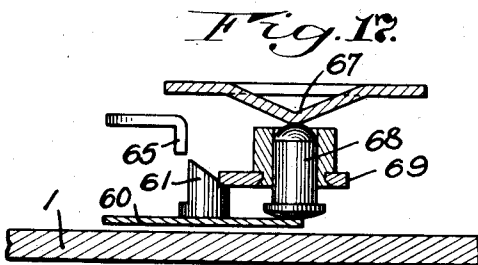
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FOCAL PLANE SHUTTER OF VARIABLE APERTURE TYPE

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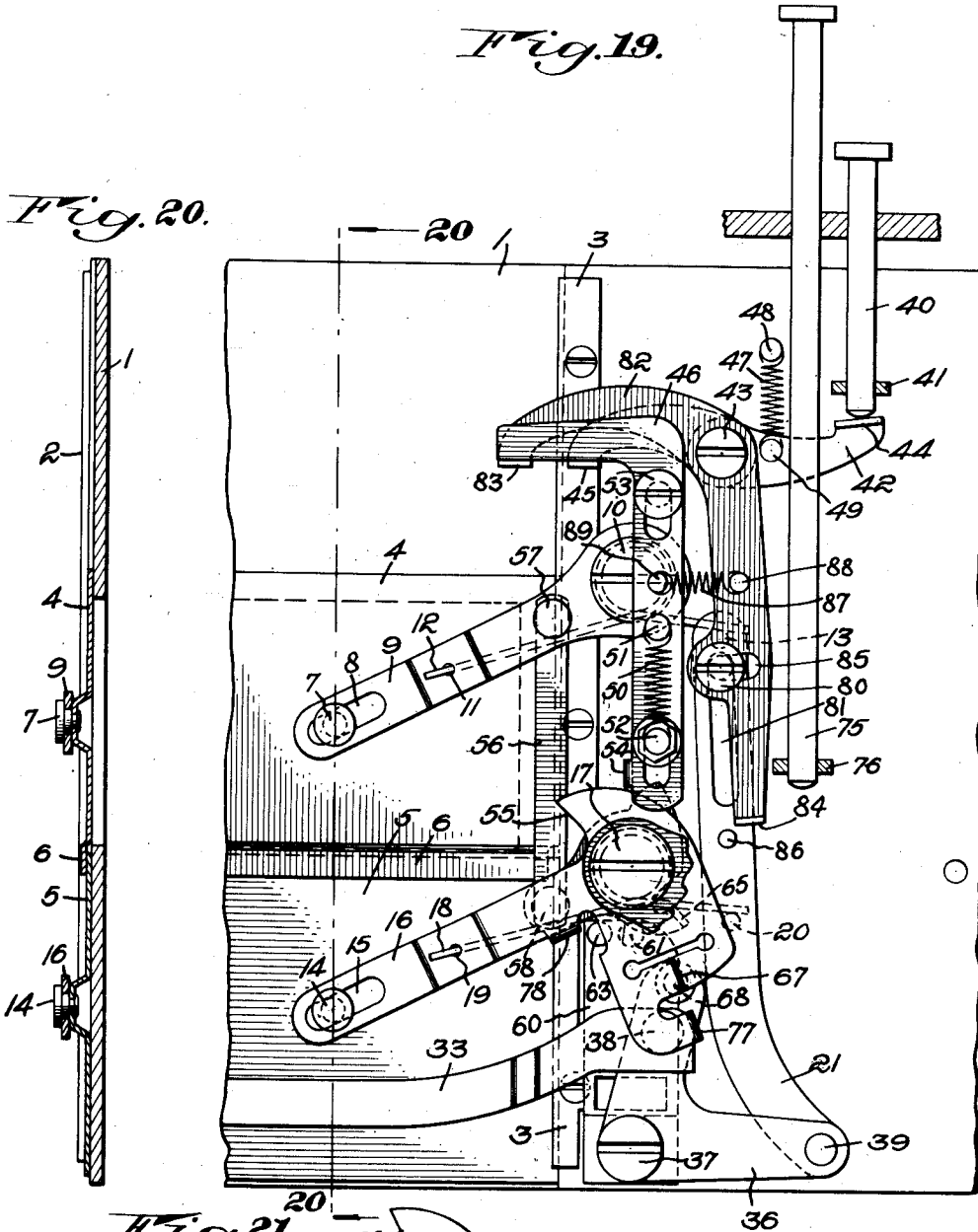
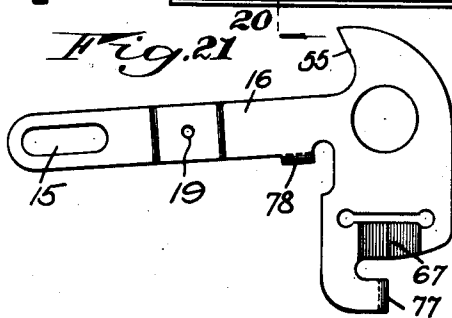
FOCAL PLANE SHUTTER OF VARIABLE APERTURE TYPE

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8 Sheets-Sheet 8

Fig. 19.

Fig. 20.



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FOCAL PLANE SHUTTER OF VARIABLE
APERTURE TYPEEdson S. Hineline, Rochester, N. Y., assignor to
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Application January 14, 1938, Serial No. 184,981

12 Claims. (Cl. 95—55)

This invention relates to focal plane shutters of the variable aperture type.

In order that the principle of the invention may be readily understood, I have disclosed in the accompanying drawings and will describe in the following specification the preferred embodiment of the invention.

It is well known to those skilled in the art that the nearer the shutter aperture is to the plane of sensitized material when a photograph is made, the more efficient is the shutter in the control of the light passing through the lens. This is especially true of wide aperture lenses.

I have invented and I herein disclose a shutter of such construction that the sensitized portion of the film strip lies within .020" of the aperture of the shutter. This shutter, of which only the preferred embodiment is herein disclosed and to which my invention is not limited, has other novel features that commend it to modern practice in camera design, and the structure thereof is very simple and rugged. All of the parts thereof are of such construction that great ruggedness can be secured in the structure without in any way impairing the efficiency of the shutter when used on a photographic camera.

These features will be pointed out in the ensuing description, wherein—

Fig. 1 is a plan view of the shutter in the set-position with the timing mechanism set for .001 of one second;

Fig. 2 is a detail of the time-set disk or speed setting dial, which is also shown as set at .001 of a second;

Fig. 3 is a plan view of the shutter showing the shutter release depressed and the lower shutter leaf as started on its downward movement;

Fig. 4 is a plan view of the shutter, the lower leaf having reached the limit of its movement and having been followed by the upper leaf, thus capping the exposure opening;

Fig. 5 is a fragmentary section of Fig. 4 showing the position of the parts before the shutter release has been pressed;

Fig. 6 is a like section showing the position of the parts at the time the action of the upper shutter leaf causes the lower shutter leaf to be released;

Fig. 7 is a cross sectional detail taken through Fig. 3 and showing the shutter arm tie-bar;

Fig. 8 is a detail of the upper shutter blade releasing pawl spring;

Fig. 9 is a section taken through Fig. 8 on the line 9—9 thereof;

Fig. 10 is a plan view of the shutter with the

release button depressed and the lower shutter leaf shown as having traveled to the position for operating the shutter-release mechanism for the upper shutter leaf, the shutter being set for a speed of approximately $\frac{1}{60}$ of a second;

Fig. 11 is a plan view of the shutter with some of the parts removed, so as more clearly to show the structure of the upper leaf release mechanism;

Fig. 12 is a plan view of the shutter with the shutter set rod in the position occupied when the shutter is in the set position;

Fig. 13 is a plan view of the shutter showing the timing mechanism therefor in position for a so-called bulb exposure;

Fig. 14 is a cross section of a portion of Fig. 13 on the line 14—14 thereof;

Fig. 15 is a rear view of the time-set disk or speed setting dial;

Fig. 16 is a plan view of the shutter with the timing mechanism in position for a bulb exposure and with the shutter release lever depressed and the lower leaf dropped all the way down;

Fig. 17 is a detail of Fig. 16 on the line 17—17 thereof;

Fig. 18 is a fragmentary transverse section of Fig. 16 on the line 18—18 thereof;

Fig. 19 is a partial plan view of the shutter with the timing mechanism set for bulb action, the shutter release lever having been released and returned to its normal position, thus releasing the upper shutter leaf which is shown as having dropped down to capping position;

Fig. 20 is a vertical section taken through Fig. 19 on the line 20—20 thereof; and

Fig. 21 is a detail in plan of the lower shutter arm.

Without limiting my invention thereto, I will now proceed to describe the preferred embodiment of my invention.

In the drawings, the shutter base-plate is indicated at 1 in the several figures. It is provided with retaining strips 2, 3 secured thereto by suitable screws so as to receive for vertical travel therein the upper shutter leaf 4 and the lower shutter leaf 5. Said upper shutter leaf 4 has at its lower edge a lip 6 that overlies the shutter leaf 5 at the proper time so as to form a light-tight connection when the shutter is returned to the set-position shown in Fig. 1.

The said upper shutter leaf 4 is provided with a stud 7 which rides in a slot 8 in an arm 9. The said arm 9 is pivotally mounted on a stud 10 that is held in place by a suitable screw as indicated in the several figures. Through a hole 11 pro-

vided in said pivoted arm 9 passes a spring 12 that is coiled around the stud 10, as clearly indicated in dotted lines, and thence over a pin 13, also indicated in dotted lines, so as to cause a downward pressure on the shutter arm 9.

Attached to the lower shutter leaf 5 is a stud 14 riding in a slot 15 formed in an arm 16 pivoted on a suitable stud 17 held in place by a screw shown in the several figures. The said arm 16 has a spring 18 passing through a hole 19 in said arm, and thence around the stud 17 as indicated in dotted lines in Fig. 1 and elsewhere, and most clearly shown in Fig. 5, and thence over a pin 20, shown in dotted lines in Fig. 1 and elsewhere.

The two pins 13 and 20 are carried by a so-called shutter adjusting spring bar 21. Any change in position of the said bar 21 will cause a change in the tension of the coiled springs 12 and 18. The said shutter-adjusting spring bar 21 is positioned by a shutter speed dial or time-set disk which is most clearly shown in Figs. 2, 14 and 15 at 22. The said dial or disk 22 is provided with a hub 23, into which is fastened a short stud 24 by a suitable pin 25, shown in Fig. 14. Integral with the said stud 24 is a pinion gear 26, best shown in Figs. 1 and 12. On the back face of the dial or disk 22 is provided a concentric groove 27, shown in dotted lines in Fig. 2 and also in full lines in Fig. 15. There are provided a number of holes also indicated in dotted lines on the back face of the said dial at 28 as spaced along the bottom of the groove 27. Each of the said holes represent a different shutter speed, indicated as B (bulb) and $\frac{1}{25}$, $\frac{1}{50}$, $\frac{1}{100}$, $\frac{1}{200}$, $\frac{1}{300}$, $\frac{1}{500}$ and $\frac{1}{1000}$ of a second.

To the shutter base-plate 1, shown in Figs. 1 and 13 at the lower left corner thereof, is fastened a flat spring 29 by means of screws 30. On the lower end of said spring is provided a pawl-like member indicated in dotted lines at 31. The said pawl-like member enters as a detent in the holes 28 to cause the dial 22 to be held stationary in whatever position it is set.

Meshing with the said pinion 26 is a short rack 32 which is an integral part of the shutter adjusting arm 33, shown as occupying a substantially horizontal position in Figs. 1, 12, 13 and elsewhere. The said arm 33 is provided with a longitudinally extending slot 34 which rides on a suitably positioned stud 35. The said arm 33 is connected to a bell crank lever 36 suitably pivoted upon a stud 37 upon the shutter base-plate 1 by a stud 38. The said bell crank arm 36 is connected at its opposite end by a stud 39 to the shutter-adjusting spring bar 21 previously referred to.

It will be understood that any movement of the shutter setting dial or disk 22 will be conveyed through the several parts so as to impart an up or down motion to the shutter-adjusting spring bar 21 which in turn varies the tension upon the springs 12 and 18 of the upper and lower shutter leaves 4 and 5.

As the shutter is shown in Fig. 1, it had previously been set and is in proper position to make an instantaneous exposure of the duration of .001 of a second. The springs 12 and 18 are therefore at maximum tension.

In order to make an exposure, a vertical push rod, which is indicated in the several figures at 40 and which is guided by a suitable boss 41, is pressed downward, causing a rocker arm 42, that is carried by a stud 43, to be moved in a clockwise direction viewing Figs. 1, 3, etc. A laterally extending lip 44 is provided upon the extremity

of the rocker arm 42, in order to assure adequate alignment. On the opposite end of the said rocker arm 42 is provided a laterally extending lip 45 which is caused to be held in the position shown in Fig. 1 by means of a spring 47, which is attached to suitable studs 48, 49, one upon the framing and the other upon the said rocker arm 42. When the said push rod 40 is depressed and the rocker arm 43 is turned in a clockwise direction, a bar 46 is caused to be raised against the action of a coiled spring 50 that is attached to a stud 51 on the said bar 46 and also to a fixed stud 52 which is fastened to the shutter base-plate 1.

The said bar 46 is supported for up and down movement upon studs 52 and 53 suitably spaced as shown in Figs. 1, 3 and elsewhere, and which are held in place by suitable screws. At the lower end of the said bar 46, there is provided a lateral projection 54 which serves as a detent to cooperate with a cam face 55 that is most clearly shown in Figs. 3, 4 and 10, but which is also indicated in Fig. 1 and elsewhere, and which will be more fully referred to hereinafter.

The push rod 40 having been depressed, causes a clockwise movement of the rocker arm 42, and hence an upward motion of the lip 45, thereby also imparting an upward motion to the vertically positioned bar 46, and thereby moves the formation or projection 54 away from the said cam face 55. This movement of the parts releases the pivoted arm 16 of the lower shutter leaf 5, so that said arm 16 and leaf 5 are free to move in a downward direction. The said arm 16 in its downward movement carries with it the stud 14 and the said lower shutter leaf 5, as clearly indicated in Fig. 3.

Attached to the upper pivoted arm 9 of the upper shutter leaf 4 is a vertically positioned link 56, shown in Fig. 1 and elsewhere, but most clearly shown in Figs. 10 and 11. The said connecting link 56 is attached to the said arm 9 by means of a stud 57 and by means of a stud 58 to a cam member 59, which is most clearly shown in Fig. 11.

Referring to Fig. 8, which is a fragmentary view of the shutter base-plate 1, there is therein shown a flat spring 60 provided with a detent or pin 61. The said flat spring 60 is fastened to the shutter base-plate 1 by means of the said shoulder screw 62, shown in Figs. 5, 6 and elsewhere. There is also provided a stud 63, best shown in Fig. 9, the function whereof is to prevent the spring 60 from rotating on its axis at the stud 63. The stud 63 passes through a slot 64 in the spring 60 and is itself anchored to the shutter base-plate 1.

The cam 59 which, as stated, is best shown in Fig. 11, is provided with a bent over portion 65, best shown in Figs. 5 and 6, that rides against the said detent 61, most clearly shown in Figs. 5 and 6 as provided upon the flat spring 60. The shutter arm 16 for the lower shutter leaf 5, as most clearly shown in Fig. 21, has a cam formed on its lower portion below its pivot, as indicated at 67. When the said lower shutter leaf arm 16 is released by moving the lip 54 away from the cam face 55 (see Figs. 3 and 10), and moves in a downward direction carrying with it the cam formation 67, such movement causes a plunger pin 68, which is most clearly shown in Figs. 5 and 6 and which is slidably mounted in a bushing carried by the bell crank 36, to be depressed or moved inward, thereby moving the flat spring 60 with its detent or pin 61 away from the face of the turned down portion 65 of the cam 59, thus

allowing said cam 59 to rotate and carry with it the connecting upright link 56, the upper shutter leaf arm 9 and the upper shutter leaf 4. Such motion takes place at a period in the cycle of movement, depending upon the position of the bell crank 36, shown in Figs. 1, 3 and elsewhere. The means for transmitting motion to the said bell crank arm 36 has been fully set forth. The said cam 67 upon the lower shutter leaf arm 16 travels with the said arm and strikes the plunger pin 68, thereby moving the flat spring 60 and with it the detent or pin 61, at a period in the cycle of movement dependent upon the position of the bell crank 36. It will thus be seen that by altering the position of said bell crank 36 the period of the release of the upper shutter leaf 4 is controlled with respect to the position of the lower shutter leaf 5, because the said plunger pin 68 is positioned further about the arc that is struck from the screw 37 as a pivot, and so is engaged at an earlier or at a later period by the cam 67 on the lower shutter leaf arm 16. For example, if a very rapid exposure is being made, the arm 36 is in the position shown in Fig. 1, and when the lower shutter leaf arm 16 is released as has been previously described, carrying with it the cam 67 formed thereon, it will contact with the plunger pin 68 almost as soon as the said arm 16 is released. If, however, the said bell crank 36 is caused to be moved by the shutter setting dial 22 of Figs. 2, 14 and 15, to the position shown in Fig. 12, such operation takes place at a later time with respect to the movement of the upper shutter leaf 4. Therefore, a greater aperture will result,—that is, a slower shutter speed. Such adjustment is sufficient to allow the shutter parts to be adjusted so that the entire width of the exposure aperture can be used as an exposure opening. That is to say, the lower shutter leaf 5 can be dropped down to the extent of the lower end of the aperture, as shown in full lines at A in Fig. 16 and in dotted lines in Fig. 12, before tripping the upper shutter leaf 4, thus giving the longest exposure. Such extreme position is not shown in the drawings, but any position can be obtained from the very narrowest shutter stop to the extreme width of shutter exposure.

I have described the manner of obtaining an instantaneous exposure with the disclosed structure, assuming that the shutter is in the set position. After the procedure hereinbefore described has taken place, the shutter parts will then be in the position shown in Fig. 4, the shutter leaves 4 and 5 being in their most downward position.

In order to make a second exposure, it is necessary to return the said parts to the position shown in Fig. 1. In order to accomplish this, there is provided in the disclosed embodiment of the invention a bell crank 69, clearly shown in Figs. 1, 3, 4 and elsewhere. The said bell crank 69 is provided with a turned-over lip 70 at the extremity of one arm thereof and an oppositely turned lip 71 at the extremity of the other arm thereof. The said bell crank 69 is pivotally mounted upon the stud 17, as best clearly shown in Figs. 5 and 6. The said bell crank 69 is caused to be turned to the position shown in Fig. 3 by means of the spring 72, shown in Figs. 1, 3 and 4 as attached to the bell crank 69 by a stud 73 and by a stud 74 to the shutter base-plate 1.

The turned over lip 70 of the bell crank 69, as shown in Figs. 1 and 3, has resting thereon a vertically positioned rod 75 suitably guided as indi-

cated at 76 in Figs. 3, 4, 12, etc. The said rod 75 constitutes the shutter re-set rod. When the said rod 75 is pushed in a downward direction, it moves the bell crank 69 into the position shown in Fig. 12, wherein the lower lip 71 of the bell crank 69 contacts with a turned over lip or boss 77 of the lower shutter leaf arm 16, thereby causing said arm 16 to be moved upward. The said lip or boss 77 on said arm 16 is most clearly shown in Fig. 21.

Also provided upon the said lower leaf shutter arm 16, as clearly shown in Fig. 21, is a turned over lip or projection 78. Said lip contacts at the proper time with the cam member 59, best shown in Fig. 11. The said cam member 59, when turned in a clockwise direction, moves upward the connecting link 56 and through the already described connections moves the upper leaf shutter arm 9 to the upper position, at which time the cam formation 67 of the lower leaf shutter arm 16 is held in position by the hereinbefore described formation 54 formed as a turned over portion of the upright bar 46.

All the parts have now been returned to the position shown in Fig. 1, and the shutter is now ready for the second exposure.

In order to make a bulb exposure, the shutter dial 22, best shown in Figs. 2, 14 and 15, is turned to such a position that the indication B lies opposite the heavy arrow 79 in said Figure 2. Said turning operation causes the shutter tension adjusting arm 33 to be moved into the position shown in Fig. 13. When said arm 33 is in such position the bell crank 36, carrying the plunger pin 68, Figs. 5 and 6, will be in the position shown in Fig. 13. This position of the parts corresponds to a position that will allow the lower shutter leaf 5 to travel all the way downward before tripping the upper shutter leaf 4. In order to prevent the said upper shutter leaf 4 from being operated at such setting of the parts, I have provided mechanism, one embodiment of which I will now disclose but to which my invention is not limited, for the purpose of holding the upper shutter leaf 4 in position until the shutter release bar 40 has been released.

It will be noted that the springs 12, 18 for the shutter leaf arms 9, 16, are, in Fig. 13, in the position of least tension, thus causing both shutter leaves 4 and 5 to be moved at a much lower velocity than at any of the other settings.

Referring to the embodiment of means herein disclosed to make a bulb exposure, it is to be noted that the upper end of the shutter adjusting spring bar 21 is pivoted on a shoulder screw 80, clearly shown in Fig. 1. The said screw extends through a longitudinally positioned slot 81, best shown in Fig. 1, and the bar 21 is adapted to move lengthwise with respect to the said screw 80. Pivoted upon the stud 43 previously described, is a holding member 82 of general inverted L shape and having a bent over lip 83 at one extremity thereof, namely, the left hand end viewing Fig. 1, and also having a turned over lip 84 at its opposite extremity, in the vicinity of the bell crank 69. The said holding member 82 is also provided with a transversely extending slot 85. Through the said slot 85 passes the said shoulder screw 80. The said screw 80 is tapped into the shutter base plate 1. The purpose of the screw 80 and slot 85 is to limit the swinging motion of the holding member 82. Attached to the shutter adjusting spring bar 21 is a pin 86, best indicated in Figs. 3, 12, 16 and 19, and which is adapted to be engaged by the lip 84 on the piv-

oted holding member 82. The said pin 86 is in the position indicated in Fig. 3 when the shutter release bar or exposure rod 40 is depressed.

Referring to Figs 13, it will be observed that a spring 87 is attached to the turned down portion of the holding member 82 at stud 88 and to the member 46 at stud 89. The purpose of the spring 87 is to cause the holding member 82 to be drawn toward the member 46. When the shutter is adjusted as previously described for making a bulb exposure, the shutter adjusting spring bar 21 is drawn downward carrying with it the pin 86 which will then be out of contact with the holding member 82, thus allowing said holding member 82 to be moved inwardly upon the application of pressure on the exposure rod 40 acting upon the rocker arm 42. At the same time that such motion is taking place, the member 46 is drawn upward by reason of the action of the turned over lip 45, carrying with it the lug or projection 54, thus releasing the lower shutter leaf 5. The shutter is now in the position shown in Fig. 16. The turned over lip 84 of the said holding member 82 now engages the face 90 of the cam 59, most clearly shown in Fig. 11. The shutter is held open as long as the shutter release rod or arm 40 is held depressed. When pressure is released from the said shutter release arm 40, the rocker arm 42 is pulled upward through the action of the spring 47, thus allowing the lip 45 of the member 46 to move downward, also allowing the spring 50 to return the member 46 to its normal position, carrying with it the holding member 82 by reason of the lip 83 contacting with the extremity of the said member 46. This draws the lip or turned over portion 84 at the lower extremity of the holding member 82 away from the said cam face 90 of the cam 59, thus allowing the upper shutter leaf 4 to close exactly the same as in instantaneous pictures.

The manner of releasing the upper shutter leaf lever arm 9 has already been fully described. The same mechanism functions in bulb exposure excepting that the said upper lever arm 9 for the upper leaf of the shutter is held up until pressure on the shutter release arm 40 is relieved.

While I have described the shutter without reference to the means for operating the same, it is to be understood that within the scope of the invention the same may be operated either manually or mechanically.

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. A shutter comprising in combination, two shutter leaves mounted for separate and also for conjoint, wholly sliding, non-pivotal movement; separate spring pressed operating levers for said leaves respectively, each connected to its own shutter leaf; common means for adjusting the pressure of both said springs upon their respective levers simultaneously, said common adjusting means including a bar-like member mounted for to and fro adjusting movement and having means to act upon both of said springs so as to vary said spring pressure by adjusting movement of said bar-like member; means connecting said operating levers for said leaves so that said upper or second leaf is operated from the said lower or first leaf operating lever; means withholding the action of said first leaf operating lever for opera-

tion; and means to release said withholding means.

2. A shutter comprising in combination, two shutter leaves mounted for separate and also for conjoint, wholly sliding, non-pivotal movement; separate spring pressed operating levers for said leaves respectively, each connected to its own shutter leaf; common means for adjusting the pressure of both said springs upon their respective levers simultaneously; said common adjusting means including a bar-like member mounted for to and fro adjusting movement and having means to act upon both of said springs so as to vary said spring pressure by adjusting movement of said bar-like members, an indicating dial to indicate the said spring adjustment and a bell crank connecting said dial and said bar-like member whereby the moving of said dial imparts the adjusting movement to said bar-like member; means connecting said operating levers for said leaves so that said upper or second leaf is operated from the said lower or first leaf operating lever; means withholding said first leaf operating lever from operation; and means to release said withholding means.

3. A focal plane shutter comprising in combination, two shutter leaves mounted substantially at the focal plane for separate and also for conjoint, wholly sliding, non-pivotal movement; separate spring pressed lever arms for said leaves respectively, each connected to its own shutter leaf; common means for adjusting the pressure of both said springs upon their respective lever arms simultaneously; and means connected in operation with said adjusting means for visually indicating the said adjustment; means connecting said operating lever arms for said leaves so that said upper or second leaf is operated from the said lower or first leaf operating lever arms; means withholding said first leaf operation; and means to release said withholding means, said releasing means including a push rod for manual or mechanical operation.

4. A focal plane shutter comprising in combination, two shutter leaves mounted substantially at the focal plane for separate and also for conjoint, sliding non-pivotal movement; spring pressed lever arms for said leaves respectively; common means for adjusting the pressure of both said springs simultaneously; and means for indicating the said adjustment; means connecting said operating means for said leaves so that said upper or second leaf is operated from the said lower or first leaf operating means; means withholding said first leaf from operation; and means to release said withholding means; means to operate the releasing means, and operating connections between said leaves including a cam moved by the movement of the lever arm for the lower leaf and a plunger pin operated by said cam to control the operation of said upper leaf.

5. A shutter comprising in combination, two shutter leaves mounted for separate and also for conjoint, wholly sliding, non-pivotal movement; spring pressed operating elements for said leaves respectively, each connected to its own shutter leaf; common means for adjusting the pressure of both said springs upon their said operating elements simultaneously; and operating connections between said leaves so that the upper or second leaf is operated consequent upon the movement of the lower or first leaf; said operating connections including a cam and a plunger pin acted on thereby so as to release and permit the operation of the second or upper leaf.

6. A focal plane shutter comprising in combination, two shutter leaves mounted substantially at the focal plane for separate and also for conjoint, wholly sliding, non-pivotal movement; spring pressed operating elements for said leaves respectively, each connected to its own shutter leaf; common means for adjusting the pressure of both said springs upon their said operating elements simultaneously; and operating connections between said leaves so that the upper or second leaf is operated consequent upon the movement of the lower or first leaf; said operating connections including a cam 67 connected in operation to said first leaf, a plunger pin 68 operated thereby, a spring operated by said pin and a pin 61 carried by said pin, and a cam 59 adapted to be released upon movement of said pin 61.

7. A focal plane shutter comprising in combination, two shutter leaves mounted substantially at the focal plane for separate and also for conjoint, wholly sliding, non-pivotal movement; spring pressed operating elements for said leaves respectively each connected to its own shutter leaf; common means for adjusting the pressure of both said springs upon their said operating elements simultaneously; operating connections between said operating elements for said leaves so that the upper or second leaf is operated consequent upon the movement of the lower or first leaf; and a plunger rod 40 with connections therefrom to said first or lower leaf for releasing said leaf, said connections between said operating element for said leaves including an element 46 constituting withholding means and provided with a formation 54, the said lower leaf operating element having a part provided with a cooperating formation 55.

8. A focal plane shutter comprising in combination, two shutter leaves mounted substantially at the focal plane for separate and also for conjoint, sliding, non-pivotal movement; spring pressed operating elements for said leaves respectively; common means for adjusting the pressure of both said springs simultaneously; operating connections between said leaves so that the upper or second leaf is operated consequent upon the movement of the lower or first leaf; and re-setting means for the said shutter leaves, said resetting means being operatively connected with the operating element for the lower or first leaf operating means, the operating element for the lower or first leaf being a lever arm and the re-setting means including a part pivoted coaxially with the lever arm of said lower leaf.

9. A focal plane shutter comprising in combination, two shutter leaves mounted substantially at the focal plane for separate and also for conjoint, wholly sliding, non-pivotal movement; spring pressed operating elements for said leaves respectively each connected to its own shutter leaf; common means for adjusting the pressure of both said springs upon their said operating elements simultaneously; operating connections between the operating elements for said leaves so that the upper or second leaf is operated conse-

quent upon the movement of the lower or first leaf, and resetting means for the said leaves, said resetting means including a rod 75 and a bell crank 69 adapted to be operated by said resetting rod, and means whereby the resetting movement of said bell crank restores both the leaves to set position, said latter means including an abutment formation 71 upon the bell crank 69 and a co-acting abutment formation 77 upon the operating element for the lower or first leaf.

10. A shutter comprising in combination, two shutter leaves mounted for separate and also for conjoint, wholly sliding, non-pivotal movement; spring pressed operating elements for said leaves respectively each connected to its own shutter leaf; common means for adjusting the pressure of both said springs upon their said operating elements simultaneously; operating connections between the operating elements for said leaves so that the upper or second leaf is operated consequent upon the movement of the lower or first leaf, a bell crank for moving said common means to adjust simultaneously the pressure of the springs for both said operating elements, and means under the control of the operator for varying the setting of said bell crank and visually indicating such setting.

11. A shutter comprising in combination, two shutter leaves mounted for separate and also for conjoint wholly sliding non-pivotal movement; spring pressed operating elements for said leaves respectively each connected to its own shutter leaf; common means for adjusting the pressure of both said springs upon their said operating elements simultaneously; operating connections between the operating elements for said leaves so that the upper or second leaf is operated consequent upon the movement of the lower or first leaf; and means providing for bulb or time exposure, said means including a manually movable holding member mounted in operative relation to the upper or second shutter releasing means to withhold the said second shutter temporarily from action.

12. A focal plane shutter comprising in combination, two shutter leaves mounted substantially at the focal plane for separate and also for conjoint, wholly sliding, non-pivotal movement; spring pressed operating elements for said leaves respectively each connected to its own shutter leaf; common means for adjusting the pressure of both said springs upon their said operating elements simultaneously; operating connections between the operating elements for said leaves so that the upper or second leaf is operated consequent upon the movement of the lower or first leaf; and means providing for bulb or time exposure, said means including a holding member 82 and a projection with which said holding member is adapted to engage, said parts also including the arm 21 constituting a part of the common means for adjusting the spring pressure for both the leaves, and the pin 86 upon said arm 21 to cooperate with said holding member 82.

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