D. A. SINE.

CAMERA.

APPLICATION FILED APR. 26, 1916.

1,330,400.

Patented Feb. 10, 1920.

5 SHEETS—SHEET 1.

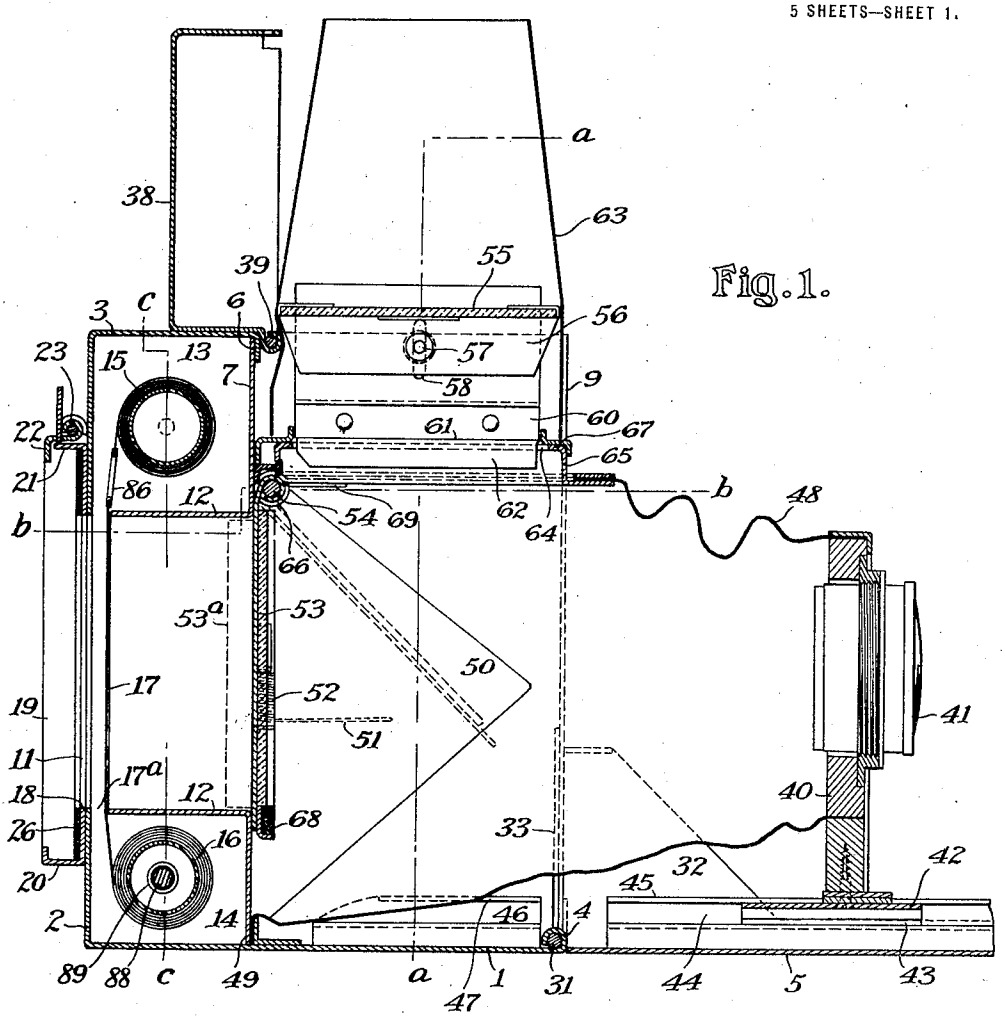

Fig. 1.

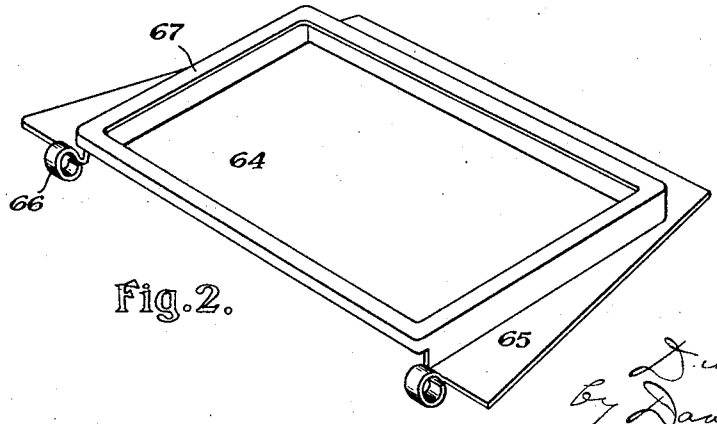

Fig. 2.

Inventor:

David A. Sine

by Davis & Simmons

his attorneys

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5 SHEETS—SHEET 2.

Fig. 3.

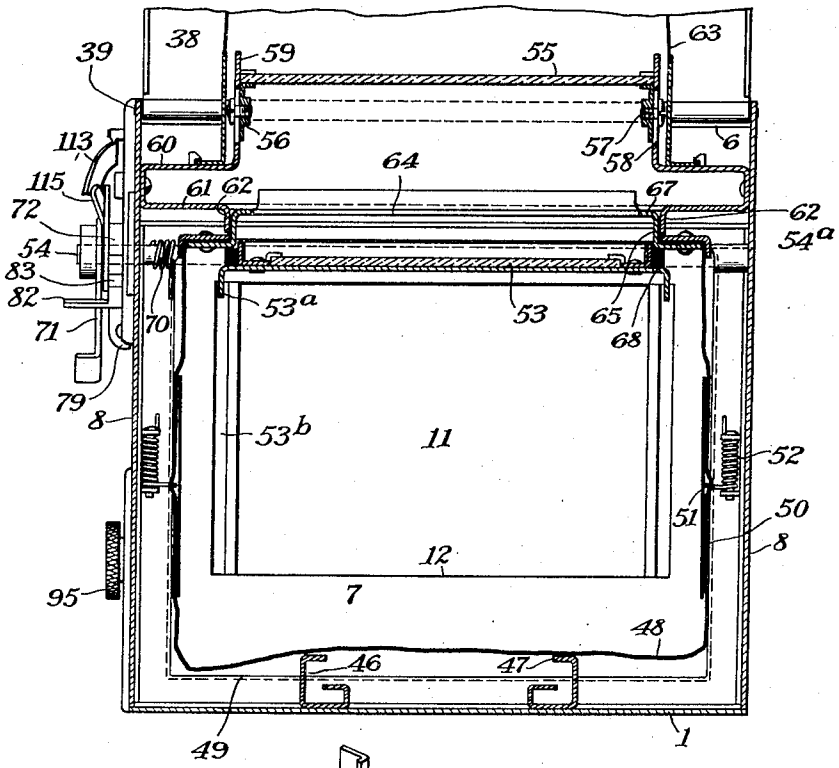
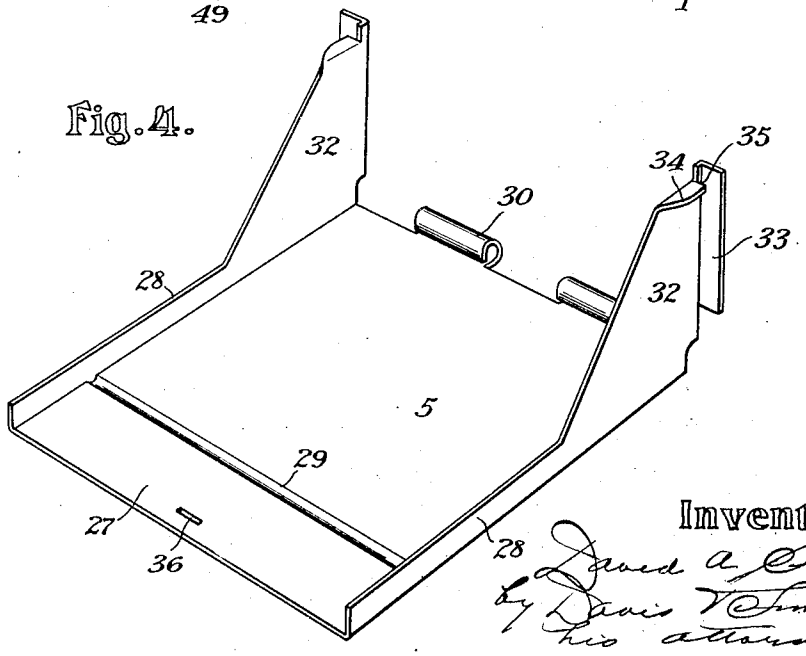


Fig. 4.



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5 SHEETS—SHEET 3.

Fig. 5.

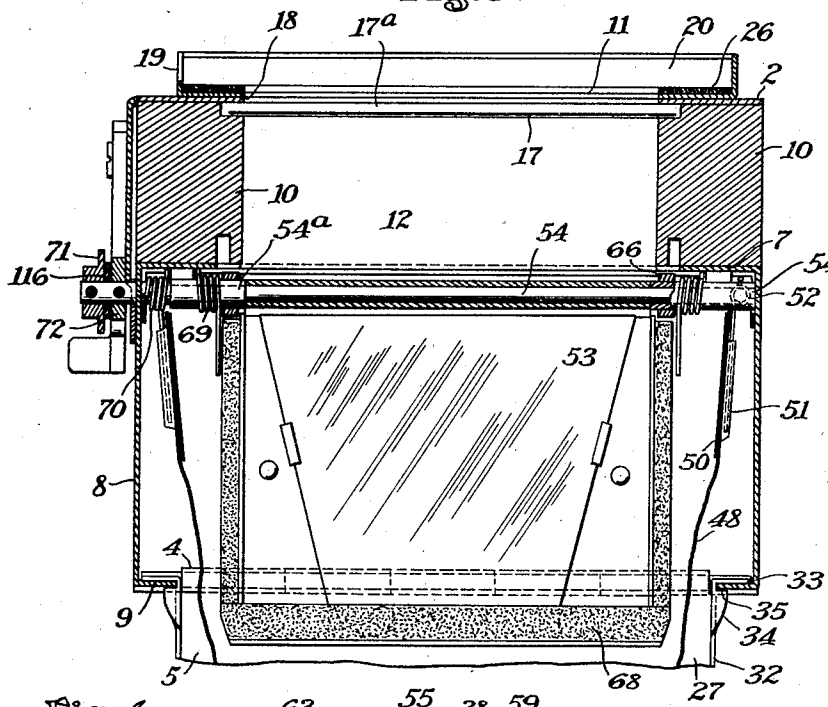


Fig. 6.

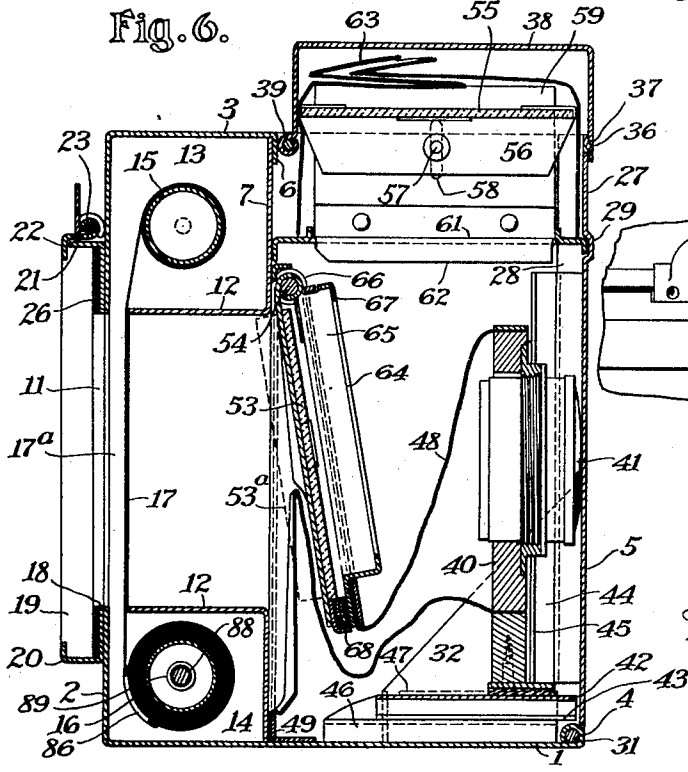
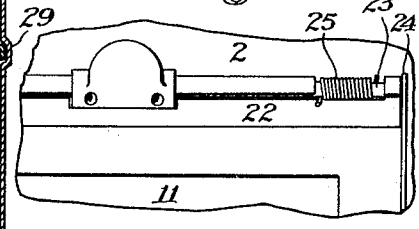


Fig. 7.



Inventor:
David A. Sine
by Davis & Thomas
his attorneys

D. A. SINE.

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5 SHEETS—SHEET 4.

Fig. 8.

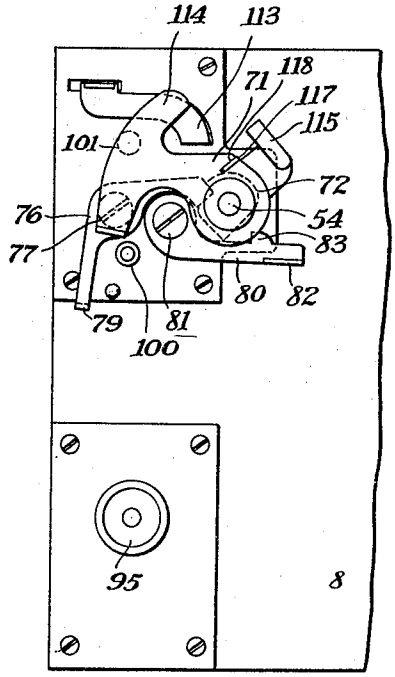


Fig. 10.

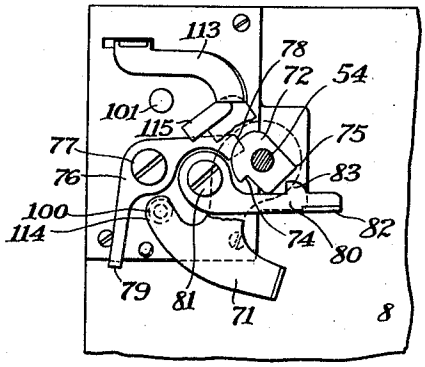


Fig. 11.

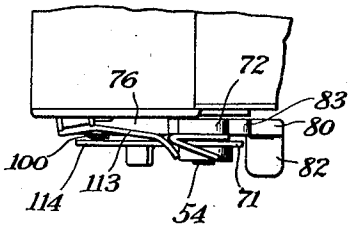


Fig. 9.

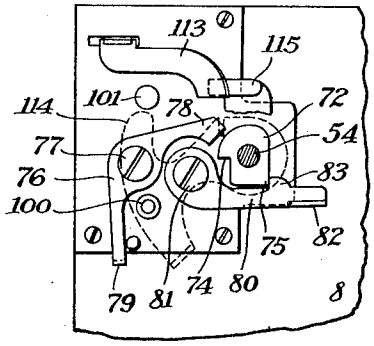
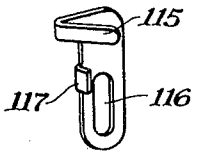


Fig. 12.



Inventor:

David A Sine

by Davis & Simms

his attorneys

D. A. SINE.

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5 SHEETS—SHEET 5.

Fig. 13.

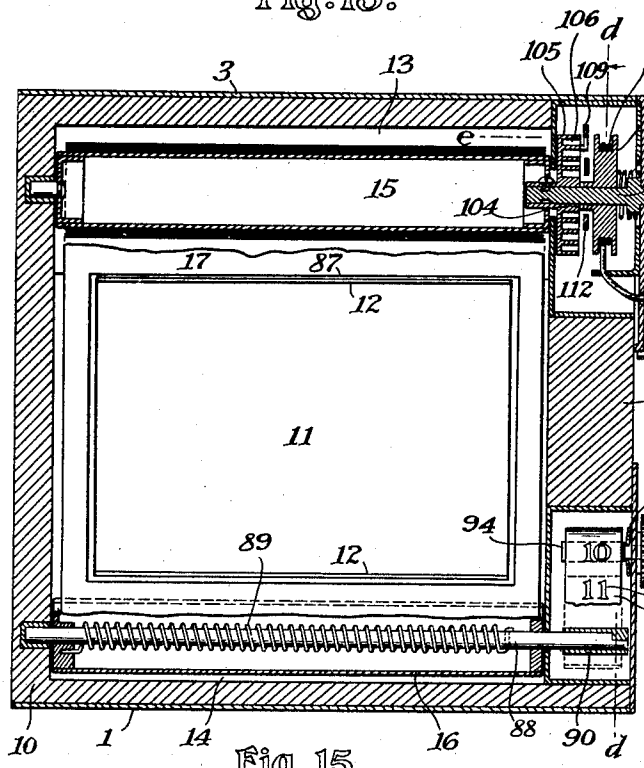


Fig. 14.

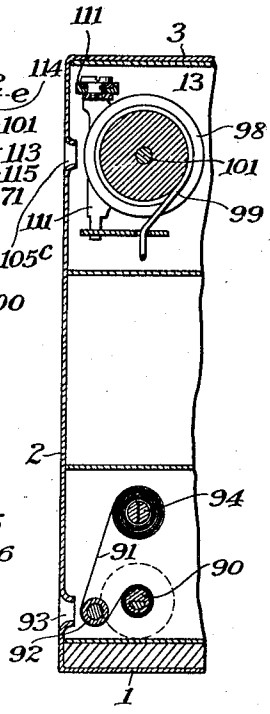


Fig. 15.

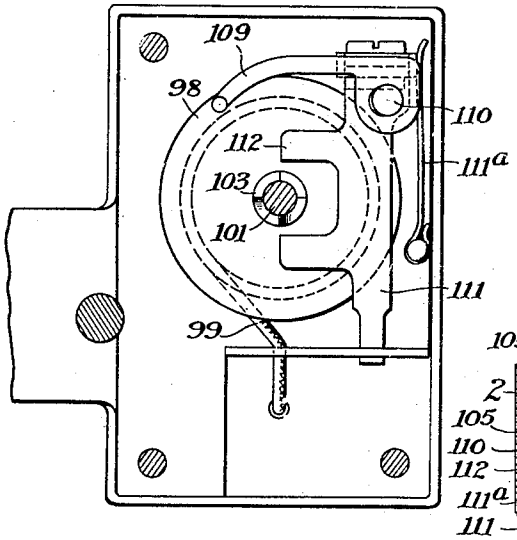


Fig. 16.

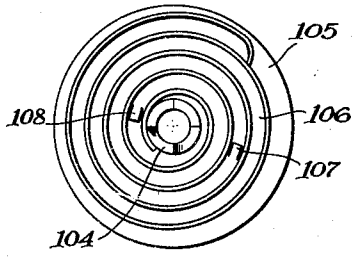
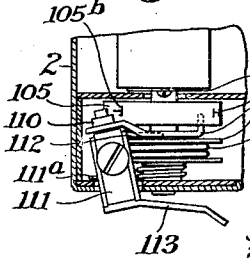


Fig. 17.



Inventor:

David A. Sine

by Davis & Sinine

his attorneys

UNITED STATES PATENT OFFICE.

DAVID A. SINE, OF GREECE, NEW YORK.

CAMERA.

1,330,400. Specification of Letters Patent. Patented Feb. 10, 1920.

Application filed April 26, 1916. Serial No. 93,780.

To all whom it may concern:

Be it known that I, DAVID A. SINE, a subject of the King of Great Britain, and resident of Greece, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Cameras, of which the following is a specification.

The present invention relates to photographic cameras and more particularly to the type in which a reflector is adapted to be interposed in the path of the image from the lens for the purpose of directing said image upon a screen in order that the proper focusing of the camera may be obtained, but it is to be understood that the invention also embodies certain features which are capable of use in cameras of other types. An object of this invention is to make provision by which cameras of the above type may be more compactly constructed, this result being secured by providing an opening in a collapsible bellows to which the image is directed in focusing. Another object of the invention is to improve the casing construction in cameras of the above type so that the casing may be more inexpensively manufactured. Still another object of the invention is to provide an improved manner of supporting a lens-board support in open positions. A further object of the invention is to improve the construction of a focal plane shutter so that the length of the latter may be materially reduced, and the different speeds may be more quickly obtained. A still further object of the invention is to construct and arrange the parts through which the operations are produced so that the user of the camera cannot manipulate the parts out of their intended order of operation.

To these and other ends, the invention consists of certain parts and combinations of parts, all of which will be hereinafter described, the novel features being pointed out in the appended claims.

In the drawings:—

Figure 1 is a vertical section through a camera constructed in accordance with this invention, the parts being in the positions which they occupy prior to the focusing of the camera;

Fig. 2 is a perspective view of the frame on the collapsible bellows through which the image is directed to the focusing screen;

Fig. 3 is a section on the line *a*—*a*, Fig. 1;

Fig. 4 is a perspective view of the lens-board support;

Fig. 5 is a section on the line *b*—*b*, Fig. 1;

Fig. 6 is a sectional view showing the camera in folded condition;

Fig. 7 is a detail view of one of the guides for the plate holder;

Fig. 8 is a view of the operating devices in set position;

Fig. 9 shows the position of the operating devices during focusing;

Fig. 10 shows the operating devices in the positions they occupy after exposure;

Fig. 11 is another view of the operating devices in the positions shown in Fig. 9;

Fig. 12 is a detail view of the device which effects the release of the shutter;

Fig. 13 is a section on the line *c*—*c*, Fig. 1;

Fig. 14 is a section on the line *d*—*d*, Fig. 13;

Fig. 15 is an enlarged detail view of the shutter operating and releasing mechanism;

Fig. 16 is an enlarged detailed view of the spiral which controls the shutter; and

Fig. 17 is a section on the line *e*—*e*, Fig. 13.

The casing of the camera may be formed in any suitable manner but, in the present instance, a single sheet of metal forms the bottom wall 1 and the rear wall 2, together with a portion 3 of the top wall, the forward edge of said sheet being rolled at 4 to provide part of the hinge of the lens-board support 5 to be hereinafter described, while the upper edge is turned downwardly or inwardly at 6. A second sheet of metal forms a partition wall 7 arranged parallel with the rear wall 2 to form a space between them, its upper edge being engaged by the flange 6 and its side edges being turned forwardly at 8 to form side walls, the forward edges of said side walls being turned inwardly at 9. Blocks 10 are inserted between the rear wall 2 and the partition 7 to close the space between these two parts.

The rear wall is provided with an opening 11 and the inner faces of the blocks 10 coincide with the vertical sides of this opening while the partition 7 is provided with an opening coincident with the opening 11 and has flanges 12 bent rearwardly at the upper and lower edges of the opening so that chambers 13 and 14 are provided for the rollers 15 and 16 respectively on which the curtain shutter 17 is mounted, the ends of

the flanges 12 being spaced at 13 from the rear wall 2 in order to provide a passageway through which the curtain shutter may pass.

Any suitable means may be employed for holding the sensitized material. In this instance, a metal plate 18 is secured to the rear wall 2 and has flanges 19, 20 and 21 thereon, the flange 20 being turned inwardly to serve as a guide for the plate holder, and a flange 21 having a guide 22 operating over the upper edge thereof and pivoted at 23 on a shaft which is journaled in lugs 24 on the plate 18. A coiled spring 25 serves to move the guide flange 21 toward the guide flange 20 and light-excluding material 26 is arranged on the plate 18 about the opening 11.

The lens-board support 27 is preferably formed of sheet metal with side flanges 28 to strengthen the same in one direction and a pressed-up rib 29 for strengthening the board crosswise. One edge of the board is rolled at 30 to provide sleeves which turn on the hinged pintle 31, the latter extending also through the sleeves 4 on the bottom member 1. At the rear of the lens-board support lateral extensions 32 are provided at opposite sides of the support, these extensions having flanges 33 for coöperating with the inner faces of the inwardly-turned flanges 9 on the side walls 8 to limit the downward swinging of the lens-board support. Also formed on the extensions 32 are cam faces 34 adapted to ride against the edges of the flanges 9 in order to press the extensions 32 toward each other, so that shoulders 35 may engage the front faces of the flanges and hold the lens-board support in its lowest or supporting position. By pressing inwardly on the yielding extensions 32, these shoulders 35 may be carried out of engagement with the flanges 9 and the lens-board support swung to a closed position where the flanges 28 are received between the flanges 9. The lens-board support may be held in a raised position by a projection 36 struck up therefrom and received within an opening 37 on the flange of a flanged cover 38, which closes the space between the upper ends of the side walls 8 and is hinged at 39 in proximity to the upper end of the partition 7.

The lens-board or carrier 40, which carries the lens 41, is provided with a plate 42 at its lower part formed with inwardly-turned flanges 43 at opposite sides, received within opposed channels 44 formed in guides 45 secured to the lens-board support in parallel relation. Within the casing, channels 46 are provided on guides 47 for receiving the guide 43, when the lens board 40 is moved within the casing. A collapsible bellows 48 is connected at one end to the lens board and at its other end at 49 with the partition 7 about the opening in the latter. It is desirable that this bellows or collapsible chamber between the lens and the partition 7 shall collapse inwardly along its vertical sides and, to this end, said sides are each reinforced by two spaced strips 50, and an arm 51 on a coiled spring 52 acts on the bellows between the reinforcing portions 50 with the idea of automatically expanding the side wall as the lens support 40 is withdrawn from the casing. Before moving the lens board back into the casing, the side walls of the bellows are pressed inwardly against the actions of the springs 52.

A feature of this invention is the provision of means whereby the line of vision between the reflector and the screen or ground glass may extend through the collapsible chamber or bellows so that the camera may be constructed in more compact form. This is effected, in this instance, by securing the reflector 53 to a rod 54 journaled in bearing sleeves 54^a, so that the reflector will, in one position, close the opening in the partition 7 to prevent the passage of light from the lens to the sensitized material. Flanges 53^a are provided on opposite sides of the reflector 53 to enter grooves 53^b in the blocks 10 to further exclude light when the reflector is in the position shown in Fig. 1.

The screen or ground glass 55 is preferably secured in two end frames 56 each of which is held by a central bolt 57 permitting the ground glass to be shifted slightly about an axis longitudinally thereof, for the purpose of receiving an image from the reflector free from distortion. Slots 58 are provided in the side frames 56 to permit the vertical adjustment of the ground glass for focusing the image on the ground glass or screen. The side frames 56 are secured to supporting plates 59 which have arms 60 at their lower ends attached to the side walls 8. Also attached to these side walls above the bellows or collapsible chamber is a partition 61 having an opening directly below the screen 55, flanges 62 being bent downwardly, at opposite ends of said opening, to serve as guides for a frame on the bellows to be hereinafter described.

For the purpose of shielding the screen or ground glass from light, a hood 63 is provided, the lower portion of which surrounds the screen and its supporting plates 59 in a manner to inclose these parts against the entrance of light, whereas the upper portion of the hood is foldable so that the cover or closure 38 may swing to inclose the hood and the ground glass, as shown in Fig. 6.

With the end in view of providing optical connection between the ground glass 55 and the reflector 53, when the latter is in the position shown in dotted lines in Fig. 1, the upper wall of the collapsible chamber or bellows is provided with an opening 64 pref-

erably formed in a frame 65 which has three of its edges secured to the bellows, the opposite edge being provided with sleeve 66 turning on the bearings 54ª. This frame 65 has an inwardly-turned flange 67 for entering into light-excluding relation with the underside of the partition 61 about the opening in the latter, so that the opening 64 and the opening in the frame 61 are coincident. The underside of this frame 65 provides a flat surface with which the light-excluding material 68 is adapted to enter into light-excluding relation. Springs 69 act on the frame 65 to move the latter to the position shown in Fig. 1 in full lines, while a spring 70 acts on the shutter and reflector 53 to swing the latter upwardly into coöperative relation with the frame 65.

For moving the shutter and reflector, the shaft 54 of the latter is provided with an operating member or arm 71 on the exterior of the casing, and also with a shouldered member 72 formed with two shoulders or abutments 74 and 75. With the shoulder 74, a detent 76 engages, said detent being pivoted at 77 and having one end 78 for engagement with the shoulder 74, and the other end 79 acting as a finger piece by which the detent may be moved out of engagement with the shoulder 74. The shoulder 74, when engaged by the detent 76, holds the reflector and shutter 53 in the position shown in Fig. 1. With the shoulder 75 a detent 80 engages, said detent being pivoted at 81 at one end, and having a finger piece 82 at the other end, by which the nose 83 thereon may be moved out of engagement with the shoulder 75. Springs 84 and 85 act, respectively, on detents 76 and 80 to move them to detaining positions. The detent 80, when moved out of engagement with the shoulder 75, permits the reflector 53 to move from its inclined or intermediate position to its horizontal position against the frame 65, in order to cut off light to the screen or ground glass.

The curtain shutter 17 is, as before stated, mounted on two rollers 15 and 16, and is provided with two openings 86 and 87, the former serving for instantaneous exposures and the latter serving for time exposures. The roller 16 is hollow and is mounted upon a shaft 88 which, in turn, is surrounded by a helical spring 89 secured, at one end, to the roller 16 and at the other end to the shaft 88. By turning the shaft 88, it is possible to vary the tension of the spring 89 and in this way increase or decrease the speed of the shutter to vary the duration of the exposures. For turning the shaft, one end of the latter is provided with a drum 90 about which is wrapped a tape 91, the latter being secured at one end to said drum and, after passing from the latter, winding about an idler 92 in proximity to a view opening 93. From the idler the tape leads to a drum 94 which has an operating thumb wheel 95 on the exterior of the casing. One face of the tape is provided with indicating characters as, for instance, numerals 96 which are viewable through the view opening 93 and serve to indicate the speed of the shutter. A spring washer 97 on the shaft of the drum 94 coöperates with the inner face of the casing to hold the drum in its adjusted position.

For the purpose of setting the curtain shutter, there is provided a grooved drum 98 about which is wound a flexible cord or other device 99, which extends to the exterior of the casing where it is provided with a finger piece 100, this finger piece lying in such a position that the operating member 71 of the reflector covers said finger piece after the reflector has been set to focus the camera to prevent the resetting of the curtain shutter, while the reflector is away from the position which it occupies to exclude light from the lens opening to the sensitized material. The drum is mounted to turn in one direction on the shaft-extension 101 of the roller 15, and is also movable axially on the extension. A spring 102 serves the dual function of returning the drum to its initial position both in the direction of the length of the extension and also about the axis of the extension. On the drum a clutch face 103 is provided for coöperating with the clutch face 104 on the shaft extension. When the drum is pulled by the cord 99, motion is transmitted to the roller 15 to wind the curtain 17 and, when the cord is released, the drum 98 returns to its normal position under the action of the spring 102.

Turning with the drum 98 is a disk 105 which has a volute groove 106 in one face thereof, said groove having two lugs or stop shoulders 107 and 108 in the bottom thereof. For operating in this groove 106, a detent 109 is provided pivoted at 110 on an oscillatory member 111, said oscillatory member having extensions 112 which coöperate with one face of the drum 98. The oscillatory member 111 also extends to the exterior of the camera casing and is provided with an arm 113 formed with a deflected end. The deflected end of this arm is engaged on one side by an extension 114 on the operating member 71 and on the other side by a device 115 moving with the operating arm 71, and preferably adapted to be disconnected from said arm 71. For this purpose, a slotted portion 116 on the device 115 surrounds the shaft 54, in order that a projection 117 on the portion 115 may move out of a notch 118 in the operating member 71, whereby the portion 115 will not engage the arm 113 to release the curtain shutter on time exposure. A spring 111ª acts on the frame 111 to hold the detent 109 in the groove 106, and the

frame 111 has a slight movement with reference to the disk 105 without engaging the drum 108, this movement being provided in order that the detent 109 may ride over the stop shoulders 107 and 108 without disconnecting the winding drum 98 from the curtain roller shaft 115. On the periphery of the drum 105, two characters 105[a] and 105[b] are provided, one indicating the position of the shutter operating mechanism for instantaneous exposure and the other indicating the position of the shutter operating mechanism for time exposure, both of these characters being visible through an opening 105[c] in the camera casing.

Before the finger piece 100 can be pulled to set the curtain shutter, the operating member 71 must be shifted to close the opening in the partition 7, as in all other positions the operating member 71 overlies the finger piece 100 to prevent the operation of the latter while the reflector is away from the position in which said reflector excludes light from the sensitized material. As the operating member 71 approaches set position, it moves in the path of the arm 113 so as to hold the oscillatory member 111 in the position where the detent 109 is in the path to engage with one of the projections 107 or 108, and the arms 112 will lie so that the spring 101 will maintain the clutch faces 103 and 104 in engagement. When the drum 98 is turned, through pulling the cord 99, motion is transmitted to the disk 105, one complete pull of the cord causing one end of the detent 109 to travel in the groove 106 until it engages the stop 107, and another complete pull of the cord causing the detent 109 to travel farther in the groove until it engages the stop 108. The stop 107 holds the curtain in position for instantaneous exposure whereas the stop 108 holds the curtain in position for time exposure. The finger piece 100 after being released returns to normal position under the action of the spring 102. Upon the release of the operating member 71 the device 115 will engage with the rear face of the arm 113 after the extension 114 has moved out of the path of said arm. This engagement between the device 115 and the arm 113 swings the oscillating frame so that the detent 109 is moved out of the path of the shoulder 107 and, at the same time, the drum 102 is disconnected from the curtain roller 15 thereby permitting the spring 89 to wind the curtain on the roller 16 and cause the exposure opening 86 to travel across the face of the sensitized material, thus producing instantaneous exposure.

For effecting time exposure the device 115 is disconnected from the operating member 71 by withdrawing the projection 117 from the slot 118. The operating member 71 is shifted to the position shown in Fig. 8, and a cord 99 is pulled twice in order that the detent 109 will engage the stop shoulder or lug 108. This carries the time exposure opening 86[a] of the curtain shutter so that it coincides with the opening or aperture in the partition wall 7. When an exposure is to be made, the two detents 76 and 80 are simultaneously operated to release the reflector 53 in order to carry the same quickly from the position shown in Fig. 1 to the extreme upper position where it closes the opening 64. After the desired exposure has been made, the curtain shutter is released by pressing on the deflected arm 113 which shifts the detent 109 out of the path of the stops 108 and 107, permitting the curtain to wind on the drum 16.

A camera constructed in accordance with this invention has a casing which may be inexpensively formed from sheet metal. Its lens-board support is of novel construction and is adapted to be formed from one piece of metal with the supporting devices which maintain it in open position. These supporting devices are of novel construction and are easily manipulated. The reflector directs the image through an opening in the collapsible bellows and in this way it is possible to reduce the size of the camera. The curtain shutter has but a single exposure opening for the different durations of exposure and the speed of the shutter is controlled by a separate mechanism. The devices which control the camera are so arranged that it is impossible to manipulate them out of their intended order of operation.

What I claim as my invention and desire to secure by Letters Patent is:

1. A camera casing embodying two pieces of sheet metal, one of which is bent to form a bottom wall, a rear wall and a portion of the top wall, and the other of which forms a partition wall substantially parallel with the rear wall and side walls projecting forwardly from the opposite edges of said partition wall, the rear wall and the partition wall being provided with openings and the partition wall having flanges extending rearwardly from the upper and lower edges of its opening to provide chambers above and below said flanges and a bottom wall extending forwardly beyond the partition wall to form with the side walls a bellows chamber in advance of the partition wall, a bellows in the bellows chamber, and a reflector arranged to operate in the bellows to coöperate with the partition wall in order to close the opening therethrough.

2. In a camera, the combination with a casing, of a hinged lens-board support provided with projections near its hinge, each projection having an outwardly-turned por-

tion for engaging with the camera casing to support the lens-board support in open position.

3. In a camera, the combination with a casing, of a hinged lens-board support provided with yielding projections at opposite sides near its ends, said projections each having a device thereon for limiting the opening movement of the lens-board support, and a device for preventing the closing movement of the lens-board support.

4. In a camera, the combination with a casing having inwardly-turned portions on opposite sides of the opening for the lens-board support, a hinged lens-board support for closing said openings, yielding extensions on the lens-board support, outwardly-extending portions on said extensions for coöperating with the inner faces of the inwardly-extending portions on the casing, and cam portions having shoulders, said cam portions riding on the inwardly-extending portions of the casing in order to cause the said inwardly-extending portions of the casing to engage behind the shoulders and lock the lens-board support in open position.

5. A camera comprising a casing having a partition therein provided with an opening, a shutter arranged on one side of the partition, a bellows extending from the other side of the partition and provided with an opening in one of its walls, a lens-board connected to the bellows, a screen mounted in the casing above and independently of the bellows and over the opening in said bellows when the latter is extended, and a reflector for directing rays from the lens to the screen through the opening in the bellows.

6. A camera comprising a lens-board, a shutter, a bellows interposed between the shutter and the lens-board, and provided with an opening in the wall thereof, a hood having its lower end supported independently of the bellows and arranged to have the opening of the bellows brought to register therewith when the bellows is expanded, and a reflector adapted to be positioned to direct an image from the lens to the hood through the opening in the bellows.

7. A camera comprising a lens-board, a shutter, a bellows interposed between the shutter and the lens-board, and provided with a frame in one wall having an opening, springs acting on the bellows on opposite sides thereof below said frame to expand the bellows, and a reflector adapted to direct an image from the lens to the opening in the frame.

8. A camera comprising a lens-board, a shutter, a bellows interposed between the shutter and the lens-board and provided with a frame in one wall having an opening, two pairs of stiffening strips secured to opposite walls of the bellows to cause the bellows to fold on lines between the adjacent edges of the strips, and a reflector adapted to direct an image from the lens to the opening in the frame.

9. A camera comprising a casing, a lens board, and a collapsible bellows arranged between the casing and the lens board and having a rigid portion adjacent its inner end adapted to swing downwardly to lie between the lens board and the casing, said bellows also having flexible walls below said rigid portion foldable inwardly, the bellows being flexible from said rigid portion to the lens board to permit the downward swinging of the rigid portion.

10. A camera comprising a casing, a lens board, a collapsible bellows arranged between the casing and the lens board and having a rigid portion adjacent its inner end adapted to swing downwardly to lie between the lens board and the casing, said bellows also having flexible walls below said rigid portion foldable inwardly, the bellows being flexible from said rigid portion to the lens board to permit the downward swinging of the rigid portion, and springs for expanding said flexible portions below the rigid portion of the bellows.

11. A camera having a focusing screen, and a single means for securing said screen in different tilted positions on the camera as well as in different positions toward and from the lens.

12. In combination in a camera, a lens, a shutter, a detent for holding the shutter in set position, a screen, a movable reflector arranged to direct an image from the lens to the screen and movable to three positions, one to close the camera against the admission of light rays from the lens to the sensitized material, another to direct an image from the lens to the screen, and another to cut off rays from the interior of the camera by way of the screen, and a device moving with the reflector and holding the shutter detent against movement while the reflector is directing an image on the screen.

13. In combination in a camera, a lens, a shutter, a detent for holding the shutter in set position, a screen, a movable reflector arranged to direct an image from the lens to the screen and movable to three positions, one to close the camera against the admission of light rays from the lens to the sensitized material, another to direct an image from the lens to the screen, and another to cut off rays from the interior of the camera by way of the screen, a device moving with the reflector and holding the shutter detent against movement while the reflector is directing an image on the screen, and a device moving with the reflector and shifting the

shutter detent when the reflector has cut off the rays from the screen.

14. In combination in a camera, a lens, a shutter, a detent for holding the shutter in set position, a screen, a movable reflector arranged to direct an image from the lens to the screen and movable to three positions, one to close the camera against the admission of light rays from the lens to the sensitized material, another to direct an image from the lens to the screen, and another to cut off rays from the interior of the camera by way of the screen, a device moving with the reflector and holding the shutter detent against movement while the reflector is directing an image on the screen, and a device moving with the reflector and shifting the shutter detent when the reflector has cut off the rays from the screen, said last named device being movable out of operative position in order that the reflector may cut off the rays from the screen without releasing the shutter.

15. In a camera, a lens, a curtain shutter, a spring for moving the shutter in one direction, a roller on which the shutter is wound, a device adapted to turn the roller to wind the shutter thereon, a screen, a movable reflector movable to three positions, one to cut off the rays from the lens to the sensitized material, another to direct an image from the lens to the screen and still another to cut off the rays to the interior of the camera by way of the screen, and means moving with said reflector for covering the operating portion of the roller-turning device when the reflector is away from the position in which it cuts off the rays from the lens to the sensitized material.

16. In combination in a camera, a lens, a shutter, a detent for holding the shutter in a certain position, a screen, a movable reflector arranged to direct an image from the lens to the screen and movable to three positions, one to close the camera against the admission of light rays from the lens to the sensitized material, another to direct an image from the lens to the screen, and another to cut off rays from the interior of the camera by way of the screen, and a device moving with the reflector and shifting the shutter detent when the reflector has cut off the rays from the screen, said device being movable out of operative position in order that the reflector may cut off the rays from the screen without releasing the shutter.

17. In a camera, a lens, a shutter, a spring for moving the shutter in one direction, a device for moving the shutter in the other direction, a screen, a reflector movable to three positions, one to cut off the rays from the lens to the sensitized material, another to direct an image from the lens to the screen, and still another to cut off the rays to the interior of the camera by way of the screen, and means for preventing the operation of the shutter when the reflector is away from the position in which it cuts off the rays from the lens to the sensitized material.

DAVID A. SINE.