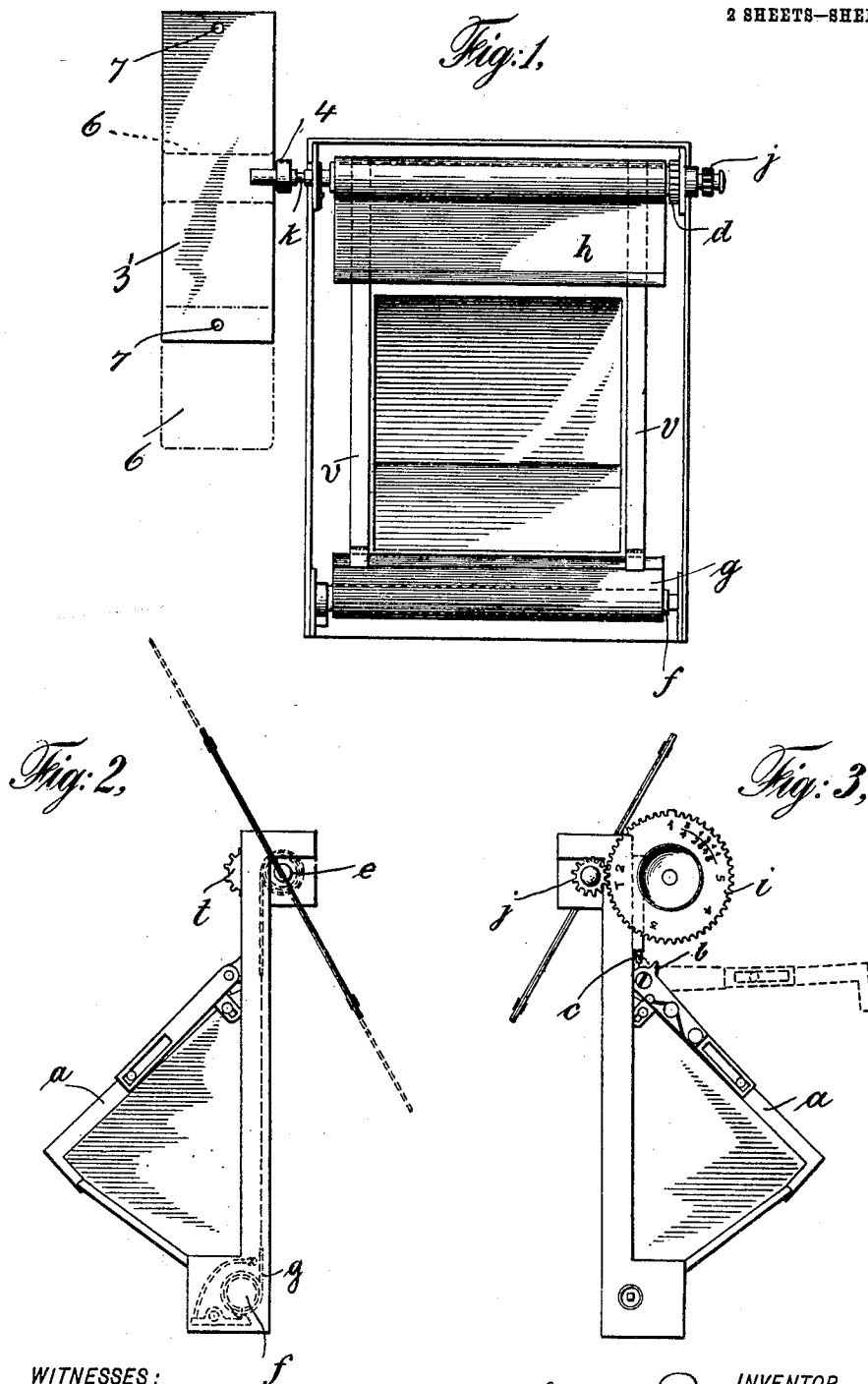


No. 835,127.

PATENTED NOV. 6, 1906.

L. BORSUM.
PHOTOGRAPHIC CAMERA.
APPLICATION FILED DEC. 5, 1905.

2 SHEETS—SHEET 1.



WITNESSES:

Wm. B. A. Doring.
L. F. Browning.

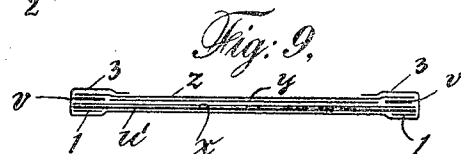
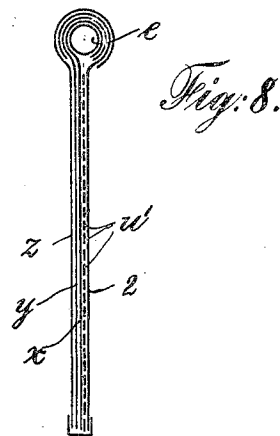
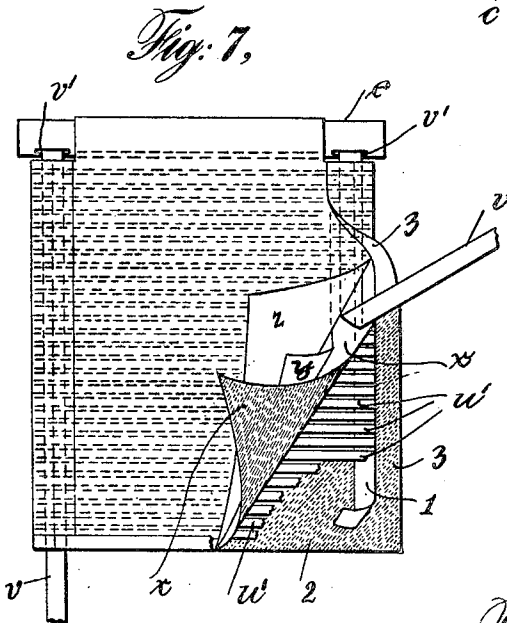
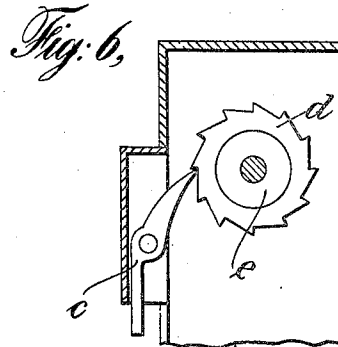
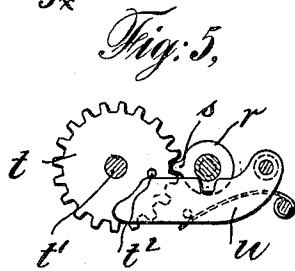
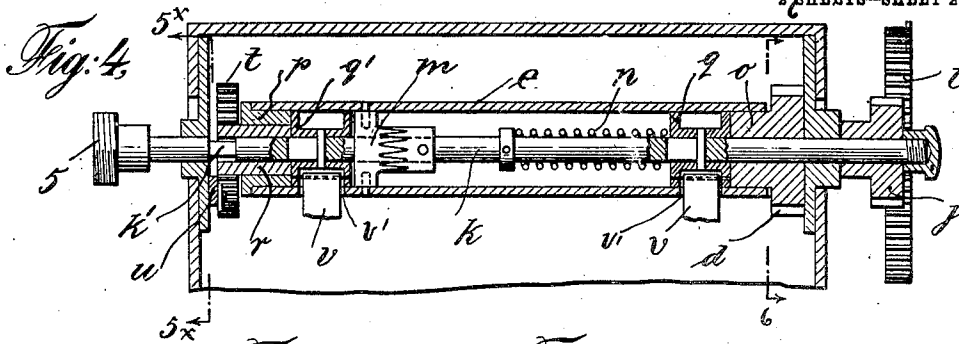
INVENTOR
Louis Borsum
BY *Edward C. Davidsohn*
ATTORNEY

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2 SHEETS—SHEET 2.



WITNESSES:

Max H. A. Doring.
L. F. Browning

INVENTOR

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UNITED STATES PATENT OFFICE.

LOUIS BORSUM, OF PLAINFIELD, NEW JERSEY.

PHOTOGRAPHIC CAMERA.

No. 835,127.

Specification of Letters Patent.

Patented Nov. 6, 1906.

Application filed December 5, 1905. Serial No. 290,337.

To all whom it may concern:

Be it known that I, LOUIS BORSUM, a citizen of the United States, residing at Plainfield, county of Union, State of New Jersey, have invented certain new and useful Improvements in Photographic Cameras, of which the following is a specification.

This invention comprises improvements in and relating to photographic-camera focal-plane shutters. Its primary object is to afford a simple ready means of adjusting the slit from the exterior of the camera-box. For this purpose adjusting-tapes connected to or adjacent the respective ends of the edge of one shutter-section (usually the lower one) attached to the spring-roll pass along the edges of the other shutter-section to pulleys capable at will of being rotated independently of the upper shutter-roll, the organization being such that the upper shutter lies flat and is not disturbed by movements of the tapes in adjusting the slit or shutter-opening. To this end the shutter-section along which the tapes pass has novel characteristics hereinafter set forth. Preferably the adjusting-pulleys, to which the adjusting-tapes are attached, are located within the upper shutter-roll, but are capable of being connected with or disconnected therefrom for independent rotation.

The foregoing, as well as other important features of this invention, are fully set forth in detail below.

In the accompanying drawings, which illustrate one embodiment of this invention demonstrated by experience to be practical and efficient, Figure 1 is a rear elevation of a focal-plane shutter and the frame or support in which it is mounted; Fig. 2, an elevation of the left-hand side of Fig. 1; Fig. 3, an elevation of the right-hand side with a slit-adjustment-indicating disk applied thereto; Fig. 4, a longitudinal section through the upper shutter-roll and associated parts; Fig. 5, a detail sectional view on line 5^x 5^x of Fig. 4, illustrating a locking device that prevents adjustment of the slit except when the shutter is down; Fig. 6, a detail sectional view on line 6 6 of Fig. 4, showing the usual retention and tripping pawl applied to the upper shutter-roll; Fig. 7, a detail view, partly broken away, showing the upper shutter-section, the

roll to which it is attached, and the slit-adjusting tapes; Fig. 8, a side elevation or edge view of a diagrammatic character indicating the upper shutter-section, and Fig. 9 a view of like character showing a transverse section through the upper shutter-section.

Figs. 1, 2, and 3 show the shutter applied to a type of camera known in the trade as the "Reflex." It has a mirror contained in a frame *a*, arranged at an angle of forty-five degrees, that reflects the focused image upwardly upon a horizontal ground glass in the top of the camera-box. When an exposure is made, this frame is tripped, and in rising out of the path of the light-cone a lug *b* thereon strikes the tail of the detent and tripping pawl *c*, applied to a ratchet *d*, Fig. 6, fast on the roll *e* of the upper shutter-section. *f* indicates the usual spring-roll, the tension of which may be varied at will, *g* the lower shutter-section applied thereto, and *h* the upper shutter-section. The general operation of all the devices thus far indicated is well understood. Adjustments of the shutter-slit are determined by rotation of a gear *i*, gearing with pinion *j* on the shaft of the upper shutter-section. The side of the gear *i* is engraved with characters indicating the width of the slit when such characters respectively appear opposite an opening in a cover-plate, which being a usual device in shutters of this class is not illustrated.

The construction in detail and the special form of shutter as here shown are as follows: The upper shutter-roll *e* is normally locked to its shaft *k* by a two-part clutch *m*, one member being fast to the interior of the roll and the other to the shaft *k*, movable endwise to separate the clutch members, normally held in engagement by a coiled spring *n*, surrounding the shaft. The ends of roll *e* are closed by bushings *o p*, in which shaft *k* has bearings. The release-ratchet *d* is shown as formed integrally with bushing *o*, between the inner end of which and the end of spring *n* is interposed a flanged pulley *q*, splined as indicated or otherwise to shaft *k*. Between the end of the other bushing *p* and that member of the clutch secured to the roll is located a like pulley *q'*, also splined to endwise-movable shaft *k*. Within the bushing *p*, but really forming a part thereof, and rotatable

with roll *e* is secured a sleeve *r*, extending beyond the end of the roll and provided with a radial tooth or projection *s*, coöperating with a geared or toothed wheel *t*, mounted on a stud-shaft *t'*.

The shaft *k* at sleeve *r* is reduced in diameter or has an annular groove *k'*, of suitable width longitudinally, adapted to receive a pivoted locking plate or dog *u*, mounted on the side of the frame and normally urged toward the shaft by a spring. When the shutter is wound upon the upper roll, a pin *t''* on the side of the stop-gear *t* passes out of engagement with the latch or dog *u* and permits it to enter the groove *k'* in the shaft, thereby preventing endwise movement of the latter whenever the shutter is wound or being wound preliminarily to being tripped to make an exposure.

The slit-adjusting tapes *v v* are attached to the edge strip of the lower shutter-section near its ends and pass upwardly along the upper shutter-section *h* and through slots *v' v'* in the upper shutter-roll to the pulleys *q q'*, to which, respectively, they are attached. The upper shutter-section at its upper corners is cut away, so that the tapes will have unimpeded and unobstructed entrance or movement in the slots *v'*, and intermediate the cut-away corners the shutter is applied to or wound around its roll. If the upper shutter-section, while being sufficiently flexible to be wound upon its roll and yet have sufficient stability or steadiness to properly descend when the shutter is tripped and to retain form without displacement or distortion when the tapes move along it in adjusting the shutter-slit, it will be obvious that when the shutter is down and shaft *k* moved endwise to separate the members of clutch *m* the pulleys *q q'* may be rotated to adjust the shutter slit or opening, and thereafter the shutter may be wound and tripped in the ordinary way. To permit of this operation, the upper shutter-section is so constructed that it will be flexible enough to properly be wound upon its roll and yet stiff enough to drop in the ordinary way when the shutter is tripped and retain its shape and position when the adjusting-tapes are manipulated with the shutter down. A shutter-section having these characteristics may no doubt be made in various ways by those skilled in such matters.

A construction shown by experience to be most satisfactory is illustrated in detail in Figs. 7, 8, and 9. The adjusting-tapes occupy and move in passages or channels formed in the body of the upper shutter-section, entering the same at the lower edge and leaving it at the upper cut-away corners, passing thence into the slots *v'* and to pulleys *q q'*, to which they are attached. This special feature of construction is considered to be the most sat-

isfactory and desirable way of making the shutter.

To give the shutter the described characteristics, I employ a series of closely-placed transverse slats *u'*, preferably made of very thin sheet metal, that may be steel—say of four-one-thousandths-inch thickness—cemented to a piece of fabric *x* as wide as the slats are long and over which is cemented a layer of fabric *y* of less width. Cemented to face of *y*, but not the faces of *x*, extending beyond it on each side, is a layer of fine opaque rubber-faced cloth *z* of a width equal to the length of the slats. In the passages or spaces outside the edges of *y* and between the layers *x* and *z* at each side of the shutter travel the adjusting-tapes *v*. On the opposite side or face of the shutter, near its edges, are cemented to the slats strips 1, corresponding in dimensions and material with the adjusting-tapes *v*. Finally, a sheet 2 of fabric is cemented to this latter face of the shutter, and its extended sides 3 are folded over upon and cemented to the other side of the shutter. The described construction of the upper shutter-section *h* is most efficient, but may no doubt be varied by those skilled in the art without departing from the principles of this invention. I have found that winding and unwinding of the shutter-section *h* upon its roll *e* is improved if the fabrics are cut on the bias. This is indicated by the shaded lines applied to the under face of the fabric *x* showing at the turned-up corner thereof in Fig. 7, also by shaded lines appearing in this figure upon the sheet of fabric 2. Experience shows that the gear *t* acts somewhat as a governor and facilitates the even regular fall or drop of the shutter. As an additional means of controlling the time of exposure I provide a vane or blade 3', formed with a hub 4, which for convenience of attachment to the upper-roll shaft *k* is internally screw-threaded to screw upon the head or knob 5 on the end of the shaft. In a device of this character the use of a vane for retarding the traverse of the shutter past the exposure-opening of the camera is not new. In this construction, however, the main body of the vane is provided with extensible end pieces 6, shown as pivoted thereto at 7, so that the effective area of the vane may be that of the central part or body only or may be increased at either or both ends by partially or entirely swinging out the extension-pieces 6 into parallelism with the main body or blade. In Fig. 1 the dotted lines at the bottom of the vane indicate the swinging out of the extension on that end of the blade. In Fig. 2 the dotted lines at the end of the blade indicate the swinging out of both extensions. In this way an adjustment of the resistance which the vane opposes to the de-

scent of the shutter may be had. I have shown the extensions 6 6 pivoted to the ends of the main body of the blade or vane, as such is a convenient and inexpensive construction.

The parts *v* I have designated as "tapes." They may be considered as cords, as obviously any suitable strips of appropriate cross-section adapted to perform the functions described may be employed. When the shutter is down and the slit-adjusting pulleys are rotated, tension exerted by the spring-roll upon the adjusting-strips entering the slots *v'* in the upper roll prevents rotation of the latter roll should there be such friction between it and its shaft and pulleys as might tend to revolve it.

I claim as my invention—

1. A focal-plane shutter comprising two sections, one of which, while adapted to wind and unwind from its roll, is relatively stiff and stable as compared with the other one.

2. A focal-plane shutter comprising a relatively stiff or stable section and a relatively flexible one combined with means for adjusting the opening or slit between their contiguous edges.

3. In a focal-plane shutter, two shutter-sections each adapted to wind or unwind from its roll and one of which is relatively stiff or stable, slit-adjusting tapes attached to the other section and passing along the relatively stiff or stable section, rotatable members around which such tapes pass and means for at will rotating them to adjust the slit or opening between the edges of the shutter-sections.

4. In a focal-plane shutter, two shutter-sections each adapted to wind and unwind from its roll and one of which is relatively stiff or stable, slit-adjusting tapes attached to the other section and passing along the relatively stiff or stable section, rotatable members around which such tapes pass, means for at will rotating them to adjust the slit or opening between the edges of the shutter-sections, means normally connecting the roll of a shutter-section and said rotatable members and means for disconnecting them when the rotatable members are to be rotated to adjust the slit.

5. A focal-plane shutter having means for adjusting the slit between the shutter-sections and comprising the following elements, a relatively stiff or stable shutter-section, having passage-ways formed longitudinally therein adjacent its edges and adjusting-tapes secured to the other shutter-section and passing through said passage-ways.

6. A focal-plane shutter having means for adjusting the slit between the sections thereof and comprising a section composed of transverse slats, fabric applied thereto and

adjusting-tapes applied to the other shutter-section and passing along the slatted section adjacent its edges.

7. A focal-plane shutter having two shutter-sections and means for adjusting the slit between them comprising a shutter-section composed of transverse slats and flexible fabric uniting them, the fabric being applied so as to form tape passage-ways, whereby the section is rendered relatively stiff or stable and yet is adapted to be wound upon and unwound from its roll, adjusting-tapes attached to the other shutter-section and passing through the passage-ways formed by the fabric in the slatted shutter-section.

8. A focal-plane shutter having means for adjusting the slit between the two shutter-sections, comprising a relatively stiff or stable shutter-section, adjusting-tapes having corresponding ends secured to the other shutter-section and slidably passing along the stiff section, and winding devices to which the other ends of the tapes are attached.

9. A focal-plane shutter having two sections, one of which is formed of transverse slats flexibly united by fabric cut on the bias and applied to the front and rear faces of the slats, and means for adjusting the slit between the sections.

10. A focal-plane shutter having two sections, one of which is formed of transverse slats flexibly united by fabric cut on the bias and applied to the front and rear faces of the slats so as to leave tape passage-ways adjacent the edges of said section, and adjusting-tapes applied to the other shutter-section and passing through said passage-ways.

11. In a focal-plane shutter, the combination of the upper shutter-roll, its shaft, cooperating clutch members carried respectively by the roll and shaft and normally spring-held in engagement, pulleys carried by the shaft within the roll with reference to which the shaft is capable of endwise movement to separate the clutch members, a relatively stiff or stable shutter-section attached to the roll and having passage-ways therein, another shutter-section, its spring-roll, and tapes attached to said section passing through the passage-ways in the stiff section and attached to said pulleys whereby when the shaft of the upper shutter-roll is moved endwise the clutch members are separated and the pulleys may be independently rotated to adjust the shutter-slit.

12. In a focal-plane shutter, the combination of the upper shutter-roll, its shaft, cooperating clutch members carried respectively by the roll and shaft and normally spring-held in engagement, pulleys carried by the shaft within the roll with reference to which the shaft is capable of endwise movement to separate the clutch members, a relatively

stiff or stable shutter-section attached to the roll and having passage-ways therein, another shutter-section, its spring-roll, tapes attached to said section passing through the passage-ways in the stiff section and attached to said
5 pulleys whereby when the shaft of the upper shutter-roll is moved endwise the clutch members are separated and the pulleys may be independently rotated to adjust the shut-

ter-slit, and means for locking the shaft 10 against endwise movement except when the shutter is in down or tripped position.

In testimony whereof I have hereunto subscribed my name.

LOUIS BORSUM.

Witnesses:

L. F. BROWNING,
E. F. WICKS.