

N° 20,528



A.D. 1905

Date of Application, 11th Oct., 1905—Accepted, 28th June, 1906

COMPLETE SPECIFICATION.

Improvements in Focal Plane Shutters

I, MAGNUS NIELL 140 West 23rd St New York U.S.A. Mechanical Engineer do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement;—

5 The purpose of my invention is to provide a convenient and reliable means for regulating the opening in that type of photographic shutter known as the focal plane, in which the exposure of the subject is made by means of a slit or opening in the roller blind passing more or less rapidly across the sensitive plate. This movement being brought about in the usual manner by the action of a
10 spring roller.

It is found necessary at times to vary the width of the aforesaid slit or opening to suit variable conditions, and whilst there are several methods at present in use for affecting this object they have been found more or less unreliable and difficult to manipulate.

15 I wish it to be understood that I am aware of the existence of focal plane shutters in which cords or tapes are used for adjusting the width of the slit in the roller blind, but I am not aware that tapes held by spring grips operated by external means, as hereunder described, have as yet been used.

I am also cognisant of the common use of release detents of various forms
20 which can be displaced at will or which may have auxiliary detents relatively adjustable thereon for the purpose of acting as time stops.

Identical reference letters and parts agree throughout the accompanying drawings in which Fig: 1 is a perspective view of the focal plane shutter with the front plate removed for the purpose of displaying the general arrangement
25 of the rollers and various other parts.

Fig: 2 shows the manner in which the spring clips and adjusting tapes and bosses are arranged.

Fig: 3 is an enlarged detail view of one of the spring clips showing the method of gripping the adjusting tape when the pressure feet are raised.

30 Fig: 4 is a similar view to Figure 3 with the pressure feet lowered and the spring clip open, in which condition the tape is free to run in either direction, it also shows a light spring that lies under the tape adopted for the purpose of straightening the said tape when the clip is opened.

Fig: 5 is a plan of the lever and pressure link and feet which open the clips.
35 The latter are shown in position.

Fig: 6 shows the mechanism contained under the cap or cover attached to one side of the shutter and includes the following parts. First, the extended pivot of top roller spindle on which is fixed a pinion. Second, a cog wheel in gear with the said pinion. Third, a rocking pivoted detent, controlled by a
40 spring, which prevents the blind from running back, when the shutter is set, until it is desired to make an exposure, a knob being provided for this purpose. Fourth, a sliding detent, attached to the pivoted detent, which is placed in gear with a stud fixed to the said cog wheel when time exposures are required,

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also controlled by a spring. Fifth, a sliding cam plate, furnished with parallel slots, which engages on studs fixed to the side of shutter, a diagonal slot to control the movement of the pressure link. A raised cam for the purpose of operating the pivotted detent and a tongue for placing the sliding detent in gear with the stud on cog wheel, as referred to above, it is also provided with a setting knob which projects through the cap or cover. Sixth, the extended pivot of the bottom roller spindle on which is fixed a finger that operates a star wheel pivotted on the inner surface of cover, the said star wheel being provided with a series of numbers to indicate the degree of tension of the spring roller. Seventh, a suitably shaped spring pawl, provided with a releasing stud, which engages with the aforesaid finger when the spring is wound up.

Fig. 7 is a plan of the side of shutter showing the cover in position and the setting disc with its graduated bevelled edge, the releasing knob, the slot in which the setting knob of sliding plate travels, also the opening for viewing the numbers on star wheel. The releasing stud of spring pawl and the winding knob connected with the spring roller.

I now proceed to describe my invention in detail.

To an outer casing *a* is fitted an inner casing, *b*, the latter being of somewhat smaller dimensions than the former for the purpose of forming end chambers to accomodate pivotted rollers *e* and *e* 1 on which is wound a flexible opaque blind consisting of an upper section *f* and a lower section *f* 1.

To both the inner and the outer casings is fitted a flat frame *g* and *g* 1 containing identical exposure apertures, and the said frames are separated slightly to allow of the free passage to and fro of the blind and parts attached thereto as shown at *h*.

The roller *e* 1 is of the ordinary kind containing a helical spring for the purpose of operating the blind and also for regulating its rate of action.

To this roller is fixed the lower section of the blind, its free end being connected to adjusting tapes more fully described hereinafter. To the spindle on which the said roller turns is an extended pivot to which is fixed the usual winding knob, detent, and tension indicating dial.

The roller *e* is formed of a hollow cylinder which freely fits the spindle on which it turns, but is prevented from erratic movement by means of a light friction spring situated between the spindle and the inner surface of the said cylinder. At the ends of the latter and securely fixed to the said spindle are solid bosses *i* *i* on which are fixed narrow adjusting tapes attached at their opposite extremities to the lower blind as shown at *i* 1 Fig. 2.

Each section of the blind is sufficiently large to entirely cover the exposure aperture, one part performing this function before, and the other after exposure, and their free ends are provided with suitable stiffening strips to prevent the material from sagging as shown at *j* Fig. 1.

The section of the blind attached to the adjusting roller *e* is provided at each side of its free end with a flat spring clips *k* *k*, more clearly shown in the detail diagrams, which normally grips the tapes and firmly holds the sections of the blind at a given degree of separation.

When it is required to alter the width of the slit, the blind is first allowed to run down. This will bring the spring clips directly underneath the pressure feet *l* *l* Fig. 5 the lever *p* is then depressed, by means hereinafter described, which causes the said pressure feet to release the grip of the springs *k*, *k*, and admits of the free rotation of the bosses *i* *i* in either direction, the reserve run of the spring roller taking up the feed in one direction and giving way in the other direction and consequently altering the width of the opening as may be required.

During the process of adjusting the slit the top blind is held stationary by the pressure feet retaining the spring clips in position, and the adjustment is brought about by turning the setting gear. The spring detent connected therewith being for the time placed out of action as will be presently described.

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The raising of the lever, operating the pressure feet, allows the spring clips to again grip the tapes.

It will be seen by reference to Fig. 3 that the tape is pressed by the spring into a recess in such a manner that it is held very securely by virtue of the angles formed. To prevent these angles from obstructing the free-running of tape when the clip is opened a light spring *n* is placed underneath to straighten the said tape when the pressure of the gripping spring is released as shown in Fig. 4.

The aforesaid pressure feet *l l* are formed on the ends of a moveable link or strip *o* Fig. 5, and are operated by the pivotted lever *p* through the smaller link *o l*. These parts being attached to the lower wall of the inner casing *b*. An extension *m* of the said lever being carried through a slot *q* in the side plate of shutter where it engages in a diagonal slot *q l* in the sliding plate *r* Fig. 6.

When the feet are in the raised position they abut against stops fixed at a suitable position to the inside of the casing *a*, these stops, which are clearly shown in Fig. 5, hold the parts steady. Fig. 6 shows the pinion *s* which is fixed to the extended pivot of the top roller *c* and at all times is in gear with the cog wheel *s 1*. The latter is provided with a fixed stud *s 2* which forms a time stop when required, and also with a means for attaching a winding device when the cover is in position. A stop *t* on pivotted arm *t 1* is placed in the path of the fixed stud attached to the winding device when the parts are arranged for the adjustment of the slit, for the purpose of preventing the overwinding of the adjusting tapes, the recess in the extension of the sliding cam plate *t 2* operating this part, which is held steady by a friction washer, I sometimes adopt a similar stop attached to the cover, in which case it works in conjunction with a stud fixed to the bevelled winding disc.

In the position of the parts shown in Fig. 6 the shutter would be set for instantaneous or rapid exposures independent of the width of the slit. It will be seen that the detent *u* engages with the teeth of the cog wheel, thus keeping the shutter closed when set. When the said detent is swung out of gear, by means of a sideways pressure on the stud *w*, which projects through a slot in the cover, the blind runs down by the rotation of the spring roller. In this adjustment the hook of the sliding detent and the adjustment stop *t*, are just clear of the time stop.

When it is desired to give time exposures, at which time it is of course necessary to have the blind opening equal to the exposure aperture, the stud *r 1* on the sliding cam plate *r* is raised to its highest extremity, when the shoulder *x* presses the sliding detent *u 1* upwards by means of the stud *x 2*, against the spring *x 1* and thereby places the aforesaid hook in the path of the time stop when the pivotted detent is swung, (the latter being provided with studs that engage in slots in the sliding detent to limit its movement) and forms an anchor like escapement which requires the second swing of the said pivotted detent to bring about the closing of the shutter.

The sliding plate is held in the respective positions by a nib on the spring *y* engaging in V shaped nicks on the edge of said plate.

To set the shutter for the adjustment of the slit the blind is first let down and then the cam plate is pressed to its lower extremity, in the course of which the following changes take place. First the adjustment stop *t* is brought down in the path of the time stop *s 2*.

Second the sliding detent returns to its lower position, third the sloping cam *x 3* is brought into contact with the releasing stud *w* and throws the pivotted detent out of gear with cog wheel, as indicated by the dotted lines, and fourth the lever *m* is operated by the cam slot in the lower part of sliding plate, thereby bringing the pressure feet into action and opening the spring clips as already described.

It will be seen by the above that there is now nothing to prevent the cog wheel being turned in either direction so far as the stop *t* will allow, and it will be also understood that the turning of the said cog wheel imparts move-

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ment to the aforesaid bosses carrying the adjusting tapes, whilst the top roller and blind are kept stationary in the manner already set forth.

It only now remains to describe the cover and the parts connected therewith.

The said cover is formed of a plate *z* Fig. 7 held down by screws as illustrated. It is provided with turned down sides and entirely covers the mechanism shown in Fig. 6. 5

A graduated disc *z*1 is connected to the cogwheel by two pins which enter suitable holes in the latter as shown at *s*3 Fig. 6. A hole is formed in the cover to accommodate a clearance washer or boss which prevents friction taking place between the surfaces of the cogwheel or disc and the cover plate. The whole is held in position by means of a shouldered screw which enters the side plate of shutter and forms a pivot on which the parts freely turn. 10

An arrow mark *z*2 is made on the cover plate and serves the purpose of a pointer to indicate the width of the slit in the blind by the aid of the degrees marked on the bevelled edge of disc. 15

*z*9 *z*9 are winding knobs fixed to the said disc for the purpose of setting the shutter or adjusting the slit. *z*4 shows the releasing knob threaded to the stud *w* Fig. 6 and *z*5 is the knob for operating the sliding cam plate, threaded to the stud *r* Fig. 6. The letters T. I. & S. indicate the positions where the knob *z*5 should be for time, or instantaneous exposures, or for adjusting the slit, as described in the foregoing. *z*6 is an aperture in the cover for viewing the figures on the star wheel which indicates the tension of the roller spring, which is wound up by means of the knobs *z*7 and released by the stud *z*8. These parts being of the usual and well known construction do not require detailed description. 20 25

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed I declare that what I claim is

1. In a photographic shutter of the focal plane type of the method of regulating the width of the slit or opening in the roller blind, by means of spring clips engaging or disengaging adjusting tapes, the said spring clips being opened or closed at will by external means substantially, as and for the purpose described. 30

2. The combination in a focal plane shutter of a spring roller and a composite roller, the latter being formed of a cylinder carrying a section of the roller blind, and end bosses, to which adjusting tapes are attached, the said bosses at times having independent movement to the said cylindrical roller, such movement being controlled by the setting mechanism substantially as and for the purpose described. 35

3. A lever operated link, or strip, provided with pressure feet which open spring clips connected to one section of the roller blind substantially as and for the purpose described. 40

4. A sliding spring controlled detent in combination with a rocking detent, the former acting as time catch when moved longitudinally in the path of a time stop, and the latter as a pawl or click in conjunction with the winding gear, also as a release when making exposures, substantially as and for the purpose described. 45

5. A sliding cam plate provided with slots, and cams, for operating the pressure feet, the sliding time detent, the pivotted detent, and the adjustment stop, substantially, as described and illustrated in the accompanying drawings. 50

Dated this 11th. day of October, 1905.

M. NIELL.

[This Drawing is a reproduction of the Original on a reduced scale.]

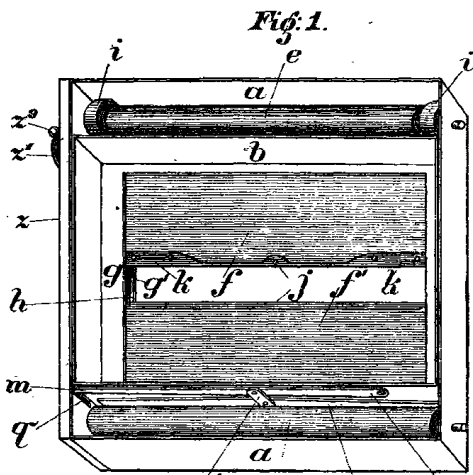


Fig. 2.

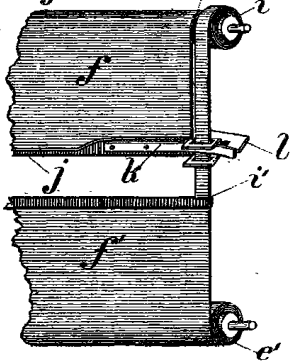


Fig. 3.

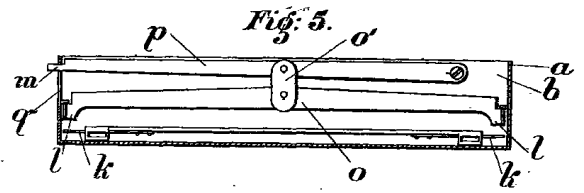
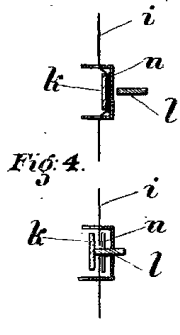


Fig. 6.

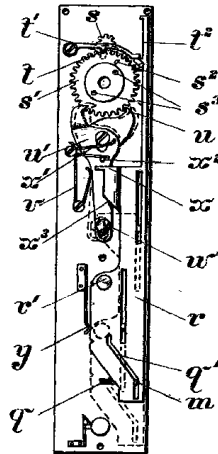
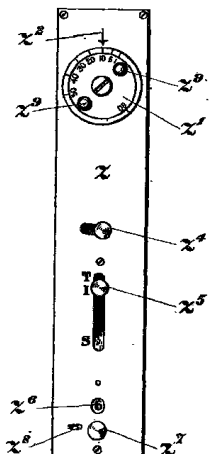


Fig. 7.



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Fig: 1.

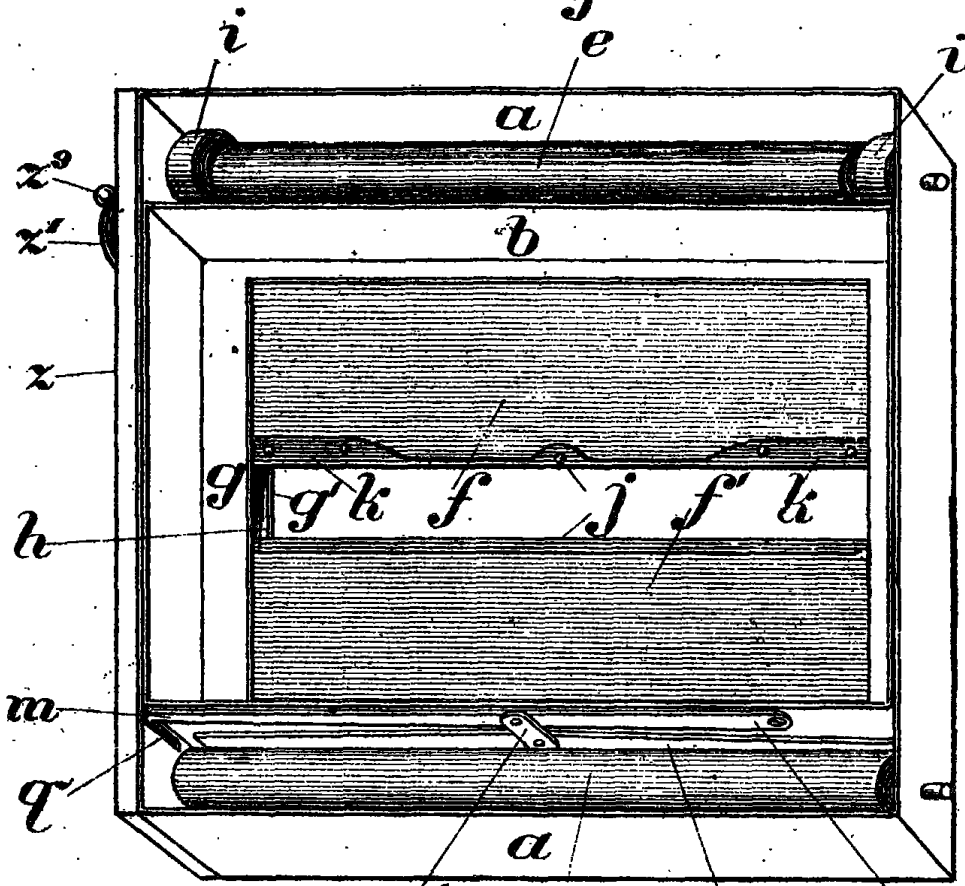


Fig: 2.

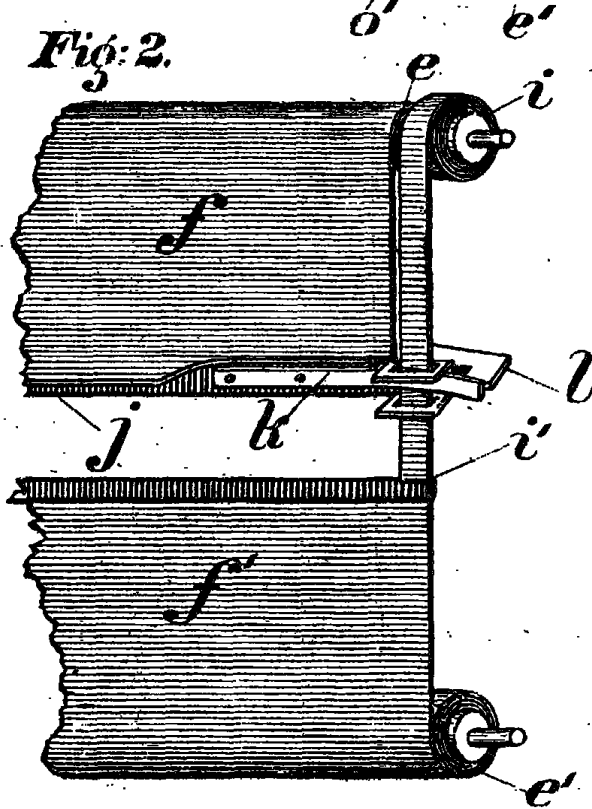


Fig: 3.

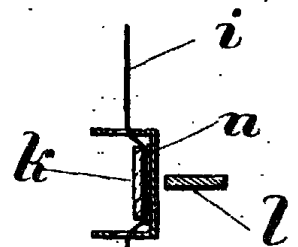
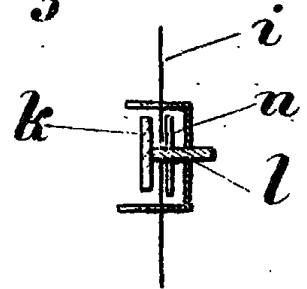


Fig: 4.



[This Drawing is a reproduction of the Original on a reduced scale.]

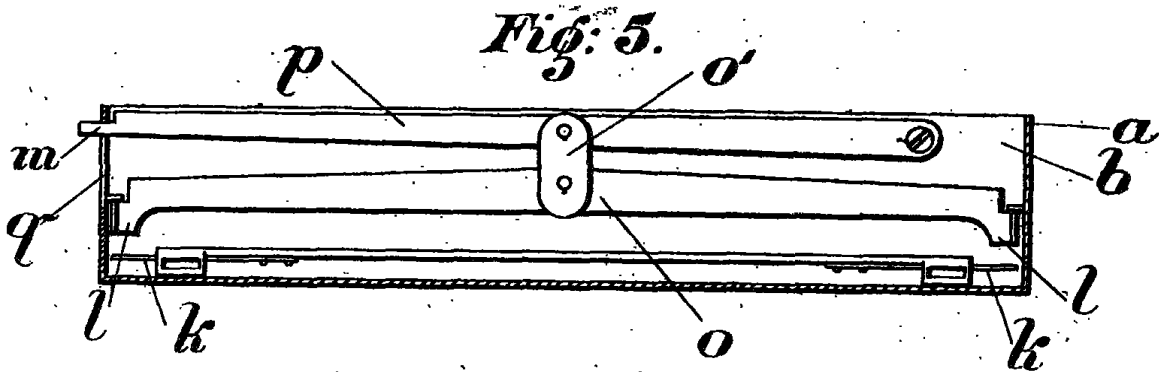


Fig. 6.

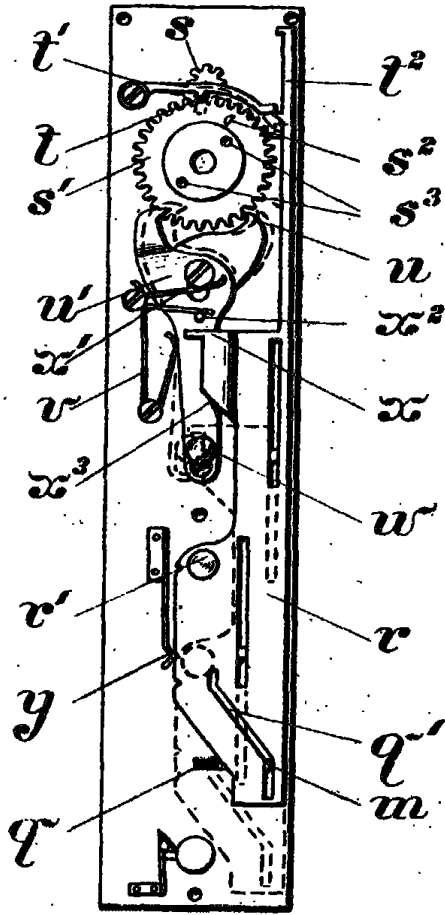
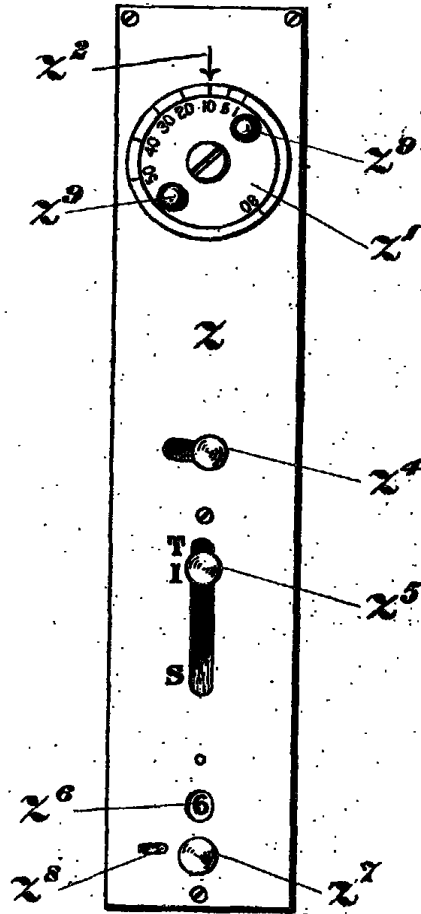


Fig. 7.



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