No. 842,896. PATENTED FEB. 5, 1907.

A. K. LOVELL.

SHUTTER OPERATING DEVICE.

APPLICATION FILED AUG. 18, 1902.

3 SHEETS—SHEET 1.

Fig. 1.

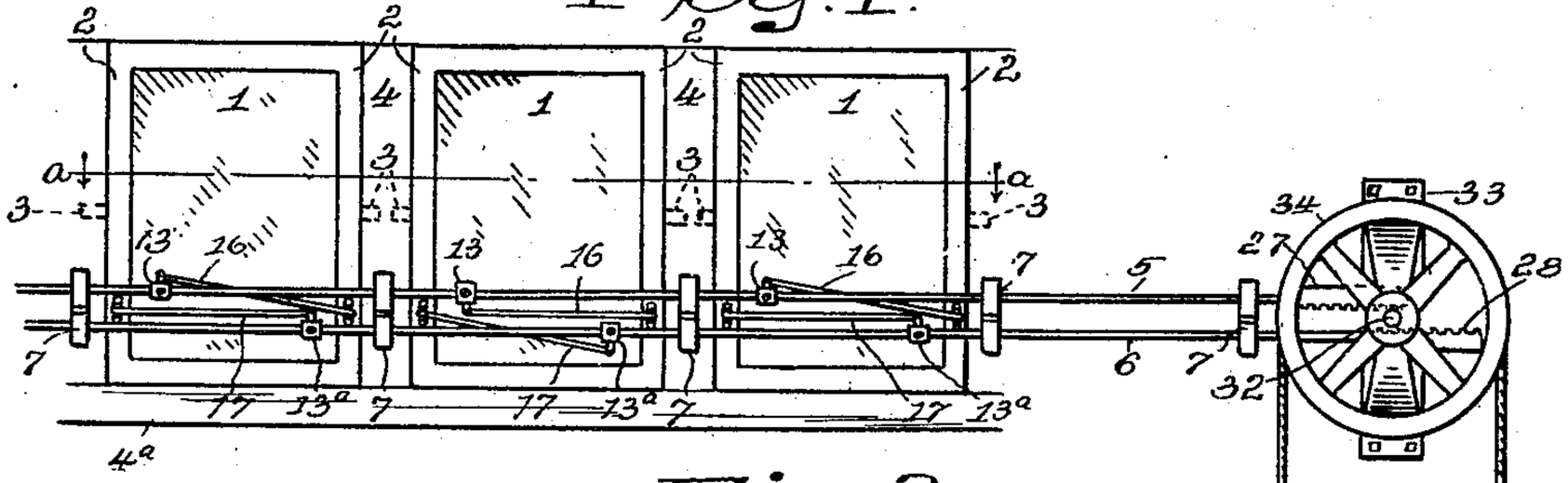


Fig. 2.

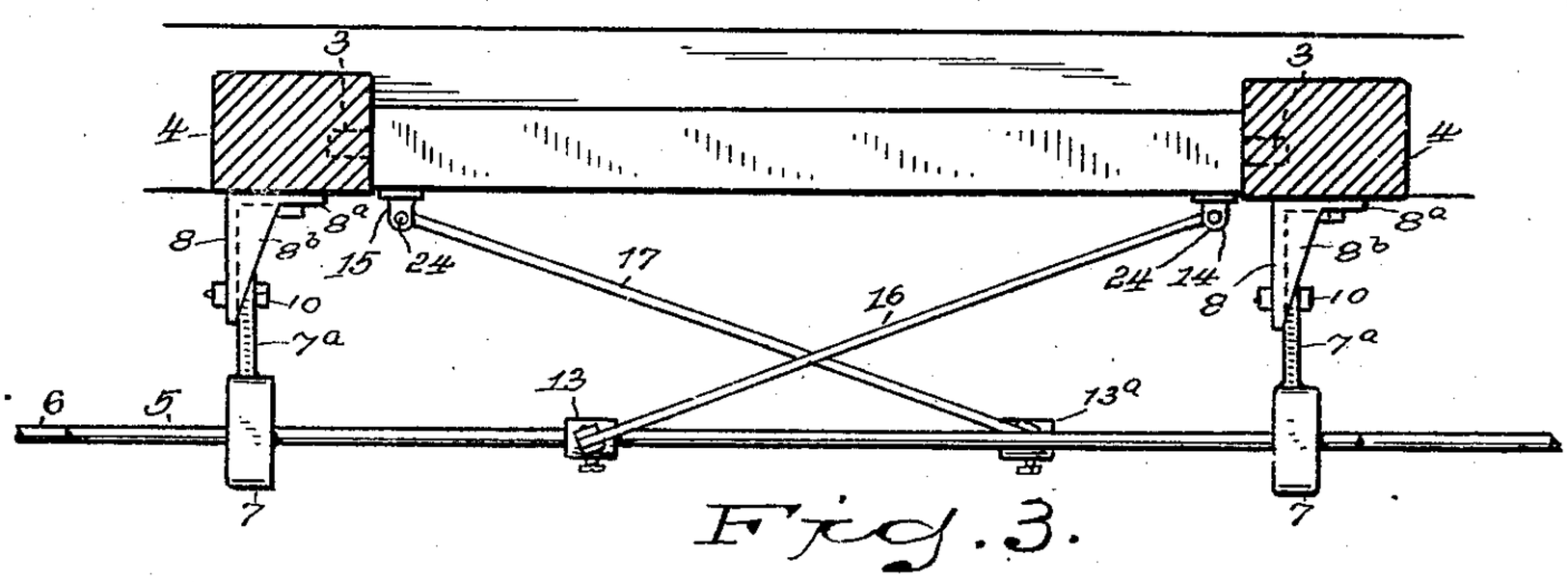
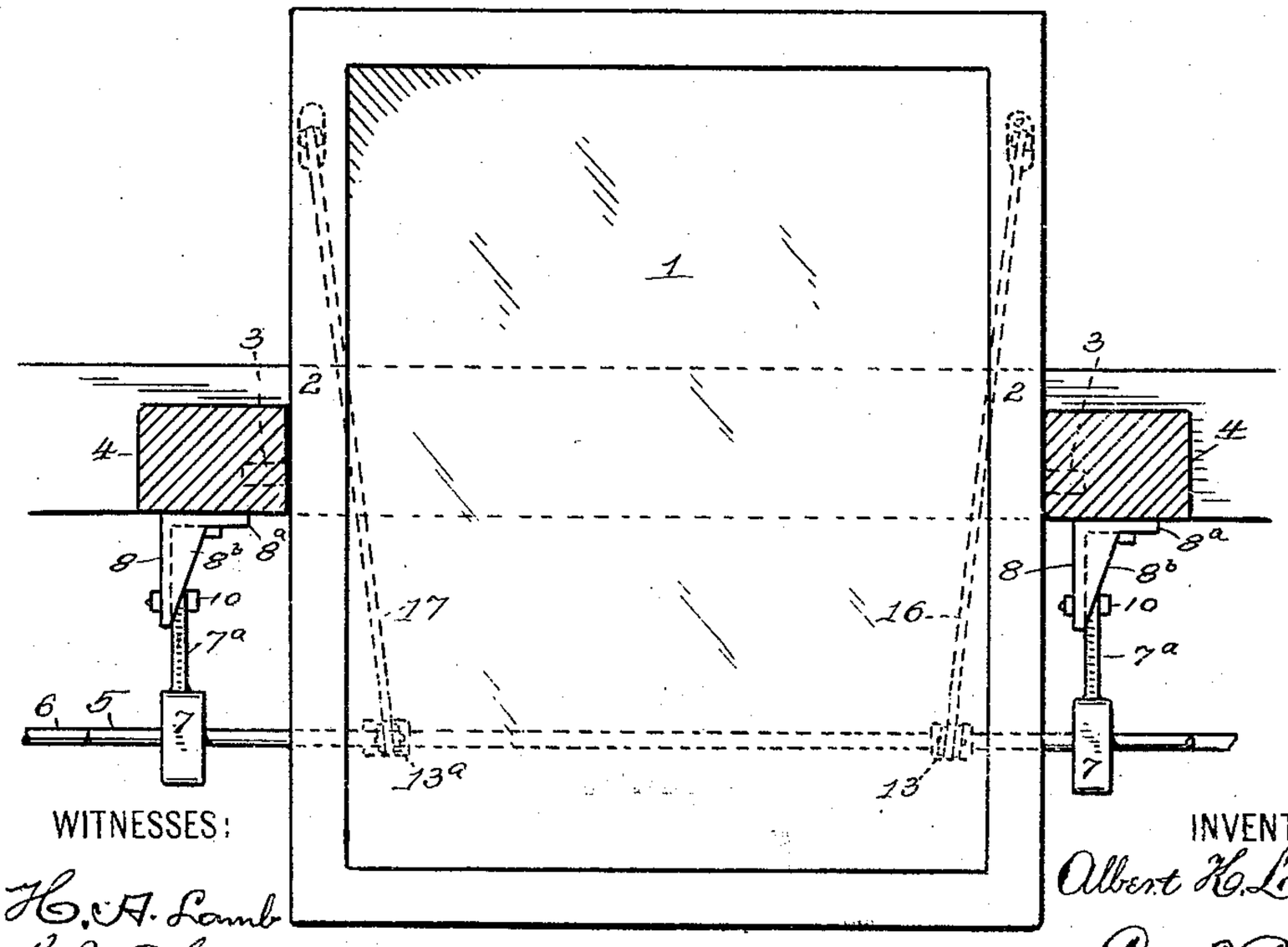


Fig. 3.



WITNESSES:

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3 SHEETS—SHEET 2.

Fig. 4.

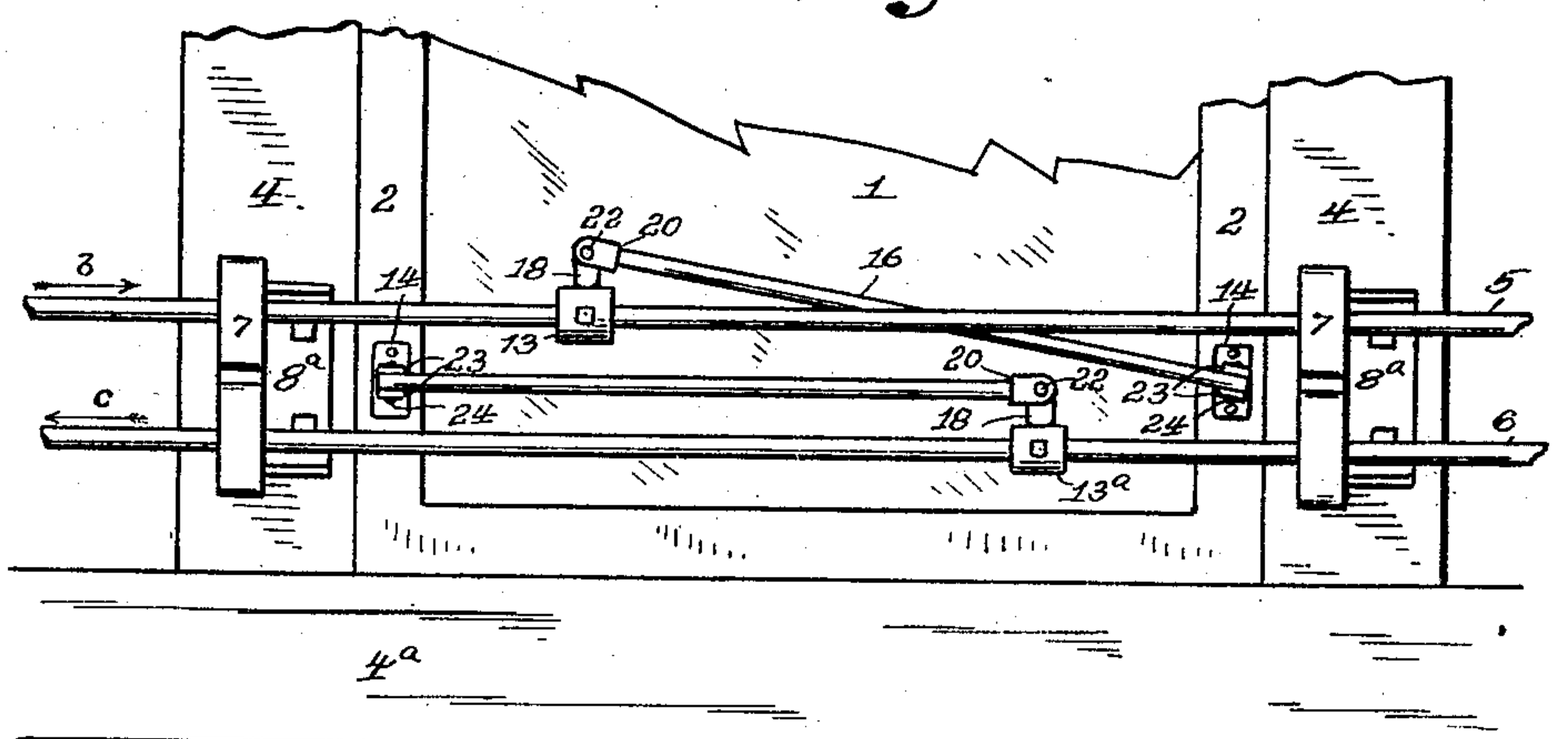

Fig. 5.

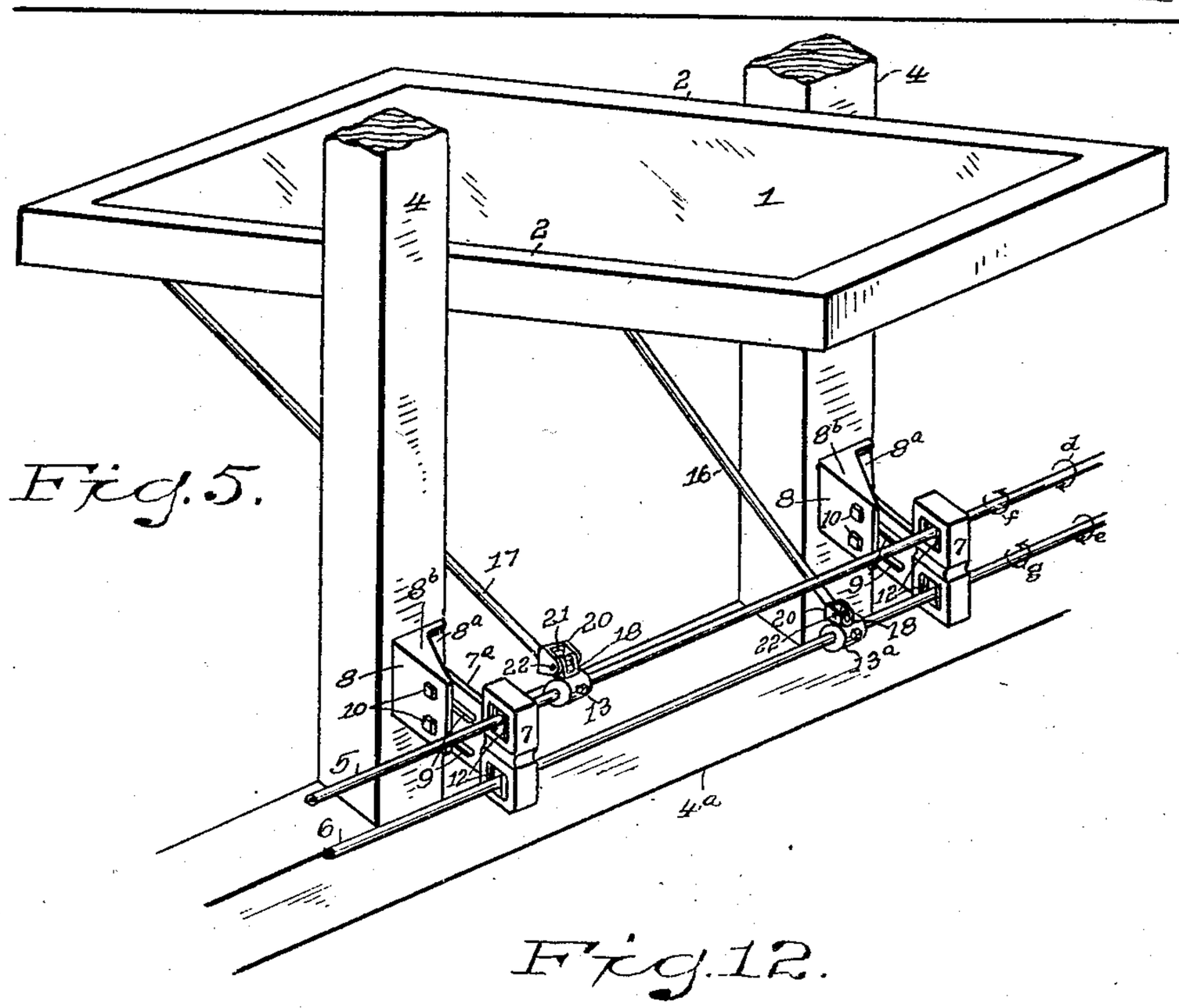

Fig. 12.

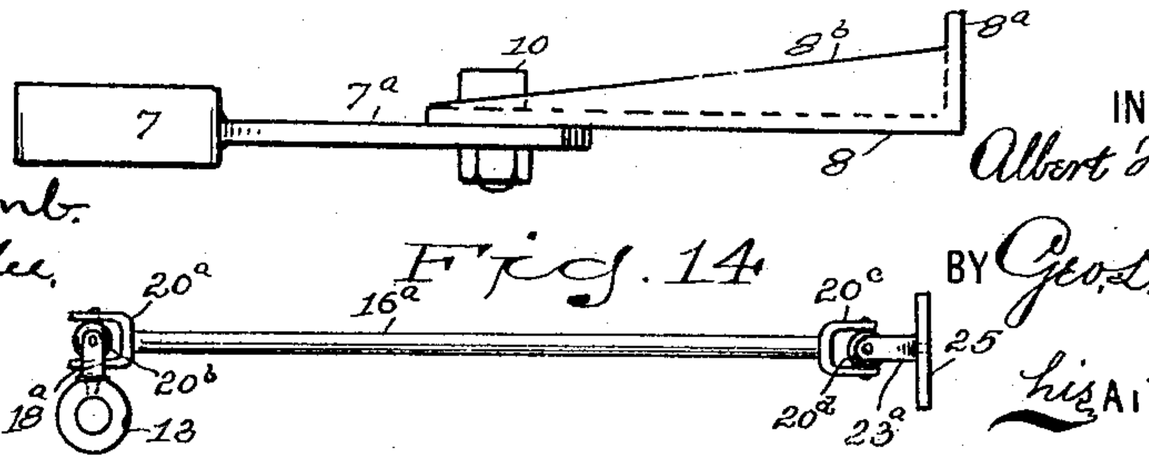

Fig. 14.

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3 SHEETS—SHEET 3.

Fig. 6.

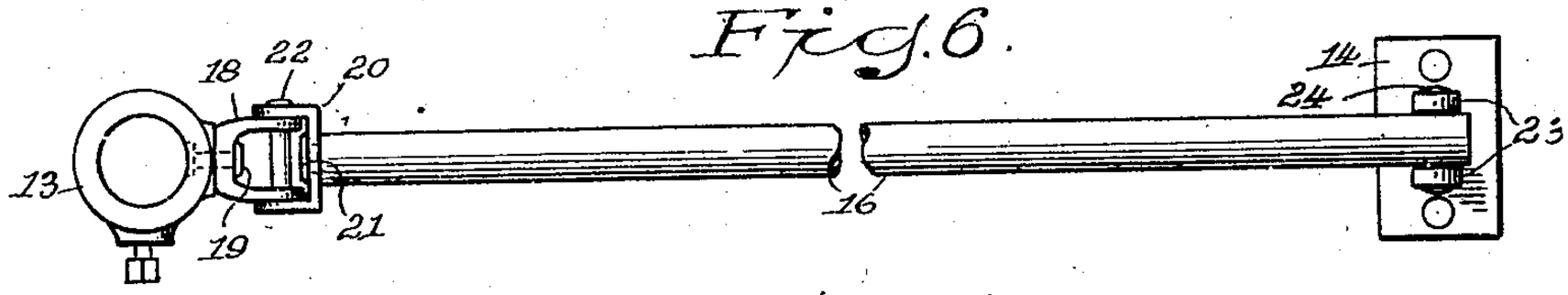


Fig. 7.

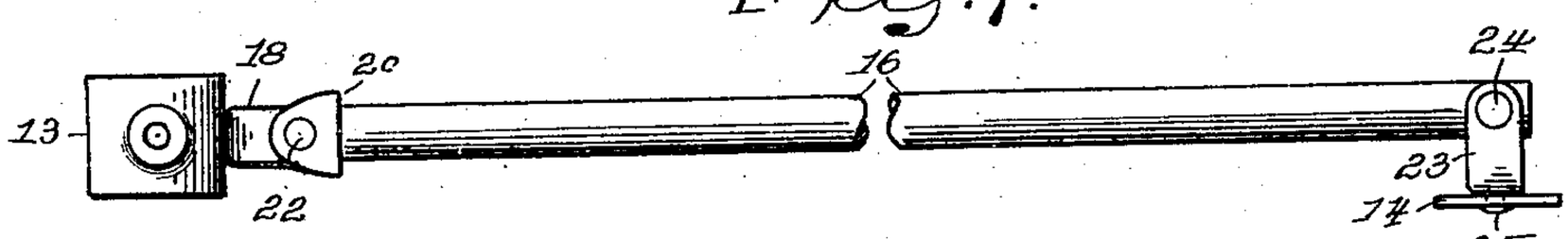


Fig. 8.

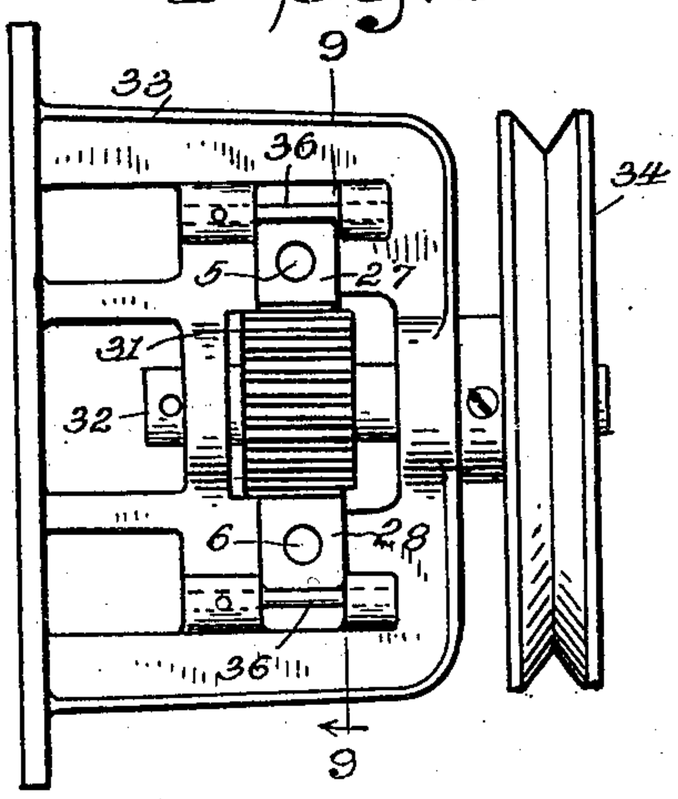


Fig. 9.

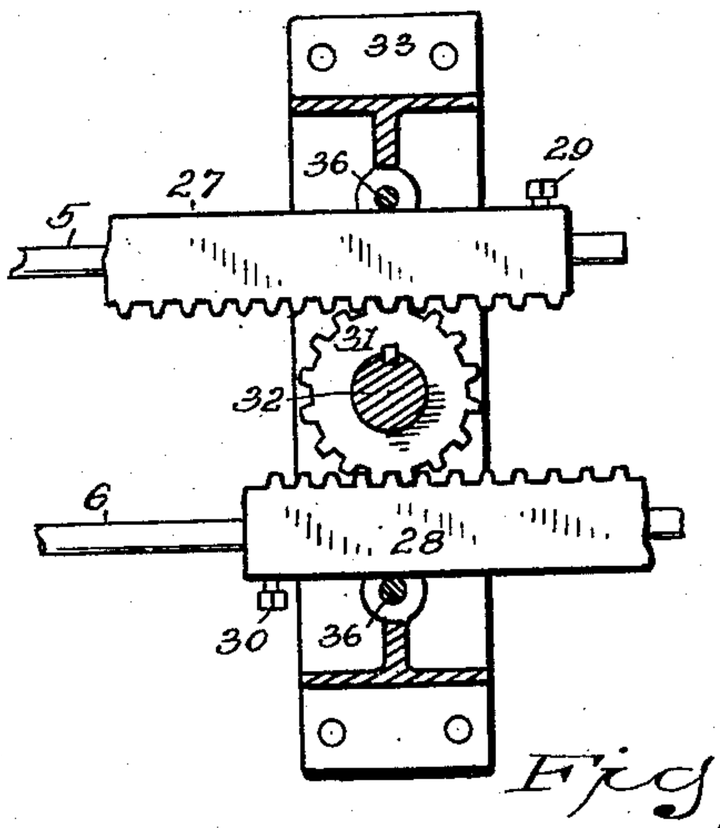


Fig. 10.

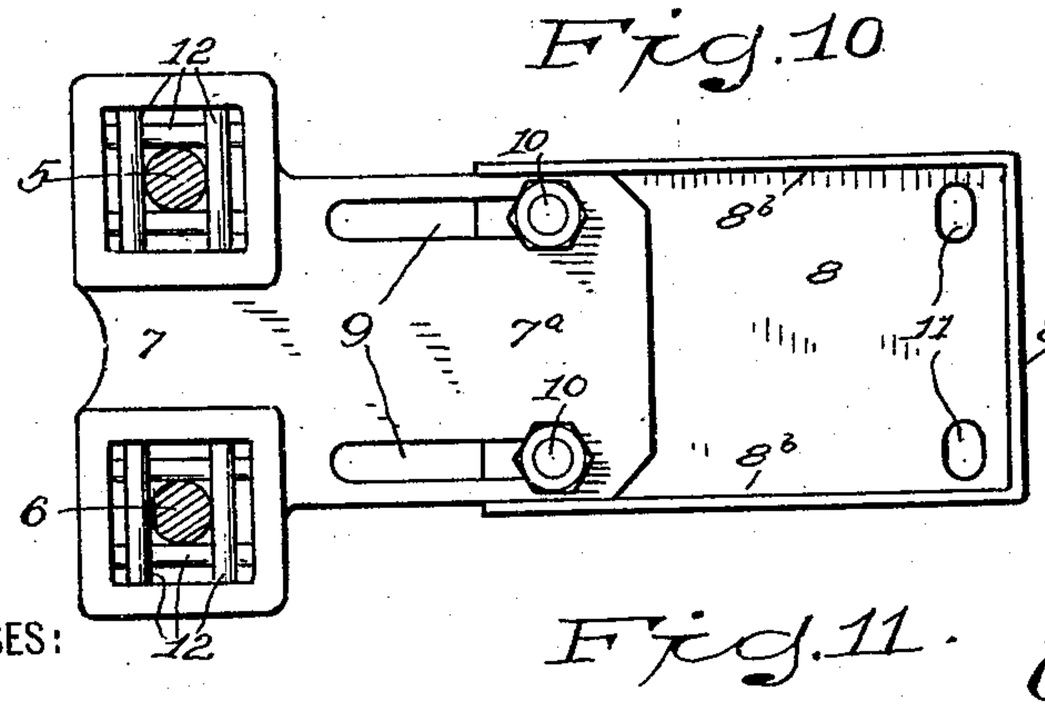


Fig. 13

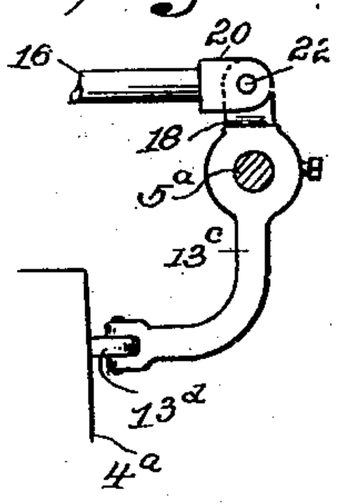
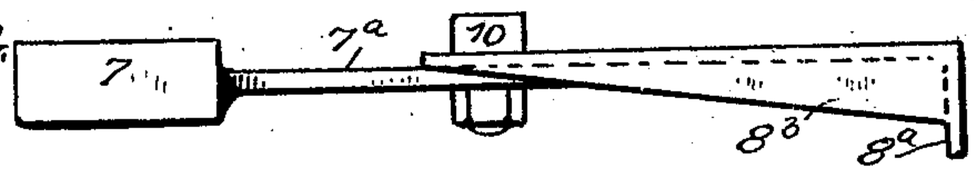


Fig. 11.



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UNITED STATES PATENT OFFICE.

ALBERT K. LOVELL, OF NEW YORK, N. Y., ASSIGNOR TO GERHARD F. DROUVÉ, OF BRIDGEPORT, CONNECTICUT.

SHUTTER-OPERATING DEVICE.

No. 842,896. Specification of Letters Patent. Patented Feb. 5, 1907.

Application filed August 18, 1902. Serial No. 120,033.

To all whom it may concern:

Be it known that I, ALBERT K. LOVELL, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Shutter-Operating Devices, of which the following is a specification.

My invention relates to shutter-operating devices whereby a long line of shutters are manipulated to as to open and close simultaneously.

The object of my invention is to control the movement of a long line of shutters by mechanism of simple and cheap construction and requiring but a slight expenditure of power to operate it. In a former application for the same purpose, filed August 7, 1902, Serial No. 119,304, I employ operating-rods which are angular in cross-section; but as it is often necessary to cut and join these angular rods when erecting the apparatus in the building being equipped with the device it is not so convenient to make connections on these angular rods. In my present application I employ round rods or pipes, preferably pipes, as these are always procurable properly threaded and can be readily coupled together to form a continuous line for any distance required. To counteract or neutralize the torsional strain on these pipes or rods, I reverse the adjustable collars mounted thereon at intervals, so that the thrust of the connecting-links will be oppositely exerted on said rods or pipes.

The ordinary universal joint or ball-and-socket joint for the connecting-links between the connecting-rods and shutters not being suitable for round pipe or rods I have devised a link especially for this purpose.

To enable others to understand my invention, reference is had to the accompanying drawings, in which—

Figure 1 represents a reduced view of three shutters of a series closed, broken view of the parallel operating-rods, links connecting the shutters with said rods, and means for operating the rods. Fig. 2 is a sectional view of one of the window-frames through line *a* of Fig. 1, showing the shutter journaled in said frame and closed, broken view of the operating-rods, and plan view of the jointed links. Fig. 3 is a view similar to Fig. 2 with the shutter opened. Fig. 4 is an enlarged broken view of a closed shutter and a broken view of its frame, broken view of the operating-rods, and front elevation of the same and the jointed links. Fig. 5 is an enlarged perspective view of an open shutter, broken view of the frame, and operating-rods. Figs. 6 and 7 are broken detail views of one of the jointed links shown in different positions. Fig. 8 is a detail side elevation of the pinion-supporting bracket and the chain-wheel. Fig. 9 is a detail sectional view of the pinion-supporting bracket through line 9 of Fig. 8, broken side elevation of the racks connected with the operating-rods. Fig. 10 is a detail side elevation of one of the adjustable rod-supporting brackets. Fig. 11 is a detail upper plan view of the bracket shown at Fig. 10. Fig. 12 is a detail upper plan view of one of the brackets for the operating-rods oppositely assembled from those shown at Figs. 10 and 11. Fig. 13 is a detail side elevation of an adjustable collar mounted on a single operating-rod and having a tailpiece carrying an antifriction-roller adapted to bear against the window-sill or other convenient place to compensate for the torsional strain on said rod, also broken view of one of the jointed links. Fig. 14 is a modified construction of the link.

Its construction and operation are as follows:

1 represents the shutters, 2 the vertical sash-rails, which vertical rails are centrally provided with the pivots 3, which pivots are journaled in the uprights or frames 4.

5 and 6 are parallel shutter-operating rods on the inside of the building and running the entire length of the series of shutters. These rods are supported in the adjustable brackets 7. These brackets are adjustably supported on the bases 8, which bases are secured to the uprights 4. As the shutters to be operated are frequently so located in a building with respect to timbers, braces, and girders, especially in iron-frame buildings, that it is desirable to make the rod-supporting brackets adjustable. These brackets (see Figs. 10 and 11) have a flat tailpiece 7^a, in which are located the two elongated openings 9. Holes are provided in the upright portion of the base 8 to receive the clamping-bolts 10, which bolts also pass through the elongated openings 9. This feature enables the brackets to be adjusted to suit the position of the operating-rods, which rods are

equal distance from all of the windows. The bases are also constructed with a view to the various existing conditions. The longer leg or upright is provided with the holes 11, whereby it may be attached to the side of a timber, girder, &c. The foot 8^a is also provided with holes (not shown) when it is most convenient to attach that portion of the base. The longer leg or upright of the base is provided with the ribs or flanges 8^b, which serve as a guide and support for the tailpiece of the bracket, and in the majority of cases this mode of connection will be used. In some instances, however, it may be impossible to secure the foot of the base to the outside of an I beam or girder. In such cases the foot of said base is secured to the inner flange of the beam with the smooth side of the upright of said base outward, as shown at Fig. 12, and to this outer face is attached the tailpiece of the bracket. From the foregoing it will readily be seen that my peculiar form of support for the operating-rods is adapted to all manner of places and conditions not readily accessible to the ordinary bracket. The bracket 7 is also provided with the antifriction-rolls 12 for reducing the friction on the operating-rods 5 and 6.

13 and 13^a are collars or sleeves adjustably mounted on the operating-rods 5 and 6, two in front of each shutter, one on each rod. 14 and 15 are sash-brackets attached to the vertical sash-rails 2. Between said collars and brackets are located the links presently to be more fully described. The operating-rods 5 and 6 moving in opposite directions, as indicated by arrows *b c*, Fig. 4, will in connection with said links tilt the shutter on its pivotal points to throw the lower part of the shutter out and the upper part in, as shown at Figs. 3 and 5.

As the links are connected at two points—viz., the lower part of the sash and to the collars on the rods—and as the lower part of the sash travels in a circular path while the links have an angular movement with respect to this circular path, it is evident that the links must be so pivoted that there is no disposition or tendency to cramp while the shutters are being opened or closed. A detail construction of these links and their pivotal connections is shown at Figs. 6 and 7. 16 is the body portion or arm of the link. 18 is a U-shaped clip swiveled on the collar 13 by the pin 19. This enables the clip to swivel or rotate freely on the said pin. 20 is a similar clip adapted to swivel or rotate freely on the headed pin 21 in the end of the link-arm. The arms of the clip 20 embrace the arms of clip 18, and both are pivotally supported on the pin 22. This combination—viz., the two clips and the pin 22—I designate the "coupling." 23 is a U-shaped clip designated as the "connection," which is pivotally supported on the pin 24, passing transversely through the opposite end of the link-arm. This connection is swiveled or rotatably connected to the sash-bracket 14 by the headed pin 25. It will thus be seen that by means of these several pivoted and swiveled connections the links are free to occupy every conceivable position that they are obliged to assume while the shutter is being operated; otherwise it would be impracticable to operate shutters hung, as shown. Therefore this combination of swiveling and pivoting of the links at one end or the other is absolutely essential.

As the ordinary universal joint used principally for transmitting motion is not adapted to swivel and can therefore only be used when the thrust of the link is directly in line with the operating-rod, it is not applicable for round rods or pipes, where the thrust of the link must necessarily be exerted on each side of the rod in order to counteract or neutralize the torsional strain of the rod. In the drawing shown at Fig. 14 the ordinary universal joint comprises the arm 16^a, clips 18^a, and 20^a, with the ball 20^b to form the coupling on one end of the said arm, and the clips 20^c and 23^a with the ball 20^d to form a coupling at the other end of said arm. Now, unless the clip 18^a is swiveled to the collar 13 or the clip 23^a is swiveled to the sash-bracket 25, or both, this form of link could not possibly operate in connection with round rods, and be set off to one side of the rod in order to reverse the thrust of the link to counteract the torsional strain on the rod. In the construction shown at Figs. 6 and 7 it is necessary for the link-arm 16 to rotate or partially rotate or swivel during some portion of its operation. This is due to the fact that the pin 22 of the coupling will only permit the coupling to tilt in one direction. Therefore it is necessary for the arm to swivel. The ball in the coupling shown at Fig. 14 compensates for the swiveling of the arm 16^a; but, as before stated, this universal coupling is useless for my purpose, unless the clips 18^a or 23^a is made to swivel. Therefore there must be a swiveling means provided for any kind of link used in combination with its other movements in order to make it available for my use.

While I show the links connected to the collars directly above and below the rods, this feature applies particularly to rods arranged in a vertical plane, as shown. When these rods are arranged in a horizontal plane to effect the movement of shutters hung in a different manner than shown, the thrust of the links will of course be on the side instead of on the top of the rods; but in whatever position the rods are located the thrust of the links on the rods must be diametrically opposite each other.

The reversal of the collars at short intervals being a very economical and effective

method for counteracting the torsional strain on round rods or pipes, it is important to so pivotally connect the links with the collars that the thrust of the links will be exerted on one side of the rods, so that by simply reversing the collars, as before mentioned, the thrust will be oppositely exerted and equalized, thus effecting a perfect balance. This will permit the rods to have a free longitudinal movement without cramping or twisting.

It will be understood that a single rod or pipe can be used (see single rod 5^a, Fig. 13) in connection with my improved link. In this case the collar 13^b is provided with the curved tailpiece 13^c, carrying in its free end the antifriction-roller 13^d, adapted to run against the window-sill 4^a or against any other convenient place.

The supporting-brackets 7 are so close together, being as before mentioned attached to the uprights on each side of the shutters, that the operating-rods are thoroughly protected against lateral strain; but unless the torsional strain on these rods is neutralized or counteracted it would not be practicable to extend them beyond a few feet at the most. As my device is calculated to operate and is operating a series of shutters extending several hundred feet, and as the operating-rods are necessarily small to avoid weight and cost, it is desirable that all torsional strain be eliminated in order to insure perfect freedom and balance in all the moving parts. To accomplish this, I reverse each alternate pair of collars on the rods 5 and 6, as shown at Fig. 1. The first shutter at the right shows the inner end of the links swiveled on the collars 13 and 13^a above the said rods. Therefore when the shutter is being opened the torsional strain will be in the direction as shown by the arrows *d* and *e* of Fig. 5. Now, if all the links in the series were similarly connected, the rods would revolve or twist and increase the friction so as to make the device work unsatisfactory; but by reversing the position of these collars, as shown in the next window at the left, the torsional strain at this point is reversed by being exerted below the rods and in the opposite direction, as shown by arrows *f g*, Fig. 5. This arrangement offsets or counteracts the torsional strain exerted by the tilting of the first shutter. The third shutter is connected the same as the first, and throughout the whole series the thrust of the links on the operating-rods is thus alternated, first on the upper side of the operating-rods and then on the lower side. It will be readily be seen that this alternating feature may occur at longer intervals, but the best effect is produced by shortening the interval as much as possible.

27 and 28 are racks mounted on the ends of the operating-rods 5 and 6, Figs. 1 and 9. These rods are adapted to pass entirely through the racks to provide for possible adjustment and are secured in place by means of the set-screw 29 and 30. 31 is a pinion mounted on the short shaft 32 of the hanger-bracket 33. (See also Fig. 8.) On the outer projecting end of shaft 32 is mounted the pulley 34, adapted to receive the endless rope or chain 35, which is operated from a distance below the apparatus.

Rotating the pulley 34 will give, as before mentioned, a longitudinal movement to the operating-rods in opposite directions, as indicated by the arrows *b* and *c*, which movement, as has already been explained, will simultaneously operate all of the shutters.

36, Figs. 8 and 9, are antifriction-rolls engaging with the outer surface of the racks to keep the racks engaged with the pinion 31.

With my improved device I am able to operate a longer line of shutters from a single station than can be done by any device now known. With my arrangement for counteracting the torsional strain of the operating-rods I am able to use much smaller rods than has heretofore been used in shutter-operating devices of this character. In place of solid rods, as before mentioned, pipes can be used which are easily coupled together and are also much lighter.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a device for operating a plurality of shutters, comprising, in combination with operating-rods moving in opposite directions and carrying adjustable collars, of links comprising arms swiveled at one end to couplings said couplings swiveled to said collars, the opposite ends of said arms pivotally supported to swiveled connections of the window-brackets, for the purpose set forth.

2. In a device for operating a plurality of shutters, comprising, in combination with operating-rods moving in opposite directions and carrying adjustable collars or sleeves, of links comprising arms swiveled at one end to couplings, said couplings swiveled to said collars, the opposite ends of said arms pivotally supported to swiveled connections of the shutter-brackets, said collars reversed at intervals on said connecting-rods so as to neutralize or counteract the torsional strain on said rods, for the purpose set forth.

3. The combination, in a device for operating shutters, of rods adapted to move in opposite directions, links interposed between said rods and shutters and having both a universal and a swivel movement, adjustable means on said rods for supporting one end of said links so that, by means of said adjustment and the universal and swiveling feature of the links, the shutters are freely operated without cramping, for the purpose set forth.

4. The combination, in a device for oper-

ating shutters, of an operating-rod adapted to have an endwise movement, links interposed between said rod and shutters and having both a universal and a swivel movement, adjustable means on said rod for supporting one end of said links, means for counteracting the torsional strain on said rod, for the purpose set forth.

5. The combination, in a device for automatically operating a plurality of shutters, comprising operating-rods carrying adjustable collars, links having both a universal and a swivel movement and connecting said collars with the shutters, said collars reversed at intervals so as to alternate the thrust of said links and thus counteract or neutralize the torsional strain on said rods, for the purpose set forth.

6. The combination, in a device for automatically operating a plurality of shutters, comprising, operating-rods adapted to be moved in opposite directions, collars adjustably mounted on said rods, links connecting said collars with the shutters, said collars reversed at intervals to bring the pivotal connection of the links with the collars alternately above and below said rods so as to alternate the thrust of said links and thus counteract or neutralize the torsional strain on said rods, for the purpose set forth.

7. The combination, in a device for operating a plurality of shutters, comprising operating-rods carrying adjustable racks adapted to engage an interposed pinion, means for supporting said pinion, said rods also carrying collars adjustably mounted thereon, links connecting said collars with the shutters and constructed substantially as shown and adapted thereby to conform to the varying movements of the shutters and operating-rods, said collars reversed at intervals so that the thrust of said links will be oppositely exerted on said rods and thereby counteract or neutralize the torsional strain on said rods, for the purpose set forth.

8. The combination, in a device for operating a plurality of shutters, with operating-rods, of brackets for supporting said rods, bases to which said brackets are adjustably secured, means on said bases for supporting them to the outside face of a beam, said base adapted to be reversed, and means thereon for supporting them to the inside face of a beam, for the purpose set forth.

Signed at Bridgeport, in the county of Fairfield and State of Connecticut, this 16th day of August, A. D. 1902.

ALBERT K. LOVELL.

Witnesses:
S. J. CHAFFEE,
F. B. FELTON.