L. G. WILSON.

MECHANISM FOR OPERATING ROLLING METALLIC SHUTTERS.

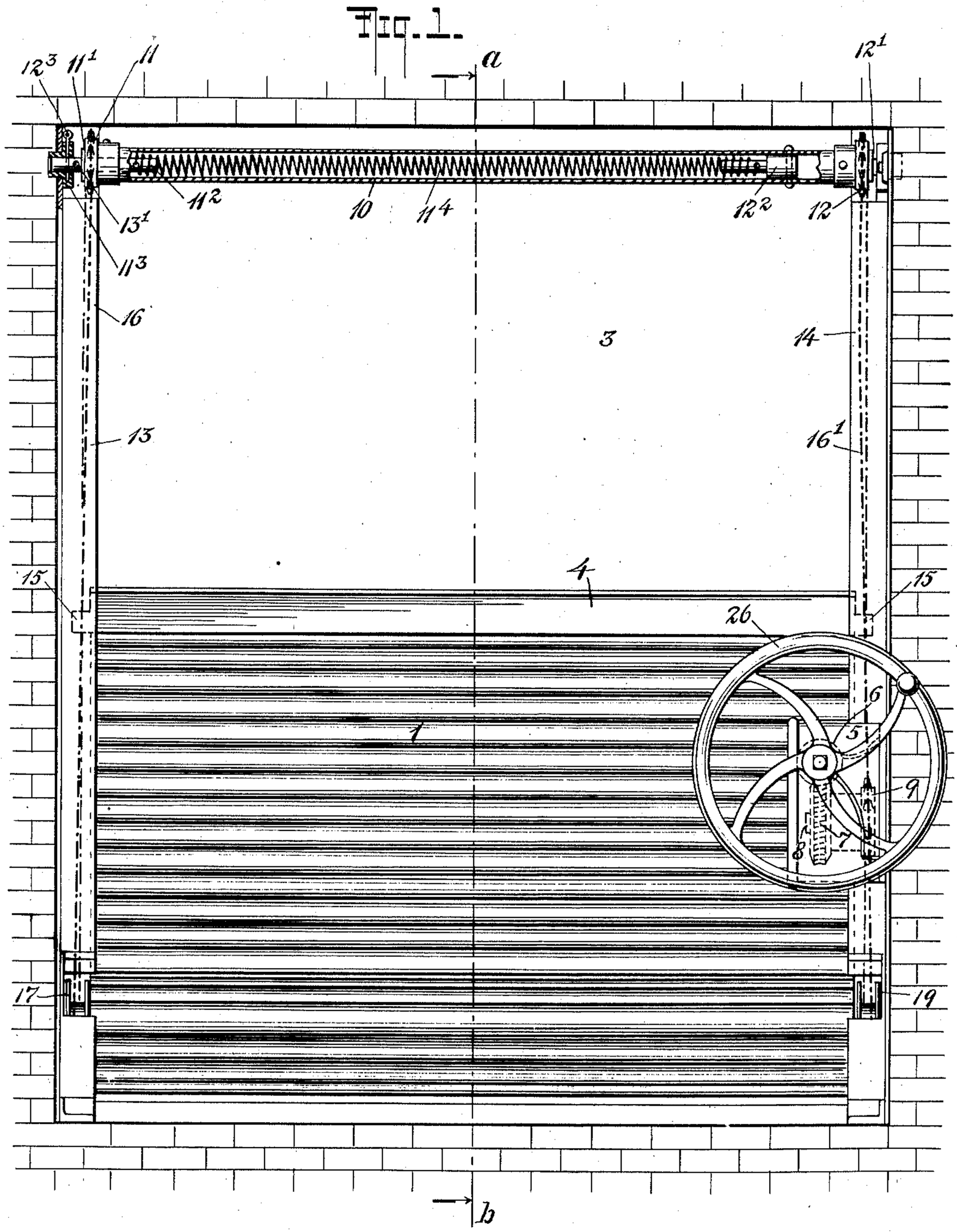
APPLICATION FILED JUNE 22, 1908.

929,742.

Patented Aug. 3, 1909.

2 SHEETS—SHEET 1.

FIG. 1.



WITNESSES:

G. V. Rasmussen

Elmer Stollyoung

INVENTOR

LESTER G. WILSON

BY

Briesen & Knauth

ATTORNEYS

L. G. WILSON.

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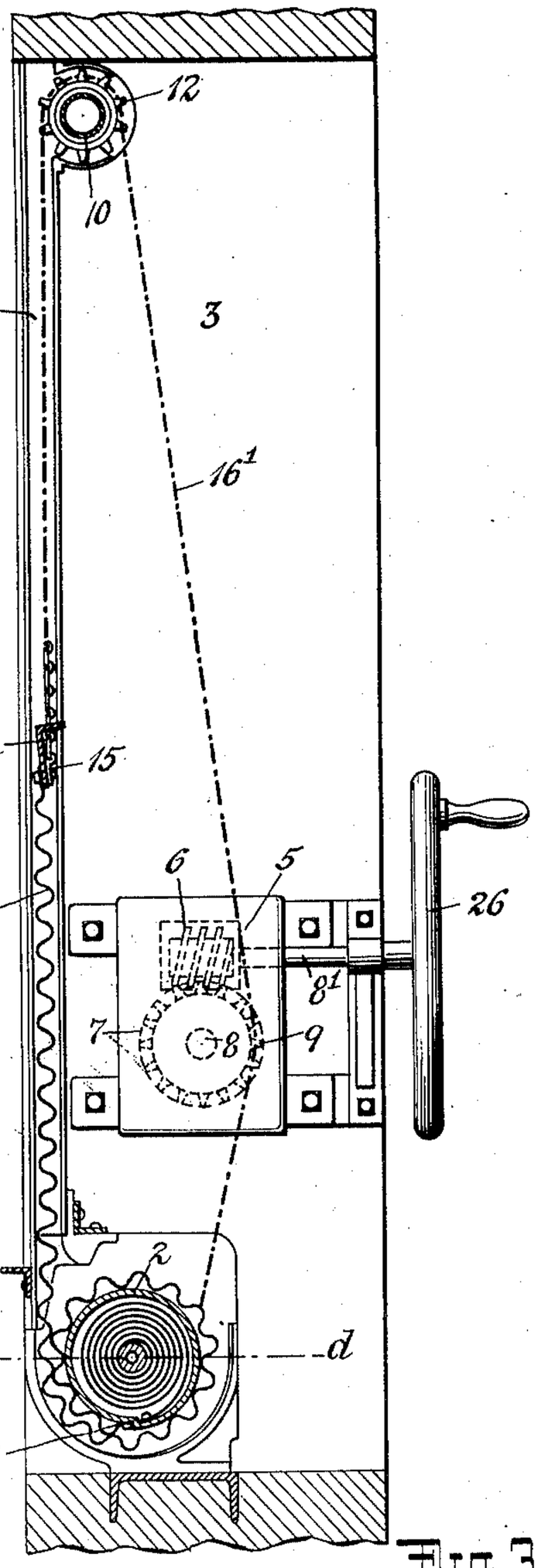

FIG. 2.

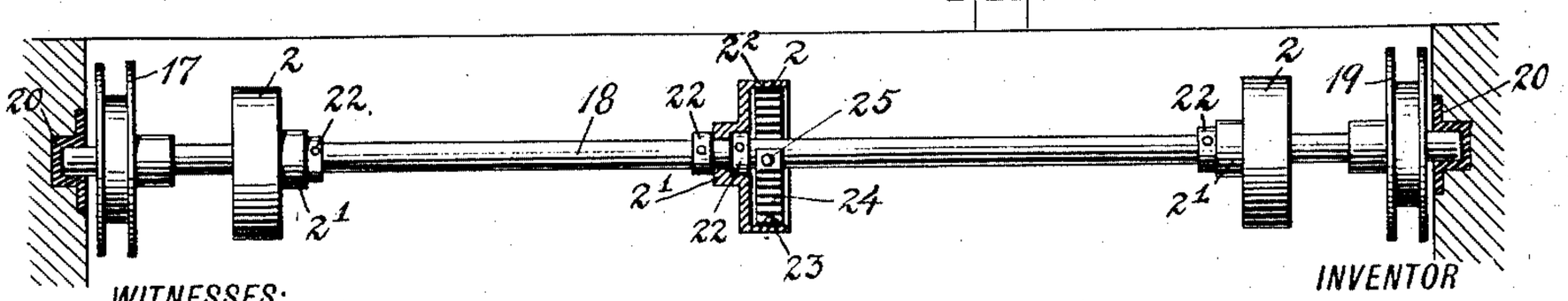

FIG. 3.

WITNESSES:

G. V. Rasmussen

Elmer Shilkowsky

INVENTOR

LESTER G. WILSON

BY Briesen & Knauth

ATTORNEYS

UNITED STATES PATENT OFFICE.

LESTER G. WILSON, OF LARCHMONT, NEW YORK.

MECHANISM FOR OPERATING ROLLING METALLIC SHUTTERS.

No. 929,742. Specification of Letters Patent. Patented Aug. 3, 1909.

Application filed June 22, 1908. Serial No. 439,662.

To all whom it may concern:

Be it known that I, LESTER G. WILSON, a resident of Larchmont, Westchester county, State of New York, have invented certain new and useful Improvements in Mechanism for Operating Rolling Metallic Shutters, of which the following is a clear, full, and exact description.

My invention has reference particularly to the means employed for raising and lowering the large corrugated metal or interlocking slat shutters now so generally used to protect the doors and windows of large buildings at night, and when not in regular use, and is especially useful when the shaft upon which such shutter is rolled or unrolled is placed below instead of above in which case the shutter must be drawn up to close and let down to open.

The object of my invention is to arrange a shutter of the above described type which may be readily opened or closed, and which may be stopped at any desired point; which will require a minimum of effort to operate it, when the proper means is employed, but which is positively locked and cannot be moved however great the force otherwise applied; in which the shutter is always tightly stretched; and in which the operating mechanism is simple, substantial, and not easily deranged.

My invention will be best understood by reference to the drawings where—

Figure 1 is an elevation looking from the rear, or inside, of a metal shutter fitted with my improved operating mechanism. Fig. 2 is a sectional elevation along the line *a—b* of Fig. 1 and Fig. 3 is a plan, part in section, along the line *c—d* through the axis of the shutter roller, the view being taken from above, and the shutter itself being omitted.

1 is a shutter of corrugated iron or steel fixedly attached to barrels 2, 2, 2, and adapted to open and close a window opening 3; the edge or end of the curtain is provided with a bar, 4, operating to make a close mechanical joint with the top of the window frame when the shutter is closed, as also to stiffen and protect the end of the shutter.

Attached to the window frame at one side is a worm gear, 5, composed of a worm, 6, engaging a wheel, 7, which is carried by the shaft, 8, bearing at its other extremity a sprocket wheel, 9. At the top of the window frame is mounted a shaft, 10, carrying sprocket wheels 11 and 12, fixedly attached to each end; these wheels lie in planes intersecting that of the curtain near the outer edges of the runways, 13 and 14, in which the curtain moves and one of these planes, that of sprocket wheel 12, is also that of the worm gear sprocket wheel, 9. The peripheries of these sprocket wheels project into the runways approximately to their central plane. Shaft 10 itself is hollow and has, at one end, a journal 12^1 fixedly attached thereto and working in a suitable journal box set in the side of the shutter frame or opening. At the other end of the hollow shaft is a suitably formed plug 11^1, also fixedly attached; this plug has the sprocket wheel 11 exteriorly keyed to it and is centrally bored to receive a short shaft section 11^2, itself firmly keyed to a wall socket 11^3 by a pin 12^3, upon which shaft section it is free to rotate. A coiled spring 11^4 of selected strength is fixed, at one end to the shaft section 11^2 and, at the other end, to an internal plug 12^2 riveted or keyed fast to the main shaft 10. As 10 revolves, therefore, in one direction or the other a corresponding twist is given to the spring 11^4.

Attached to extensions, 15, 15, at each end of the bar, 4, are the ends of sprocket chains which pass up and over the sprocket wheels, 11 and 12, one of the chains, 16, going straight down to be fixedly attached to the periphery of a flanged pulley, 17, keyed to one end of the barrel shaft, 18, and the other 16^1, being similarly attached to a second flanged pulley, 19, identical with 17 and similarly fastened to the shaft, 18, the chain first passing back, however, over the worm gear sprocket, 9, and engaging therewith.

The shutter roller consists of a shaft 18, which is attached to the window frame by suitable bearings, 20, 20, and besides carrying the pulleys, 17, and 19, also supports the barrels 2, 2, 2, to which the inner shutter end is fastened and upon and from which the shutter is rolled. These rollers may be thought of as relatively thin flat disks with a central hub 2^1 on one side and a flat peripheral rim 2^2 on the other, the hub being bored for an easy fit over shaft 10 and the other diameter of the rim being gradually decreased over a segment of its circumference until it meets a radial and axial shoulder, 21, against which the curtain end is abutted; this construction causes the rolling and unrolling of the curtain upon its barrels 2, 2, 2, to take place as a smooth spiral without the hump, irregular movement, and va-

riability in the necessary applied power which would otherwise result. Collars, 22, 22, retain the rollers in their correct axial position. Inclosed within the rim of each roller and attached to it at 23 is a spiral spring, 24, preferably of flat material, so selected as to have a suitable number of turns and tension; the inner end of this spring is attached to shaft 18 at 25. The barrels 2, 2, 2, may, therefore, turn in either direction upon shaft 18 against the resistance of spring 24, within limits determined by the length of the spring, its tension, and the torsional force applied. Suppose, now, the curtain to be down or open. To raise it I rotate the hand wheel, 26, carried by the worm gear shaft, 8^1, in the proper direction, thereby pulling upon the curtain end through the instrumentality of the sprocket chains and causing the curtain to unwind from the barrels 2, 2, 2; the shaft 18, through the springs, 24, will also rotate tending thereby to wind upon the pulleys 17, 19, that length of sprocket chain which is released by the unwinding of the curtain.

The shutter 1 is, necessarily, of considerable thickness so that the diameter and consequent circumference of the cylinder which is formed as it rolls and unrolls, changes very rapidly and has minimum and maximum limits widely different. When the curtain begins to rise this circumference is greatest but continuously decreases as the curtain is unrolled until, finally, when the latter is fully closed, it becomes least. The effect of this is, that for successive revolutions of the shutter barrels the length of the shutter unrolled and, hence the length of sprocket chain to be wound upon the pulleys, 17, 19, becomes less and less. But since the sprocket chain itself has material thickness it must, as it winds upon these pulleys, steadily increase the effective diameter of the cylinder upon which it, itself, rolls. An actually greater length of chain is therefore required for each successive revolution of the pulleys. By using the previously described spring connection between the rollers 2, 2, 2, and the shaft 18, these just mentioned opposing conditions are reconciled inasmuch as this shaft need not revolve with the same angular velocity as the rollers, but is free to turn relatively thereto; while tending continually to rotate, therefore, in the same direction as the roller it will, in fact, only rotate sufficiently in amount to hold the chain and shutter taut.

The relative rotative movement of the pulleys and the barrels may be continuously in the one direction or the other, as the shutter rolls or unrolls, or partly in the one direction and partly in the other; this depends largely upon the diameter of the pulleys with reference to the diameter of the rolled shutter. If the pulley diameter is less than that of the fully rolled shutter the pulleys will rotate more rapidly than the rollers until such time as the decreasing diameter of the rolled shutter shall become equal to the increasing diameter of the chain wound pulleys after which the pulleys will revolve less rapidly than the curtain rollers. Should the pulleys be of greater diameter than the fully rolled shutter they will, of course, revolve more and more slowly, with reference to the rollers, as the curtain is unwound.

In practice I prefer to make the diameter of the pulleys about equal to the diameter of the coiled shutter when the latter is about half unwound and with some tension on the springs, 24, at this point. In this way, as the shutter begins to unroll, the pulleys move relatively to the shaft so as to lessen the spring tension to a minimum when the shutter reaches its midway position, after which the relative direction of movement is reversed so as to restore the spring tension to a maximum as the shutter is further unrolled to its limit. It should be noted that the bar extensions 15, 15, to which the chains 16, 16^1 are attached are well below the top of the bar; this is so that the top flat of the bar may be firmly seated against the underside of the top of the shutter opening before the attaching points of the chain and bar begin to turn over the top of the sprocket wheels and out of the vertical plane of the curtain. As explained, there is always tension upon the springs 24, so that, no matter in what position, their tendency is at all times, to coil the shutter upon the barrels. This keeps the shutter front stretched and smooth and so as to always present a good appearance. In a shutter coiled at and lowering from the top the weight of the shutter alone would, of course, always insure this result: When raising or lowering with reference to the bottom, however a permanent twisting movement upon the shutter barrels, tending always to coil the shutter, must be established and maintained. This stretching of the shutter is aided by the spring 11^4 of the top shaft 10 which I set so that it has, always, a tendency to raise the shutter. This setting is easily accomplished by thrusting a pin into diametral holes 13^1 and using this pin as a lever to rotate the shaft 11^2 joined to the end of the spring, the key pin 12^3 being adapted to fit any one of a number of similar diametral holes placed in the shaft for its reception. The direction of rotation is so chosen that spring 11^4 has minimum tension when the shutter is up or fully closed but is increased as the shutter is lowered.

By employing a properly proportioned worm gear as an operative means, the shutter may be raised or lowered with ease no matter how large or massive it may be; being an irreversible device, however, the shutter can not be operated by any force, however, great, applied elsewhere or from the outside.

The shutter may be partially opened, therefore, for light or ventilation without fear of casual trespassers since it may not be moved from the outside and does not afford an easy footing for climbers.

I may, if I choose, substitute for the upper spring shaft 10 as described, an ordinary straight shaft with sprocket wheels firmly fixed thereto and I may also vary many of the details of design and construction in my invention without departing from its true spirit, and now, having described its preferred embodiment,

I claim:

1. In a flexible metallic shutter having one end attached to and adapted to coil upon a roller; journals within said roller and elastically attached thereto; and means attached to the journals and to the free end of the shutter and coöperating with an irreversible driving device whereby the shutter may be operated.

2. In a flexible metallic shutter having one end attached to and adapted to coil upon a roller; journals within said roller and elastically attached thereto; means guided by overhead pulleys and attached to said journals and the free end of said shutter; and an irreversible driving device coöperating with said means and adapted to operate the shutter.

3. In a flexible metallic shutter having one end attached to barrels and adapted to coil thereon, a shaft passing through the center of each barrel and elastically attached thereto; pulleys fixedly attached to the ends of said shaft; sprocket chains coöperating with overhead sprocket wheels and attached, as to one end, to the periphery of each pulley the other ends of said chains being attached to the free end of the shutter; and an irreversible driving device engaging one of said sprocket chains and adapted to operate the curtain.

4. In a flexible metallic shutter having one end attached to barrels and adapted to coil thereon, a shaft passing through the center of each barrel and elastically attached thereto; flanged pulleys fixedly attached to the ends of said shaft; sprocket chains coöperating with overhead fixedly related sprocket wheels and attached, as to one end, to the periphery of each pulley the other ends of said chains being attached to the free end of the shutter; and a sprocket wheel driven by a worm gear engaging one of said sprocket chains, whereby said curtain may be raised or lowered.

5. In a flexible metallic shutter having one end attached to barrels and adapted to coil thereon, a shaft through the center of each barrel and elastically attached thereto; flanged pulleys fixedly attached to the ends of said shaft; overhead sprocket wheels fixedly related to one another and having torsional spring connection with fixed centers upon which they rotate; sprocket chains cooperating with said overhead sprocket wheels and attached, as to one end, to the periphery of each pulley the other ends of said chains being attached to the free end of the shutter; and a sprocket wheel driven by a worm gear engaging one of said sprocket chains, whereby said curtain may be raised or lowered.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

LESTER G. WILSON.

Witnesses:
ELMER SHIRLYOUNG,
JOHN A. KEHLENBECK.