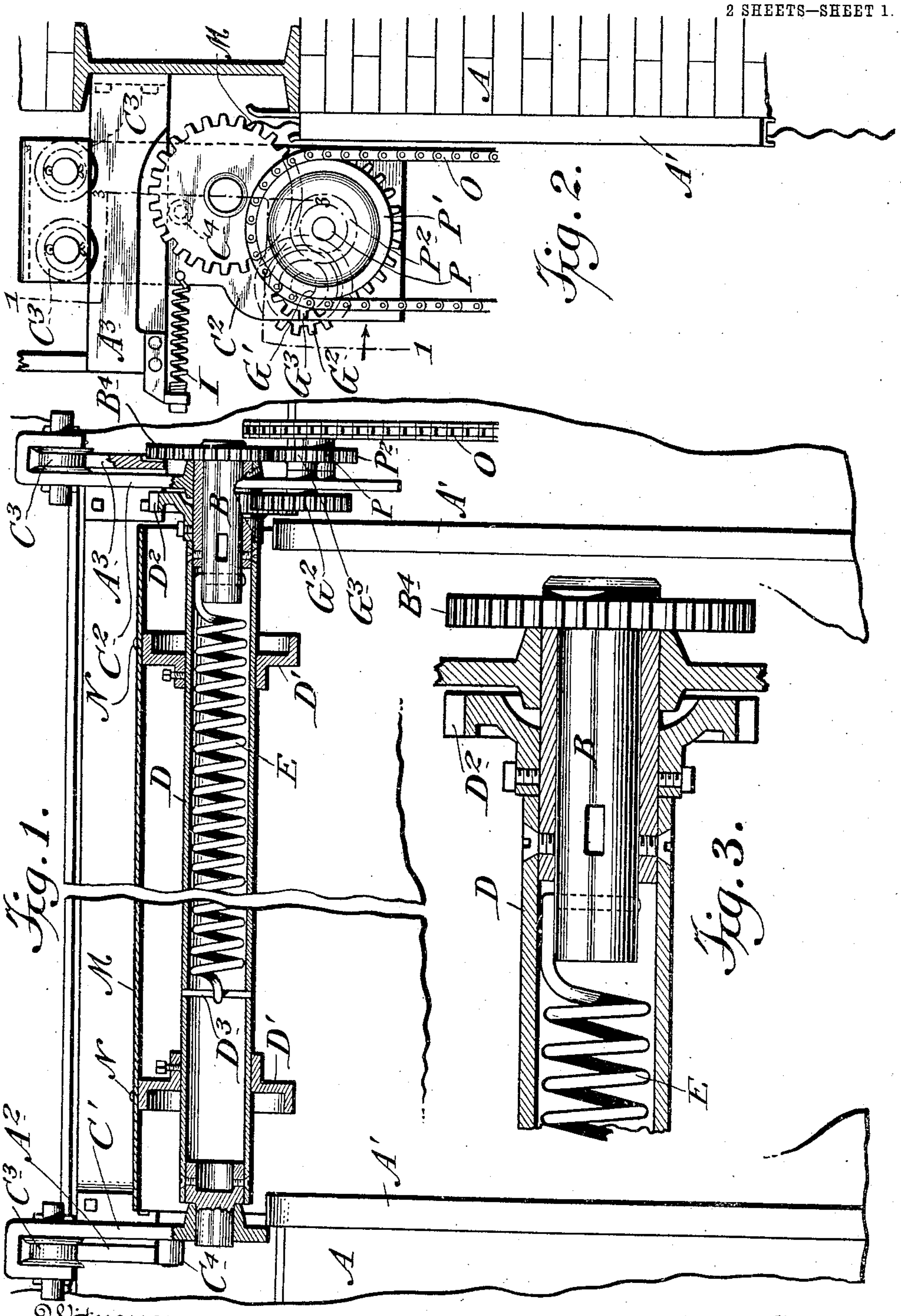
No. 835,599. PATENTED NOV. 13, 1906.

J. CAHILL.

ROLLING OR FLEXIBLE SHUTTER.

APPLICATION FILED NOV. 8, 1904.

2 SHEETS—SHEET 1.



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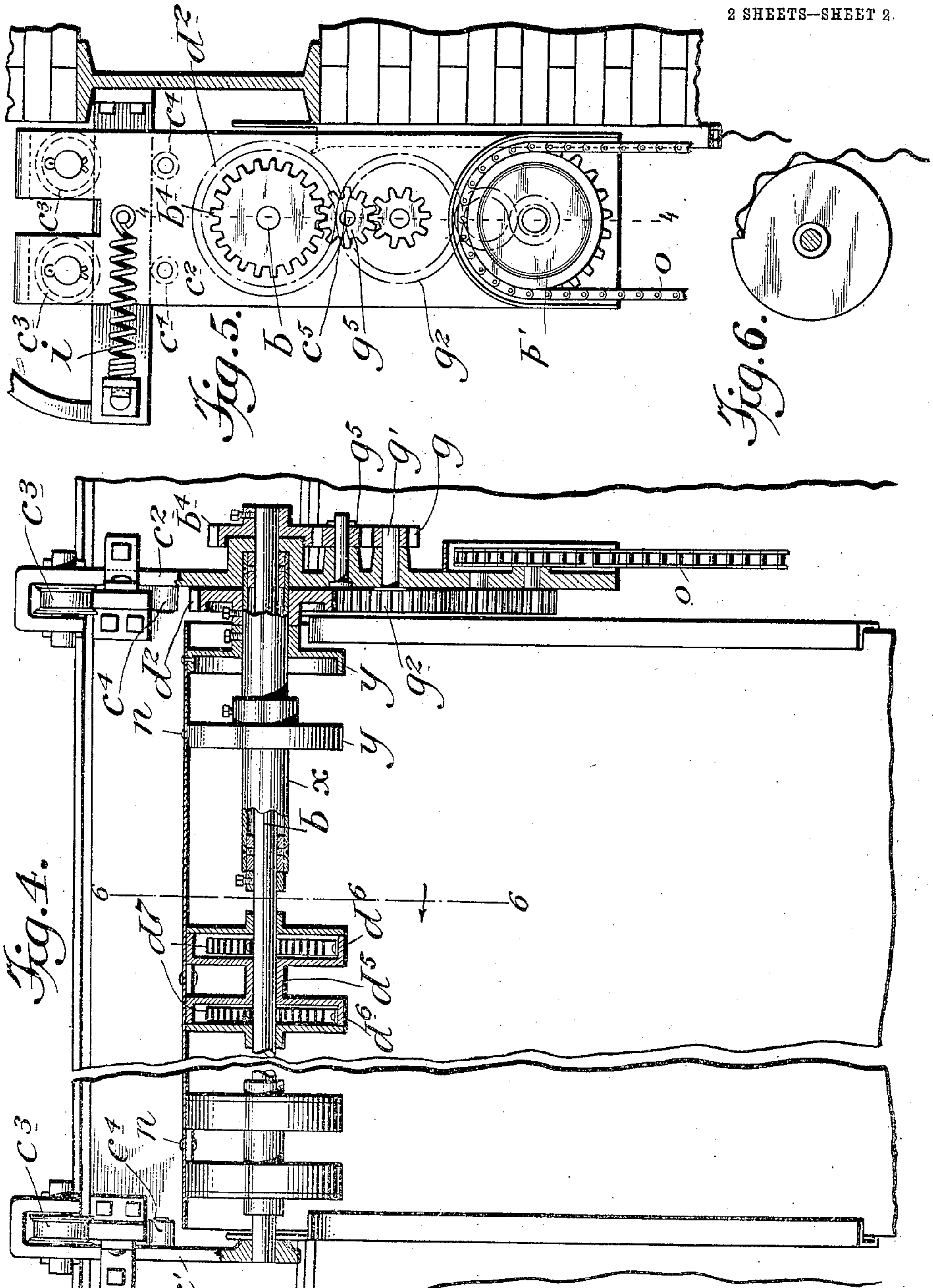

Witnesses

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UNITED STATES PATENT OFFICE.

JOHN CAHILL, OF NORFOLK, VIRGINIA.

ROLLING OR FLEXIBLE SHUTTER.

No. 835,599. Specification of Letters Patent. Patented Nov. 13, 1906.

Application filed November 8, 1904. Serial No. 231,829.

To all whom it may concern:

Be it known that I, JOHN CAHILL, a citizen of the United States, residing at Norfolk, in the county of Norfolk and State of Virginia, have invented a certain new and useful Improvement Relating to Rolling or Flexible Shutters, of which the following is a specification.

The improvement lies in the roller and the provisions for working it with the aid of gearing. Any of the ordinary styles of flexible shutters can be used with my improvement. I will describe it as applied to one of the long-approved forms, using the term "roller" to designate a set of two or more pulleys which are properly spaced apart, all of equal size, and revolved alike around a horizontal axis.

When the roller has by its revolution in the proper direction wound upon itself one layer of the shutter and it commences to wind the second layer, it has been proposed to allow the mass to correspondingly change its position by moving to the required extent away from the building. I do the same and cause the shutter to rise and sink truly in its guideways always from the extreme inner line of a cylinder, which cylinder varies in diameter as the shutter is wrapped around it.

In my improved shutter mechanism, as in many now in use, the weight of the shutter is approximately balanced. I have devised a construction in which a spring is mounted on a shaft carried within the roller, one end taking hold of such internal shaft and the other end taking hold of the roller. The spring exerts a tension which can be modified by turning such inner shaft relatively to the roller, and I have combined gearing which revolves the inner shaft oppositely to the revolutions of the roller. The combination enables me to greatly increase the action of the spring, producing what may in some sense be designated a "double" effect. The double-ended spring thus arranged balances the gravity of the shutter very completely in all positions in which the roller may be either permanently or temporarily held. I can use more than one spring and will describe such use in a modification.

The following is a description of what I consider the best means of carrying out the invention.

The accompanying drawings form a part of this specification.

Figure 1 is a front view with a portion in vertical longitudinal section on the line 3 3 in Fig. 2 parallel to the face of the wall of the building. Fig. 2 is an end elevation. Fig. 3 is a section on the line 3 3 in Fig. 2, on a larger scale. The remaining figures show a modification. Fig. 4 is a vertical longitudinal section on the line 4 4 in Fig. 5, partly in front elevation. Fig. 5 is an end view corresponding thereto seen from the right, and Fig. 6 is a section of the roller and the upper portion of the shutter. All the views show the shutter nearly unrolled.

Similar letters of reference indicate corresponding parts in all the figures where they appear.

Referring to Figs. 1, 2, and 3, A is the wall of the building; A′, the usual vertical casings of metal, which form guideways; M, the rolling shutter, having its edges loosely embraced in such ways as it hangs suspended in position for work and is slowly raised and lowered, and A^2 A^3 are brackets extending horizontally outward from the face of the building. C′ C^2 are carriages adapted to travel thereon and to form supports for the roller and its attachments as they move toward and from the building when required.

D is a sleeve rotated by two forces, one a spring E, inclosed, another a gear-wheel D^2. This sleeve performs three important functions. One consists in supporting pulleys D′, firmly fixed thereon, constituting the roller and carrying the weight of the shutter through screws N, which secure the upper slat of the shutter thereto. Another function consists in receiving the varying tendency of gravity to turn the roller around to let the shutter run down and the varying spring force which opposes such tendency, and a third function consists in receiving, through the gear-wheel D^2, a force imparted by the operator, which latter force is additional to the force received through the spring E. I show the sleeve D as carrying two pulleys D′; it may carry more. Whatever the number, they are rigidly attached to the sleeve. Means being applied to turn the gear D^2 compels the required revolution of the sleeve D and the pulleys D′, and the latter compels the desired elevation of the shutter M or by the turning force being applied in the opposite direction allows the sinking thereof. The sleeve D in this form of the invention extends the whole breadth of the shutter in one continuous length and is supported at the ends—the left end in a bearing formed in the carriage C′, riding on the bracket

A^2, and the right end in a bearing formed in the more elaborate carriage C^2, riding on the bracket A^3.

It will be seen that the gear-wheel D^2 receives force according as the varying effect of the gravity of the shutter, the amount of spring force, and the friction of the parts shall preponderate—that is to say, the winding up of the shutter reduces the quantity of the shutter depending from one side, but also by winding one layer upon another increases the effective diameter of the roller, and thus increases the leverage of the weight remaining. These changes tend to equalize each other. The relaxing of the tension of the spring E as the shutter is wound up introduces another element of importance. These changes, with the parts proportioned as shown, tend to equalize the action at all the different stages, but it does not perfectly balance. There is likely to be an unbalanced resultant force in some positions of the shutter. The gearing by turning the internal shaft and varying the tension of the spring serves to equalize the action in this regard.

In the form of the invention here shown only one spring is used. This is in a helical form of small diameter loosely inclosed within the sleeve D and extends a good portion of the length of its interior. One end of the spring takes hold of a cross-pin D^3 in the sleeve D. The other end is set in a transverse hole in the short inner shaft B, which turns freely in its interior and constitutes an abutment for the spring and can be turned to increase or reduce the tension of the spring.

The gear-wheel D^2, carrying the sleeve D, is engaged by a gear-wheel G^2, keyed on a short shaft extending through the carriage C^2 and carrying a gear-wheel G^3, which engages with the gear-wheel P^2, keyed on the shaft P and controlled by a sprocket-wheel P′ by the aid of a chain O, running on the latter and worked by the attendant. This arrangement connects the sleeve D with the short internal shaft B and insures that whenever the chain O is overhauled to cause the rotation of the sprocket-wheel P′ the same operation revolves the sleeve D and pulleys D′ in one derection and also turns the short inner shaft B in the opposite direction and increases or diminishes the tension of the spring. B^4 is a gear-wheel on the outer end of this internal shaft.

The revolutions of the shaft B and the sleeve D in opposite directions contribute to the life and usefulness of the spring motion. As shown, these parts not only revolve simultaneously, but revolve to equal extents in opposite directions. I attach much importance to this condition; but it is not essential that the revolutions in opposite directions be exactly equal. A portion of the benefit would be obtained by other ratios.

A modification is set forth in Figs. 4, 5, and 6. In this the wall of the building, the guideways, the brackets, and the pulleys, which constitute portions of the rolling shutter, are substantially as in the preceding figures and are where necessary marked with corresponding lower-case letters and supernumerals. In this form of the invention, as in the other, the direct application of the operating power is to the outer shaft or sleeve. The sleeve is in several lengths. In this, as in the other form, the inner shaft is turned simultaneously with the outer shaft or sleeves and in the opposite direction, and in this, as in the other form, the inner shaft acts on the pulleys only through spring force. As shown, two springs are used. The inner shaft *b* extends quite across and is supported in the carriages c' c^2. The outer shaft in the form of several short sleeves is supported loosely on the inner shaft. These sleeves and the pulleys fixed thereon are of two kinds or classes, one receiving motion to revolve in one direction or the other through direct gearing and the other contributing to aid such motion through springs which are engaged with the inner shaft. Turning the inner shaft modifies the action of the springs. I have shown two pulleys in each class. Greater numbers may be used, or one alone may serve.

A gear-wheel b^4 is fixed on an overhanging end, by means of which the inner shaft *b* can be turned. The first sleeve is marked d^5. There are pulleys d^6 fixed on such first sleeve, but the sleeve turns loosely on this shaft. The upper slat of the shutter is fastened to these pulleys by screws *n*.

The springs d^7 are each formed of thin flat steel coiled in a volute form like a clock-spring. Each is inclosed within the hollow interior of a pulley d^6. I have shown two additional pulleys, which are of corresponding size and are useful by engaging with the shutter to fill out the form of the roller. They do not contribute to raise or lower the shutter. So far as such motion is concerned they are mere dummies. They may be similarly hollow, but without springs, or they may be solid pulleys. These dummy pulleys are fixed on a sleeve, which latter is loosely mounted on the inner shaft *b*.

A pitch-chain *o* is adapted to be overhauled by the hand of the operator to turn the sprocket-wheel p' in one direction or the the other at will. The shaft *b* extends through the carriage c^2 and carries a spur-wheel b^4, which latter engages with an idle wheel g^5, turning loosely on a stud c^5, and this gears with a spur-wheel *g*, fixed on a shaft g', which extends through the carriage c^2 and carries a larger spur-wheel g^2, which latter receiving motion from the sprocket-wheel, through gearing as shown, serves in two ways, first, by meshing with the wheel d^2, turning the long sleeve *x*, which has the pul-

leys y y fixed thereon, these pulleys also being secured to the shutter m by screws n, and, second, by the means above referred to of its shaft g', extending out through the carriage c^2 and carrying the gear g, meshing with the idler g^5 and through the latter turning the larger gear b^4, and thus rotating the shaft b in the direction opposite to the rotation of the long sleeve. In both forms the elastic action of one or more springs properly adjusted supports a portion of the weight of the shutter. In both forms force is applied by other means to overcome friction and to operate in either direction to move the shutter up or down, whether the tension of the springs and the weight and leverage of the shutter are perfectly balanced or not, and in both there is automatic change in the spring force, which may correspond so closely to the change in effect of the weight of the shutter as the rising and sinking of the shutter progresses that the unbalanced force remaining is so slight as to be insignificant.

Further modifications may be made without departing from the principle or sacrificing the advantages of the invention. Parts can be used without the whole. I have shown the mechanism for partially rotating the shaft B and thus changing the tension of the springs as applied only to one side of the window. I prefer such construction; but a more elaborate form could be obviously made with the mechanism at both ends.

I include in the term "rolling shutter" or "flexible shutter" any of the various forms of metal or wood partitions, elastic or made in sections, hinged together and wound upon a roller, and pendent therefrom by gravity. The number of the pulleys may be varied within wide limits. The size of the pulleys may be varied.

I use the term "double-acting" as applied to the spring to mean that the ends alternate in their action, the two ends being not necessarily alike in form, but being each ready to serve and actually serving at some periods as the working end and at other periods simply as the abutment for the action.

I claim as my invention—

1. In a shutter-operating mechanism, a hollow roller, a flexible shutter engaged therewith, a shaft, a spring connected at one end with the shaft and at the other end with the roller and mechanism for turning said shaft and roller in opposite directions to each other, substantially as described.

2. In a shutter-operating mechanism, a hollow roller, a flexible shutter engaged therewith, a spring within said roller and having one end connected therewith, a revoluble shaft within the roller and having said spring connected therewith, gear-wheels connected to said shaft and said roller, and means connected with said gears to revolve the shaft and the roller in opposite directions to each other in raising and lowering the shutter, substantially as described.

3. In a shutter-operating mechanism, a roller, a flexible shutter engaged therewith, a spring inclosed in the roller, a revoluble shaft within the roller, said spring being connected with the roller and said shaft, and means for revolving the shaft and the roller in opposite directions to each other in raising and lowering the shutter, substantially as described.

4. In a shutter-operating mechanism, a roller comprising two classes of pulleys having a flexible shutter engaged therewith, a revoluble shaft within the roller, springs connecting said roller and one class of pulleys for transmitting motion through said springs, and means for actuating the other class of pulleys, substantially as described.

5. In a shutter-operating mechanism, a roller, a flexible shutter connected therewith, a revoluble shaft within the roller, a spring inclosed in said roller and connected therewith and to said shaft, and a train of gearing connecting the roller with the shaft and having its members arranged so that the roller and the shaft may turn in opposite directions to each other to vary the tension of the spring in raising and lowering the shutter, substantially as described.

6. In a shutter-operating mechanism, the combination of the roller carrying a flexible shutter, the oppositely-disposed carriages having the roller journaled therein and provided with wheels at their upper ends, and the laterally-extending brackets upon which said wheels travel back and forth and from which the roller-carriage is suspended, substantially as described.

In testimony that I claim the invention above set forth I affix my signature in presence of two witnesses.

JOHN CAHILL.

Witnesses:
VIRGINIUS TUCKER,
OSCIE DASHIELL.