May 31, 1938. P. J. MUSCHONG 2,119,399

SASH OPERATOR

Filed April 12, 1937 2 Sheets-Sheet 1

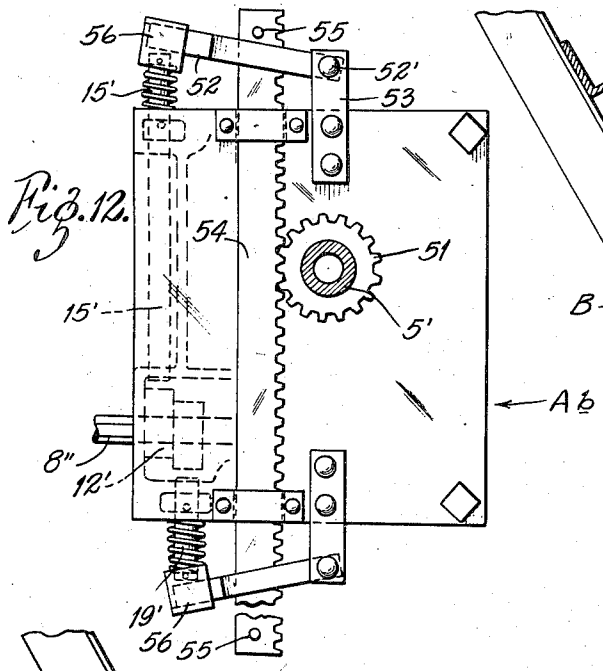


Fig. 12.

Fig. 1.

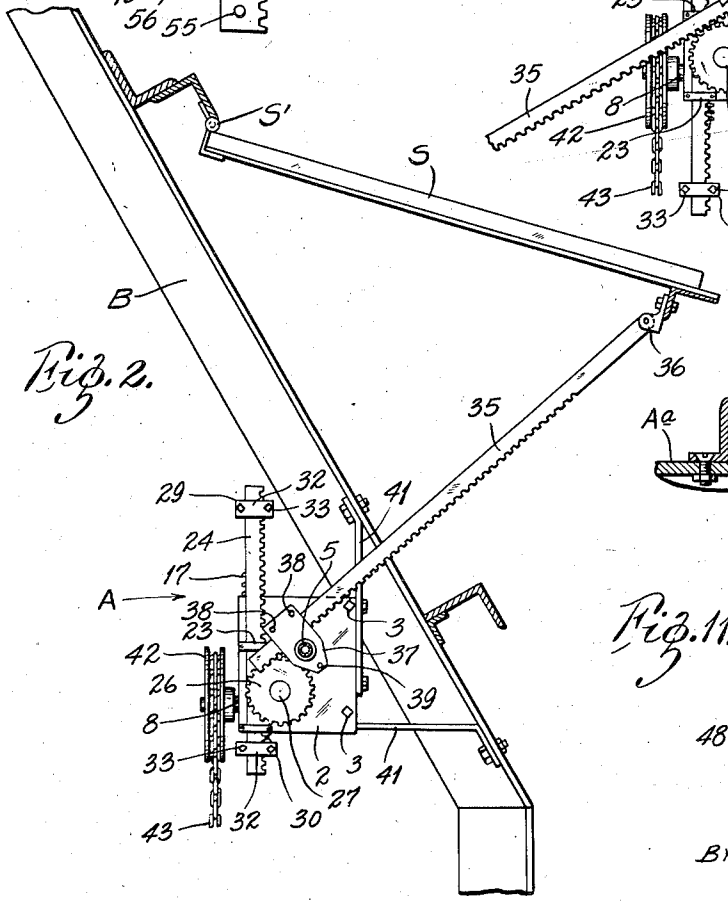


Fig. 2.

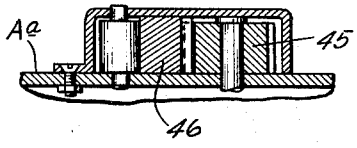


Fig. 10.

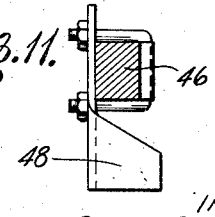


Fig. 11.

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May 31, 1938. P. J. MUSCHONG 2,119,399

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Filed April 12, 1937 2 Sheets-Sheet 2

Fig. 5.

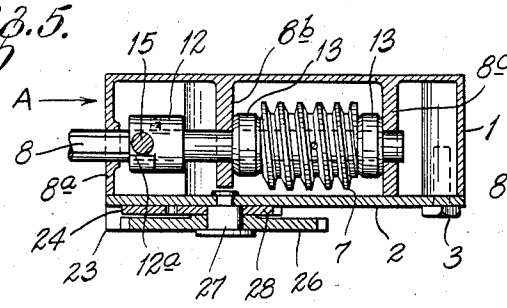


Fig. 4.

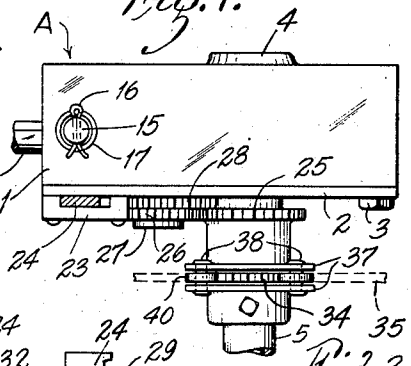


Fig. 7.

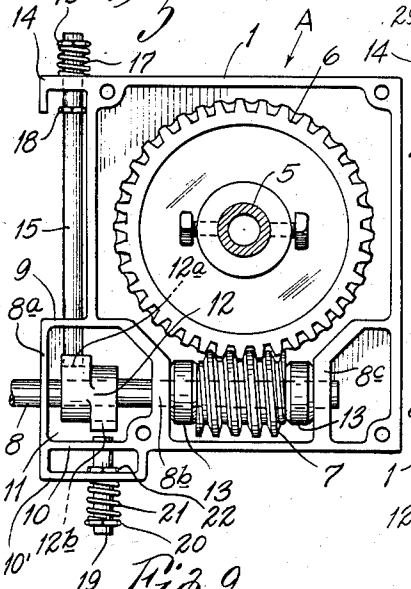


Fig. 6.

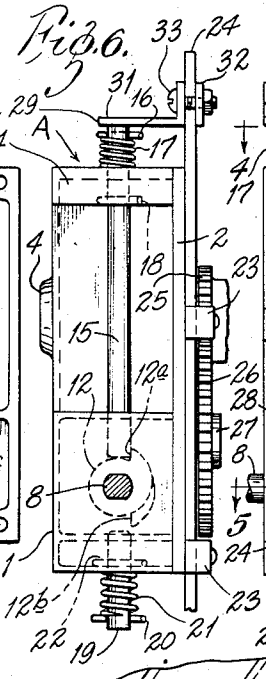


Fig. 3.

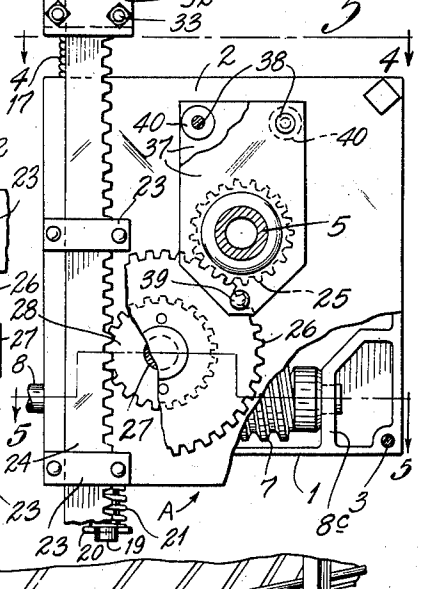


Fig. 9.

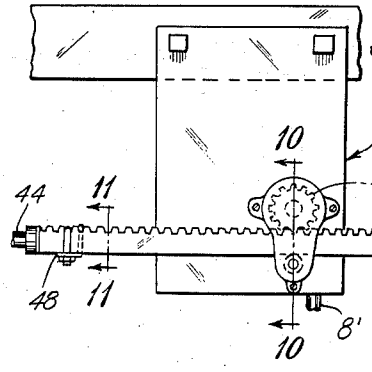
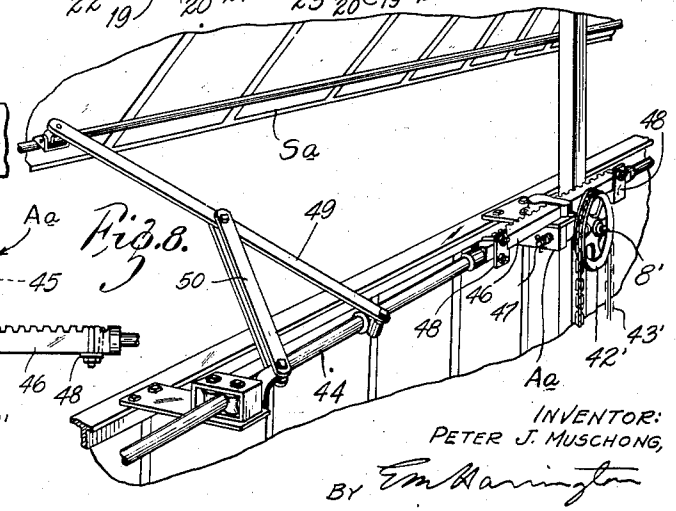


Fig. 8.



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UNITED STATES PATENT OFFICE

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SASH OPERATOR

Peter J. Muschong, St. Louis, Mo.

Application April 12, 1937, Serial No. 136,273

6 Claims. (Cl. 74—91)

This invention relates generally to sash operators and more specifically to operators for sashes of skylights, ventilators, windows and other closures for overhead openings in buildings and other structures, the predominant object of the invention being to provide a sash operator of this type which includes improved stop means that positively arrests movement of the operator when the opposite limits of movement of the sash or sashes operated thereby are reached.

Prior to this invention operators of the type to which this invention relates were provided with simple projecting pins mounted on certain movable parts thereof which were intended to arrest operation of the operators when the limits of movement of the sashes operated thereby were reached. It has been discovered, however, that in use these pins as stop elements are entirely ineffective due to the fact that the very considerable power produced in the use of the operators is sufficient to shear off the pins, or bend or otherwise distort said pins to such extent that they do not function to stop the operation of the operators as intended. Such failure of the stop pins frequently causes movable parts of the operators to become disengaged from parts with which they cooperate thereby destroying the effectiveness of the operators. Also, in many cases, failure of the stop pins causes breakage of the glass of the sashes or parts of the operator thus creating a chance that persons on the ground might be struck and injured by falling fragments of glass or parts of the sash operating mechanism.

The main purpose of the present invention, therefore, is to provide an improved sash operator which includes stop means operable to positively lock the operator when the opposite limits of movement of the sash or sashes actuated by the operator are reached. Thus the improved operator is capable of more efficient use and the annoyances and dangers heretofore present because of the use of stop pins formerly employed are entirely eliminated.

Fig. 1 is a fragmentary sectional elevation illustrating one form of the improved sash operator in use.

Fig. 2 is a view similar to Fig. 1 but showing the sash operator as it appears when the associated sash has been moved to an open position thereby.

Fig. 3 is an enlarged side elevation of the improved sash operator illustrated in Figs. 1 and 2, parts of the operator being broken away to conserve space and to illustrate parts which would otherwise be hidden.

Fig. 4 is a horizontal section on line 4—4 of Fig. 3 looking in the direction indicated by the arrows.

Fig. 5 is a section on line 5—5 of Fig. 3.

Fig. 6 is a front elevation of the operator illustrated in Figs. 1 to 5 inclusive.

Fig. 7 is a side elevation of the improved operator with the cover plate removed.

Fig. 8 is a fragmentary perspective illustrating another form of the invention.

Fig. 9 is a plan view of the operator shown in Fig. 8.

Fig. 10 is an enlarged section on line 10—10 of Fig. 9.

Fig. 11 is an enlarged section on line 11—11 of Fig. 9.

Fig. 12 is a side elevation of still another form of the invention.

In the drawings, wherein are shown for the purpose of illustration, merely, several embodiments of the invention, A designates generally in Figs. 1 to 7 inclusive, one form of the improved sash operator. In the views mentioned 1 designates the housing of the operator A which is substantially rectangular in shape, one side wall of said housing being in the form of a removable cover plate 2 which is secured to the main body portion of the housing 1 by suitable fastening devices 3.

Supported for rotary movement by a boss 4 formed on the fixed side wall of the housing 1, and in an opening formed in the cover plate 2, is a pipe 5 which, as will presently appear herein, may be of considerable length and serves as a shaft for operating one or more sashes. The section of the pipe 5 which is located within the housing 1 of the sash operator A has fixedly mounted thereon a worm wheel 6 which meshes with a worm 7 (Fig. 7). The worm 7 is fixedly mounted on a shaft 8 which is supported in bearing openings formed in the wall portions 8a, 8b, and 8c of the housing as is shown to the best advantage in Figs. 5 and 7. The walls 8a and 8b in combination with the walls 9 and 10 of the housing 1 provide said housing with a compartment 11 in which an element 12 is located and this element is fixedly mounted on the shaft 8 so that it rotates therewith. As shown to the best advantage in Fig. 6, the element 12 is provided with a pair of opposed abutment faces 12a and 12b which perform an important function in the operation of the invention which will be hereinafter set forth. Interposed between the

opposite ends of the worm 7 and the walls 8b and 8c of the housing 1 are collars 13 which are loosely mounted on the shaft 8.

Mounted for vertical reciprocatory movement in an opening formed in the wall 9 of the housing 1 and an alined opening formed in the forwardly projected extension 14 at the top of the housing 1 (Figs. 6 and 7), is a rod 15 whose lower end moves toward and from the element 12. Adjacent to its upper end the rod 15 is provided with a cotter pin 16 and interposed between this cotter pin and the top face of the housing is an expansible and contractile coilspring 17. The coilspring 17 tends to move the rod 15 upwardly and in order to limit such upward movement of the rod 15 a second cotter pin 18 is associated therewith and this second cotter pin moves into contact with the bottom face of the extension 14 to arrest upward movement of the rod. Mounted for vertical movement at a point below the element 12 is a second reciprocatory rod 19 which is supported in openings formed in the wall 10 of the housing 1 and in a wall 10' which is spaced from the wall 10. The rod 19 adjacent to its lower end is provided with a cotter pin 20 and interposed between this cotter pin and the lower face of the wall 10' is an expansible and contractile coilspring 21. The coilspring 21 tends to move the rod 19 downwardly and to limit such movement said rod is provided with a cotter pin 22 which contacts with the top face of the wall 10' to arrest downward movement of the rod.

Supported by the cover plate 2 of the housing 1 by spaced guiding members 23 is a rack 24 which is guided by said guiding members for vertical reciprocatory movement. Movement is imparted to the rack 24 by a train of gears which includes a gear wheel 25 fixedly mounted on the pipe 5, a relatively large gear wheel 26 which is mounted on a stud shaft 27 secured to the cover plate 2 of the housing 1 and which meshes with the gear wheel 25, and a gear wheel 28 mounted on the stud shaft 27 and rotatable with the large gear wheel 26, which gear wheel 28 meshes with the teeth of the rack 24. From the foregoing it is plain that rotation of the pipe 5 will cause upward or downward movement to be transmitted to the rack 24 through the train of gears described, the direction of movement of the rack depending on the direction of rotation of the pipe 5. Secured to the rack adjacent to the upper end thereof is a lock operator 29 and secured to said rack adjacent to its lower end as shown in Figs. 1 and 2 is a similar lock operator 30. Each lock operator comprises a substantially L-shaped element 31 whose long leg extends horizontally from the rack and whose short leg contacts with a face of the rack. The L-shaped element of each lock operating element is secured to the rack by a plate 32 which is disposed against the opposite face of the rack, and bolts 33 are extended through apertures in the plate and in the short leg of the L-shaped element at opposite edges of the rack.

Fixedly mounted on the pipe 5 is a gear wheel 34 (Figs. 1, 2, and 4) with which a rack 35 is arranged in mesh, the outer end of said rack 35 being pivotally connected as indicated at 36 in Figs. 1 and 2 to a sash S of a skylight or like structure which is shown as being pivotally connected at S' to a part B of a building or other structure. The rack 35 is guided for reciprocatory movement by means which includes a pair of spaced plates 37 which are arranged at opposite sides of the gear wheel 34, said plates being connected together by a pair of pins 38 and a pin 39, and the pins 38 having rollers 40 mounted thereon with which an edge of the rack contacts so as to maintain the teeth of the rack in mesh with the teeth of the gear wheel 34.

The sash operator A is secured in place by bracket arms 41, as shown in Figs. 1 and 2, which are suitably secured to the housing of the operator and to a convenient part of the building or other structure in which the operator is used. Also by referring to Figs. 1 and 2 it will be noted that the shaft 8 has mounted thereon a chain wheel 42 over which an operating chain 43 passes, said operating chain hanging downwardly from the chain wheel to a point where it may be reached for manual operation.

A typical sash operator assembly includes a sash operator A and a plurality of spaced assemblies which includes each the associated gear wheel 34, the rack 35 and the guiding elements for the racks, the racks 35 being connected to a continuous sash or a plurality of sashes in the manner shown in Figs. 1 and 2. When it is desired to open or close the sash or sashes or move them to an intermediate position the chain is moved to rotate the shaft 8 in the proper direction. Such rotation of the shaft 8 causes rotary movement to be transmitted to the pipe 5 through the worm 7 and worm wheel 6 and because the gear wheels 34 are fixedly mounted on the elongated pipe 5 the racks 35, which mesh with said gear wheels 34, will be subjected to longitudinal movement to move the sash or sashes.

As has already been set forth herein, the racks 24 are geared to the pipe 5 through the instrumentality of the gear wheels 25, 26, and 28 and therefore when the pipe is subjected to rotary movement to operate the sash or sashes, said rack 24 is subjected to simultaneous vertical movement either upwardly or downwardly depending on the direction of rotation of the pipe 5. If it be assumed, therefore, that the sash or sashes are being adjusted from the closed position to the open position rotation of the pipe 5 in the direction to accomplish such adjustment of the sash or sashes will cause the rack 24 to move downwardly. When the limit of outward movement of the sash or sashes is approached the lock operator 29 adjacent to the upper end of the rack 24 will contact with the top face of the rod 15 and continued downward movement of the rack 24 will result in the lock operator moving the rod 15 downwardly against the action of the spring 17 until the lower end portion of said rod 15 is in the path of travel of the abutment face 12a of the element 12 mounted on the shaft 8. The abutment face 12a of the element 12, therefore, will strike the lower end portion of the rod 15 and further rotation of the shaft 8 will be positively prevented.

The same results are obtained when the sash or sashes are adjusted from the open position to the closed position. When, in this operation, the sash or sashes approach the closed position the lock operator 30 adjacent to the lower end of the rack 24 contacts with the lower face of the rod 19 and continued upward movement of said rack 24 elevates the rod 19 against the force of the spring 21 until its upper end portion is in the path of travel of the abutment face 12b of the element 12. The abutment face 12b will then strike the upper end portion of said rod 19 to positively arrest further rotation of the shaft 8.

The sash operator illustrated in Figs. 1 to 7 inclusive, is of the type known as the torsional

operator, while the operator illustrated in Figs. 8 and 9 is of the tension type. In the former type of operator movement of the associated sash or sashes is obtained through operation of a rotary member (the pipe 5), and in the latter or tension type, operator, movement of the associated sash or sashes is obtained through operation of a reciprocating member (the member 44 in Figs. 8 and 9). In Figs. 8 and 9 the operator is designated generally by the reference character A*a*, and said operator includes a shaft 8' to which rotary motion is imparted through operation of the chain 43' and chain wheel 42'. Motion of the shaft 8' is transmitted to a pinion 45 by means of suitable mechanism and this pinion meshes with a rack 46 which forms a part of the reciprocatory member 44. Also the shaft 8' has mounted thereon an element (not shown) which is similar to the element 12 already described herein, and a pair of opposed rods is arranged for movement into the path of travel of abutment faces on said element (one of said rods being designated by the reference character 47 in Fig. 8). Additionally the rack 46 has secured thereto lock operators 48 which are movable with the rack into contact with the opposed locking rods to move the inner end of one or the other of said rods into a position where it will be struck by one of the abutment faces of the element mounted on the shaft 8' so as to arrest rotary movement of said shaft. Opening and closing movement is transmitted from the reciprocatory member 44 to the sash S*a* by the links 49 and 50 in a manner that is well known to persons familiar with such devices.

In the form of the invention illustrated in Fig. 12 a single pinion 51 is employed for transmitting movement to the rack 54 from the pipe shaft 5' instead of using a train of gears for this purpose as illustrated in Fig. 3. Also the lock operators which move the rods 15' and 19' inwardly so that their inner end portions are struck by the abutment faces of the element 12' mounted on the shaft 8'' comprise members 52 pivoted at 52' to brackets 53 secured to the housing of the operator A*b* and arranged in contact adjacent to their free ends with the outer end faces of said rods 15' and 19'. At points adjacent to the opposite ends of the rack 52 said rack has applied thereto pins 55 which are adapted to contact with the members 52 as the opposite limits of movement of the operator is approached so as to impart movement to said members which will force the rods inwardly to position their inner end portions in the path of travel of the abutment faces of the element 12'. The members 52 are preferably provided with head portions 56 that embrace the outer end portions of the rods 15' and 19'.

I claim:

1. An operating mechanism including a rotatable element, and means for locking said rotatable element against movement when its limit of movement in one or the opposite direction has been reached, said means including a member mounted on said rotary element for rotation therewith and provided with abutments, opposed, independently movable reciprocatory elements one or the other of which is adapted to be moved into the path of rotary travel of an abutment of said member on said rotary element when one or the opposite limit of movement of said rotary element has been reached, a member to which reciprocatory movement is imparted during rotation of said rotary element, and means fixed to said reciprocatory member which contact directly with said reciprocatory elements so as to move one or the other thereof to a position where the reciprocatory element so moved is engaged by an abutment on said member mounted on said rotary element to arrest movement of the rotary element.

2. An operating mechanism including a rotatable element, and means for locking said rotatable element against movement when its limit of movement in one or the opposite direction has been reached, said means including a member mounted on said rotary element for rotation therewith and provided with abutments, opposed, independently movable reciprocatory elements one or the other of which is adapted to be moved into the path of rotary travel of an abutment of said member on said rotary element when one or the opposite limit of movement of said rotary element has been reached, a member to which reciprocatory movement is imparted during rotation of said rotary element, gear means for transmitting movement to said reciprocatory member and means fixed to said reciprocatory member which contact directly with said reciprocatory elements so as to move one or the other thereof to a position where the reciprocatory element so moved is engaged by an abutment on said member mounted on said rotary element to arrest movement of the rotary element.

3. An operating mechanism including a rotatable element, and means for locking said rotatable element against movement when its limit of movement in one or the opposite direction has been reached, said means including a member mounted on said rotary element for rotation therewith and provided with abutments, opposed, independently movable reciprocatory elements one or the other of which is adapted to be moved into the path of rotary travel of an abutment of said member on said rotary element when one or the opposite limit of movement of said rotary element has been reached, a member to which reciprocatory movement is imparted during rotation of said rotary element, gear means for transmitting movement to said reciprocatory member, means fixed to said reciprocatory member which contact directly with said reciprocatory elements so as to move one or the other thereof to a position where the reciprocatory element so moved is engaged by an abutment on said member mounted on said rotary element to arrest movement of the rotary element, and resilient means associated with said reciprocatory elements which tend to move said reciprocatory elements to positions where they are not engaged by abutments of said member mounted on said rotary element.

4. An operating mechanism including a rotatable element, and means for locking said rotatable element against movement when its limit of movement in one or the opposite direction has been reached, said means including a member mounted on said rotary element for rotation therewith and provided with abutments, opposed, independently movable reciprocatory elements one or the other of which is adapted to be moved into the path of rotary travel of an abutment of said member on said rotary element when one or the opposite limit of movement of said rotary element has been reached, a member to which reciprocatory movement is imparted during rotation of said rotary element, gear means for transmitting movement to said

reciprocatory member, means fixed to said reciprocatory member which contact directly with said reciprocatory elements so as to move one or the other thereof to a position where the reciprocatory element so moved is engaged by an abutment on said member mounted on said rotary element to arrest movement of the rotary element, and resilient means comprising coil springs associated with said reciprocatory elements which tend to move said reciprocatory elements to positions where they are not engaged by abutments of said member mounted on said rotary element.

5. An operating mechanism including movement imparting means in the form of a rotary member, gear means for subjecting said rotary member to rotary motion, and means for locking said rotary member against movement when its limit of movement in one or the opposite direction has been reached, said means including a member mounted on said rotary member for rotation therewith and provided with abutments, opposed, independently movable reciprocatory elements one or the other of which is adapted to be moved into the path of rotary travel of an abutment of said member on said rotary member when one or the opposite limit of movement of said rotary member has been reached, a member to which reciprocatory movement is imparted during rotation of said rotary member, and means carried by said reciprocatory member for imparting movement to one or the other of said reciprocatory elements.

6. An operating mechanism including movement imparting means in the form of a rotary member, gear means for subjecting said rotary member to rotary motion, and means for locking said rotary member against movement when its limit of movement in one or the opposite direction has been reached, said means including a member mounted on said rotary member for rotation therewith and provided with abutments, opposed, independently movable reciprocatory elements one or the other of which is adapted to be moved into the path of rotary travel of an abutment of said member on said rotary member when one or the opposite limit of movement of said rotary member has been reached, a member to which reciprocatory movement is imparted during rotation of said rotary member, means carried by said reciprocatory member for imparting movement to one or the other of said reciprocatory elements and resilient means for moving said reciprocatory elements out of the path of travel of the abutments of said means mounted on the rotary member.

PETER J. MUSCHONG.