Jan. 29, 1935. E. H. ELLISON 1,989,550

WINDOW OPERATOR

Filed Aug. 17, 1933

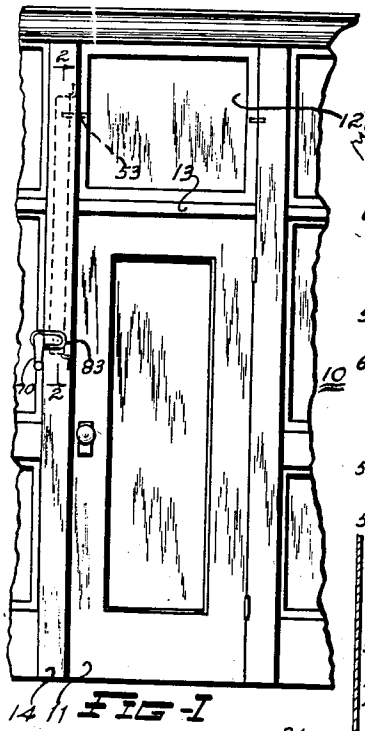


FIG-1

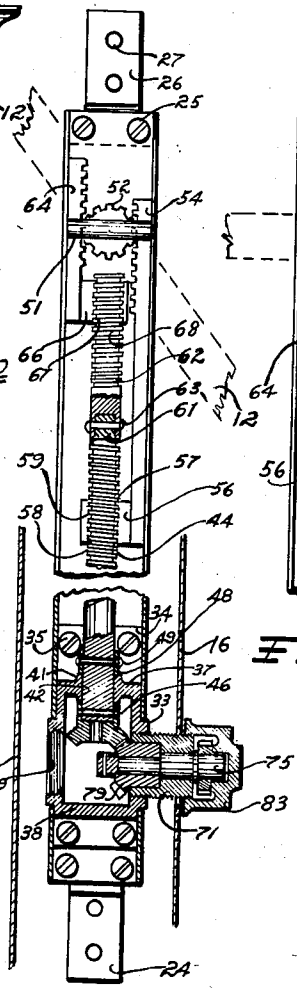


FIG-2

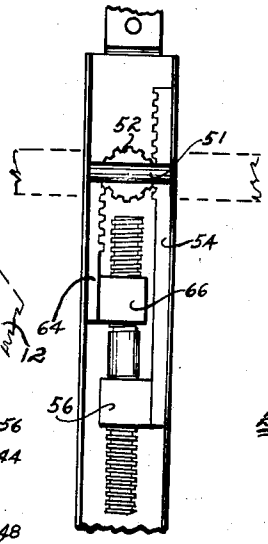


FIG-3

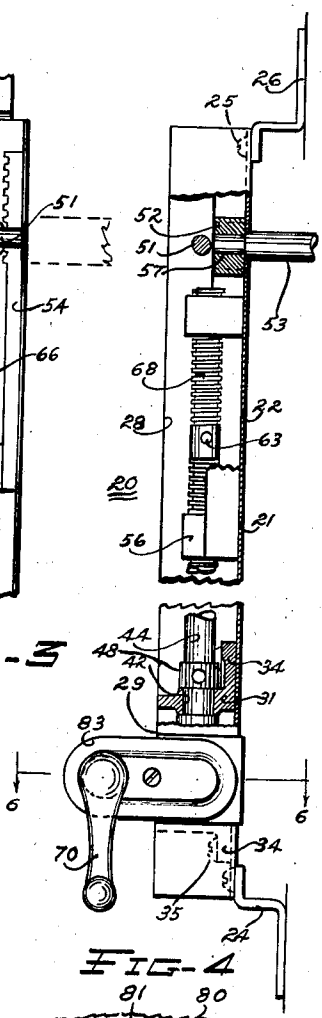


FIG-4

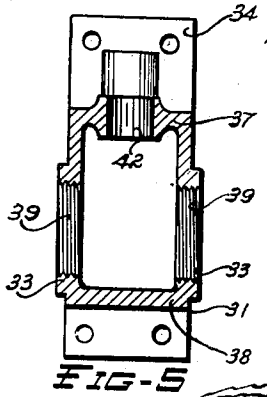


FIG-5

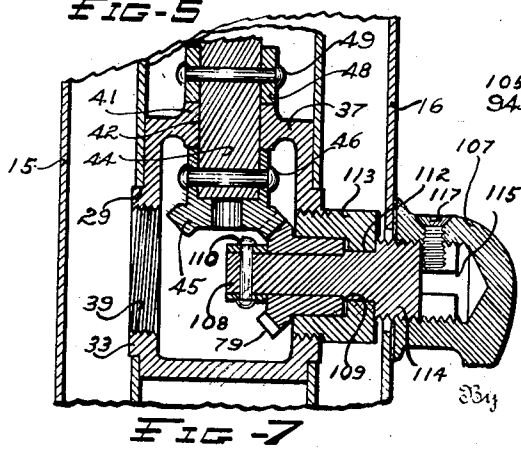


FIG-7

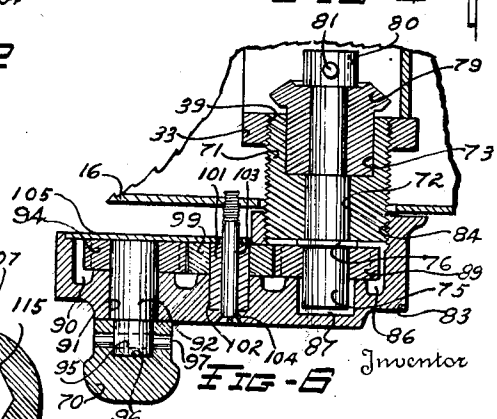


FIG-6

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UNITED STATES PATENT OFFICE

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WINDOW OPERATOR

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Application August 17, 1933, Serial No. 685,559

7 Claims. (Cl. 268—116)

This invention relates to an improvement in mechanisms for operating transom windows or other similar casement structures.

The present trend in building construction, as considered in connection with permanent building walls or removable partitions, is toward plainness and simplicity. This trend has also materially influenced and radically changed the general proportion and arrangement of hardware in particular transom operators and other window adjusters or fasteners. While the operating mechanisms for practically all types of windows have undergone many changes in structure, it is believed there is still room for improvement in order to keep pace with building development. The present invention, therefore, is directed to the provision of a practical operating mechanism for windows being of such design as to occupy a comparatively small space and includes a double rack and pinion operable by means of a rotatable shaft, the shaft in turn being geared to an exposed, suitably designed, operating lever.

One of the objects of the invention is to provide a window operating mechanism which is extremely easy to operate and which, being a self-contained unit, may be readily installed in any building or partition wall.

Another object of the invention lies in the provision of a window operating mechanism which, being self-contained, is fully interchangeable, being adapted for use at either the right or left of the window or from either face of the building wall in which the window is located.

A further object of the invention lies in the provision of means by which the operating lever is offset for the purpose of obtaining clearance for a swinging door, window or any other structural projection.

A still further object of the invention lies in the provision of a mechanism of this type which is extremely small in cross-section, thus enabling it to be installed and entirely concealed from view in the newer smaller pilasters which form part of present day building walls and partitions.

Another and still further object of the invention lies in the provision of a device of this class which is extremely rugged in construction and which automatically secures a window or panel in any position of adjustment.

Other and further objects of the invention will be more fully understood from a consideration of the following specification which is taken in conjunction with the accompanying drawing, and in which,

Figure 1 is a fragmentary front elevation of a partition or other building wall, showing one modification of the invention applied thereto;

Figure 2 is an enlarged vertical sectional view, taken substantially on the line 2—2 of Figure 1;

Figure 3 is a fragmentary vertical sectional view showing the mechanism in one extreme position, being taken in the same plane with Figure 2;

Figure 4 is an enlarged front elevation of the mechanism, parts being broken away to show further details of construction;

Figure 5 is an enlarged vertical sectional view of the gear housing which supports the operating lever;

Figure 6 is an enlarged horizontal sectional view of a gear chain for the operating lever, being taken substantially on the line 6—6 of Figure 4; and

Figure 7 is an enlarged vertical sectional view of a modification of the device in which the operating lever has a direct drive on the balance of the mechanism.

The invention is shown applied to a conventional partition which may be of the permanent or removable type, being generally indicated by the reference numeral 10. The partition includes a door 11 over which is located a transom window 12. A rail 13, which may form a part of the door jamb, is interposed between the door 11 and window 12. The door is located between identical posts or pilasters 14. The pilaster 14 may be of conventional design, consisting of a three-sided channel member 15 having a face plate 16 which encloses the open side of the member. The window operating mechanism under consideration is adapted to be located within the three-sided channel member 15 and concealed from view by application of the face plate 16 thereto. Inasmuch as the details of construction of a hollow pilaster have no bearing on the present invention, no further description thereof will be made. The door 11 (see Figure 1), is arranged to open adjacent the operating lever of the window mechanism and in order to avoid obstruction by the operating lever to movement of the door, said lever is shown to be offset, the details thereof being hereinafter fully set forth.

The window operating mechanism, generally indicated by the numeral 20, is mounted in a channel member 21 to which may be secured, along the base wall 22 thereof, straps 24, in any suitable manner as by screws 25. These straps are provided with flanges 26 having drilled openings 27 by means of which, through the use of suitable screws, the channel member may be

mounted on one of the walls of the pilaster channel member 15. Adjacent one end of the channel member 21, and produced in the side walls 28 thereof, are slots 29. A gear housing 31 is mounted in the channel member 21 by projecting shoulder portions 33 into slots 29. Top and bottom flanges 34 secure the housing to the base wall 22 of the channel member 21 in any convenient manner as by screws 35. The portions 33 are connected by top and bottom walls 37 and 38. Concentrically drilled and threaded openings 39 are formed in each of the shoulder portions 33. The upper wall 37 is arranged with upwardly and downwardly projecting bosses 41 through which an opening 42 is made. A shaft 44, located in the channel member 21, projects through the opening 42 and a bevel gear 45 is affixed thereto by means of a pin 46. Since the device is to be operated with shaft 44 in a vertical position, a collar 48 surrounds the shaft adjacent the upper boss 41, being secured to said shaft in any suitable manner as by a pin 49.

Adjacent the upper end of housing 21 there is provided a reinforcing block 51 which is fitted between and secured to the side walls 28 of the channel member 21 for the purpose of preventing any flexing of these walls during operation of the mechanism. In the space between the block 51 and the rear wall 22 of the channel member there is located a pinion gear 52, which is mounted on a shaft 53 that projects through the rear wall 22 and serves as a part of the pivotal support for the window 12 as well as constituting the means by which said window is reciprocated. In mesh with the gear 52 is a rack 54 which is located adjacent the inner face of one of the side walls 28 of the channel member 21. Affixed to the lower end of this rack is a block 56 having an opening 57 therethrough. The rod 44, commencing a short distance below the block 56, is formed with threads 58 which engage corresponding threads 59 in the block 56. The threads 58 continue to the end of the shaft 44 which is terminated by a reduced portion 61. Mounted on the portion 61 is an extension 62 which is a continuation of shaft 44, the lower end of this extension being recessed to receive the portion 61. Shaft 44 and extension 62 are secured against relative movement by means of a pin 63. Against the opposite side wall 28, from the rack 54, is a further rack 64, the teeth of which also engage the teeth of gear 52. This rack continues downwardly beneath the gear a short distance and has affixed thereto a block 66. This block is formed with a threaded opening 67 and adapted to receive the threaded end portion 68 of the extension 62. As is clearly indicated in Figure 3 of the drawing, the racks 54 and 64 move in opposite directions and are adapted to rotate the pinion gear 52 which in turn rotates shaft 53 and window 12. It is pointed out that the direction of threads 58 on shaft 44 are reverse to the threads 68 of the extension 62 and that, when the shaft 44 is rotated in one direction, blocks 56 and 66 move toward each other from the position shown in Figure 2 to that shown in Figure 3. It will be further noted, since the side walls 28 of the channel member 21 are prevented distortion by the block 51 and racks 54 and 64 as well as gear 52 are made to fit snugly within the space between the side walls 28, a considerable force may be exerted in the rotation of shaft 44 to reciprocate the racks, rotate shaft 53 and overcome any resistance of the window to movement. Forming the shaft 44 with an extension 62 makes it possible to form the threaded portions independently and locate the blocks 56 and 66 in their proper position during the work of assembling the partition and installation of the window in order that said window be made to rotate through its full limit of travel.

Reference is now particularly had to Figure 6 of the drawing wherein is shown an enlarged horizontal sectional view of the connection between an operating lever 70 and the gear 45 located on shaft 44. As brought out above, the housing 31 is formed with shoulder portions 33, in which threaded openings 39 are made. Either of these openings, depending on the face from which the operating lever is to be located, is adapted to receive an externally threaded sleeve 71. This sleeve is provided with a central opening 72 which connects with a larger opening 73. A shaft 75 is projected into the opening 72 to the point where a collar or shoulder 76 thereon abuts the end of the sleeve. The exposed end of the shaft is preferably four-sided to receive and secure a suitable gear thereto as hereinafter more fully described. That portion 78 of the shaft lying within the opening 73 is of a slightly reduced diameter and has keyed thereto a beveled gear 79 which corresponds to and is in mesh with the beveled gear 45. The gear 79, to the rear of the teeth, is of such size as to fit in the opening 73 of the sleeve 71. Inasmuch as the portion 78 of the shaft extends beyond the gear, a securing collar 80 is provided to prevent disengagement of these elements, this collar being held in place by a pin 81.

Since the external threads of the sleeve 71 extend its full length, it is found convenient to mount the operating lever housing 83 on said sleeve by projecting the sleeve into a threaded portion 84 of the housing. The housing is arranged with a cavity 86 which opens into a smaller cavity 87. A gear 89 is mounted on the square end of the shaft 75 and lies within the cavity 86. That portion of the shaft projecting beyond the gear lies in cavity 87. At the other end of the housing there is located a further cavity 90, similar in all respects to the cavity 86. This cavity in turn connects with an opening 91 in which a shaft 92 is journaled. On the end of the shaft 92, projecting into the cavity 90, is mounted a gear 94. A reduced portion 95 of the shaft 92 extends beyond the front face of the housing and fits into an opening 96 in the operating lever 70. This shaft and lever may be secured against relative rotation, in any suitable manner as by a pin or set screw 97. Centrally of the housing and between cavities 86 and 90 is an opening in which an idler gear 99 is located. This gear is mounted on a sleeve 101 which is of sufficient length to project into an opening 102 in the housing. An opening 103 in the sleeve is adapted to receive a screw 104 which is projected into the sleeve from the face of the housing being engageable with the face plate 16 or any other adjacent portion of the partition and, when thus located, prevents rotation of the housing 83 about the sleeve 71 when the operating lever is manipulated. The rear portion of the housing adjacent gears 94 and 99 is closed by a plate 105 which is secured to the housing in any convenient manner, being for the purpose of maintaining a suitable lubricant in the gear cavities and preventing dirt from entering this mechanism.

While gears 89 and 94 are shown to be identical

and the drive, through the operating lever 70, to be directly transmitted to the shaft 75 and beveled gear 79, it is contemplated to alter the relative gear sizes to accommodate the driving mechanism to all classes of pivoting or swinging windows. For example, a rugged mechanism of this type, when used to operate a small window, could be geared up to increase the window speed relative to the speed of rotation of the operating lever 70, whereas in the case of a large and heavy window, the speed of the window could be reduced relative to that of the operating lever.

The modification shown in Figure 7 of the drawing is applicable when the wall or partition in which the operating mechanism is located is sufficiently removed from a swinging member such as the door 11 to permit directly driving the beveled gears 79 and 45 by means of an operating lever 107 and thus eliminating the offset mechanism above described. The beveled gear 79 is keyed on shaft 108, being located against a shoulder 109 on said shaft and secured against displacement by a sleeve and pin structure 110. Beyond the shoulders 109, the shaft is enlarged to form a bearing surface which lies within the reduced portion 112 of a sleeve 113. The larger cavity of the sleeve 113 provides bearing support for the gear 79. A portion of the outer wall of the sleeve 113 is threaded for the purpose of engaging and supporting the sleeve in the gear housing 31 through the opening 39. This method of support is identical to that of the sleeve 71 heretofore described. Beyond the outer face of the sleeve the shaft 108 is formed with an enlarged threaded portion 114 which has flat insets 115. The operating lever 107 having a threaded cavity is mounted on the threaded portion 114, being turned down to the point where the inner face thereof lies adjacent the face plate 16 or other adjacent portion of a partition. A set screw 117 is turned down to engage the inset 115 and prevent relative rotation of lever 107 and shaft 108. In this modification as well as in that shown in detail in Figure 6, it is to be noted that the gear housing 31 supports the entire mechanism and that no dependence is placed on the face plate 16 of a partition pilaster for support. This arrangement of parts not only makes for more rugged assembly but eliminates the necessity for the provision of special escutcheon plates or other trim to frame the shaft opening through the partition or pilaster. In this modification the gear housing 31 is shown to have opposed threaded openings 39, thus permitting installation of the operating lever 107 from either face of a partition or building wall.

Referring again to Figures 2 and 3 of the drawing it will be noted that as the shaft 78 is rotated to rotate gear 79, gear 45 is made to rotate and in consequence shaft 44 and extension 62. Assuming the window 12 is to be moved from the position shown in Figure 2 to that shown in Figure 3, shaft 44 will be rotated in a clockwise direction. Such rotation causes block 56 to travel upwardly along shaft 44 and block 66 to travel downwardly of the extension 62. This movement of the blocks moves racks 54 and 64 in opposite directions and rotates gear 52 in a counterclockwise direction. Should the window 12 become unintentionally sealed in closed position or slightly jambed and resist manipulation, it is possible to exert a considerable force through the operating lever to free said window. This is possible since the two forces applied to gear 52 are uniform and opposite and consequently gear 52 cannot be disengaged from either rack nor the racks warped away from the gear by reason of the confined space in which this portion of the mechanism operates. It will be noted that the mechanism may be applied to the manipulation of windows or ventilators other than as shown in the present drawing and in such instances it may be required that rotation be possible through 180 degrees instead of approximately 90 degrees, also that the speed of such operation be changed. The extent of rotation is governed entirely by the length of the racks 54 and 64 and the rapidity of rotation per revolution of the operating lever by the gear mechanism in the housing 83 and also by the size of the gear 52. The present invention is therefore considered to be adaptable for use with all types of swinging windows, ventilators, etc., regardless of the size, weight, or required rapidity of movement.

Although applicant has shown and described only one modification of that portion of the invention which is mounted and concealed within a building wall or partition and two modifications of a further portion of the mechanism applied to the face of the building wall or partition, it is intended, since the invention is susceptible of adaption to many uses, that other additions and alterations in arrangement and design are contemplated in-so-far as these changes or alterations lie within the scope of the hereunto annexed claims.

Having thus set forth my invention what I claim as new and for which I desire protection by Letters Patent is:—

1. A device for operating a window comprising a channel member, a window connected shaft on said member, a gear on said shaft, a pair of reversely disposed racks engaged with said gear, the walls of said member serving as guides for said racks, a rod extending longitudinally of said member, operable means connecting said racks with said rod, said gear, rod and operable means being contained within the limits of said channel member whereby to install said mechanism as a unit in a building wall or partition.

2. A device for operating a window installable as a unit into a building wall or partition comprising a channel member, a window connected shaft mounted on said member, a gear on said shaft, a pair of reversely disposed racks engaged with said gear, the walls of said member serving as guides for said racks, and means connecting said double rack with an operating lever, said lever serving to rotate said window shaft.

3. A device for operating a window comprising a shaft joined to and supporting said window, a gear secured to said shaft, opposed racks in mesh with said gear, a rod including reversely threaded portions, blocks on said threaded portions connected with said racks, and a lever for rotating said rod whereby to move said racks and said gear to actuate said window.

4. A device for operating a window comprising a shaft joined to and supporting said window, a gear secured to said shaft, a channel member supporting said shaft and said gear, opposed racks in mesh with said gear, said racks and said gear completely filling the space between the side walls of said member, means adjacent said gear for securing the side walls of said member against distortion during operation of said mechanism, a rod having reversely threaded portions, blocks on said threaded portions connected with said racks, an operating lever, cooperating beveled gears connecting said rod with said lever whereby to transmit rotation from said lever to said window.

5. A device for operating a window comprising a shaft joined to and supporting said window, a gear secured to said shaft, a channel member supporting said shaft and said gear, opposed racks in mesh with said gear, said racks and said gear completely filling the space between the side walls of said member, means adjacent said gear for securing the side walls of said member against distortion during operation of said mechanism, a rod having reversely threaded portions, blocks on said threaded portions connected with said racks, an operating lever, a plurality of gears connecting said lever with said rod, said gears being interchangeable and replaceable to vary the ratio of rotation of said operating lever and said rod whereby to change the speed of operation of said window.

6. A device for operating a window comprising a shaft joined to said window, a gear secured to said shaft, a pair of opposed racks in mesh with said gear, a rod, means connecting said rod with said racks, said means being adjustable to set said racks for equal opposite movement, and an operator connected with and adapted to rotate said rod.

7. A device for operating a window comprising a channel member, a shaft joined to said window and journaled in said channel member, a gear secured to said shaft, a pair of racks mounted against opposite sides of said channel member and engaged with said gear, a rod, means operably connecting said rod with said racks, said means serving to produce opposite directional movement of said racks and being adjustable to set said racks for equal movement, and an operator connected with and adapted to rotate said rod.

EDWARD H. ELLISON.