July 19, 1960 M. J. TRACY 2,945,267

CLOSURE-OPERATORS

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FIG. 1.

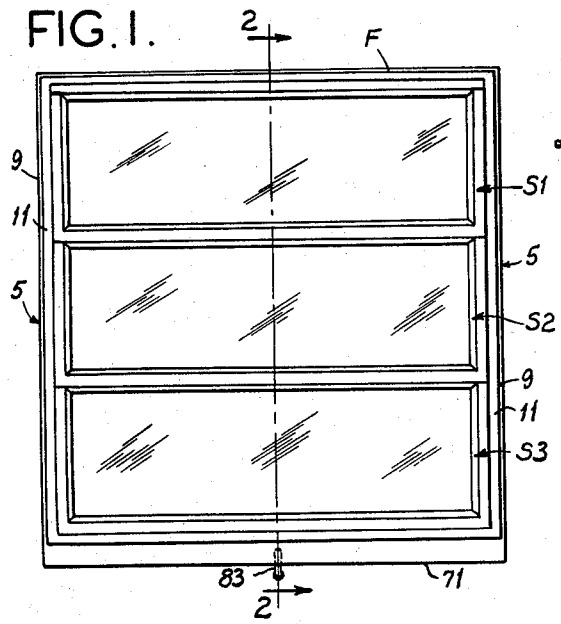


FIG. 3.

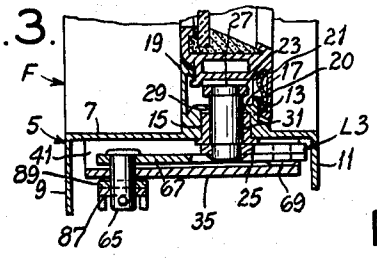
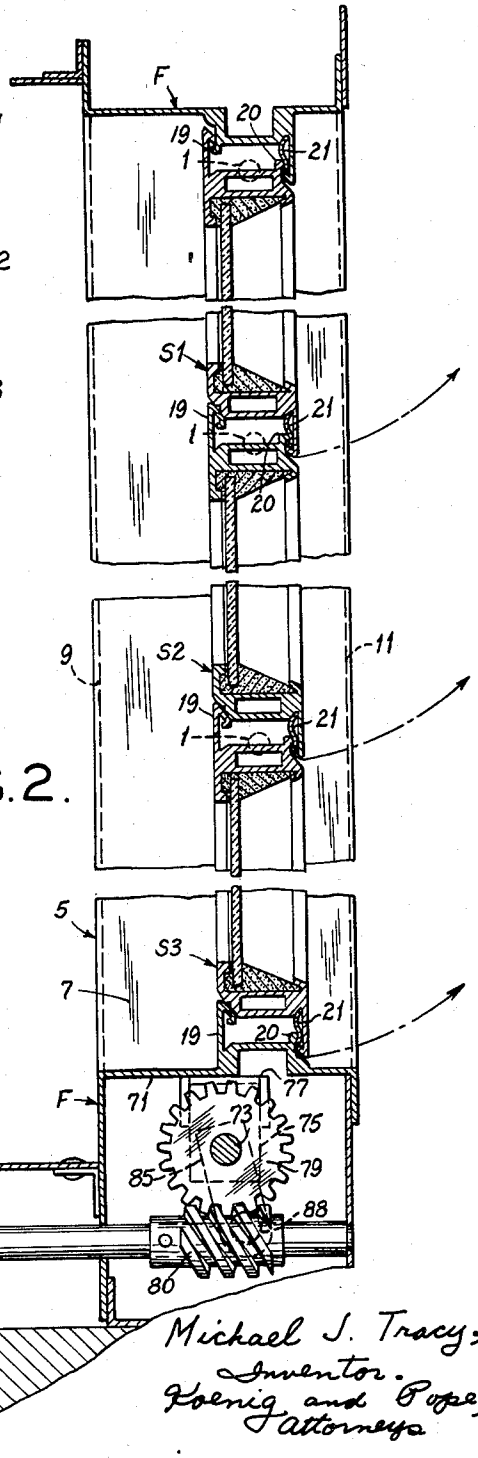


FIG. 2.



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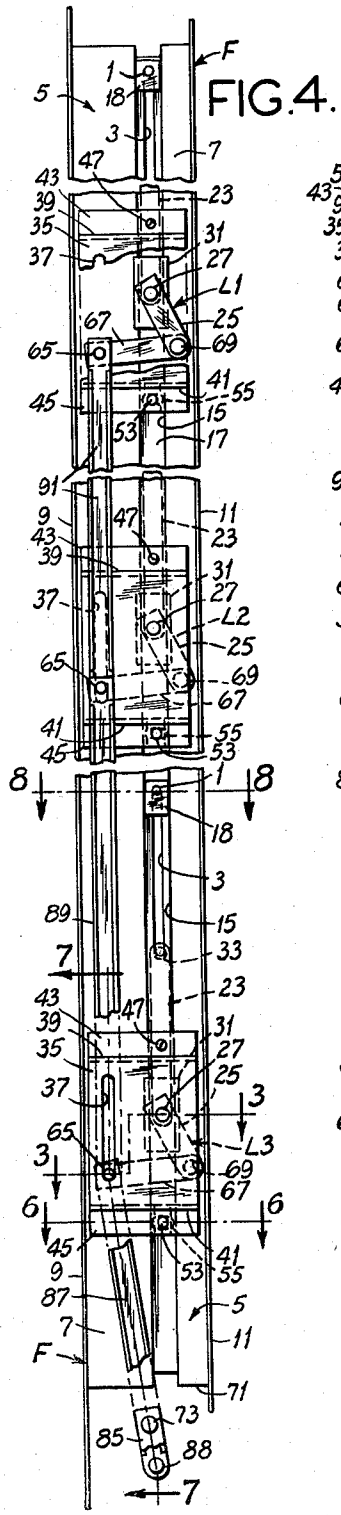


FIG.4.

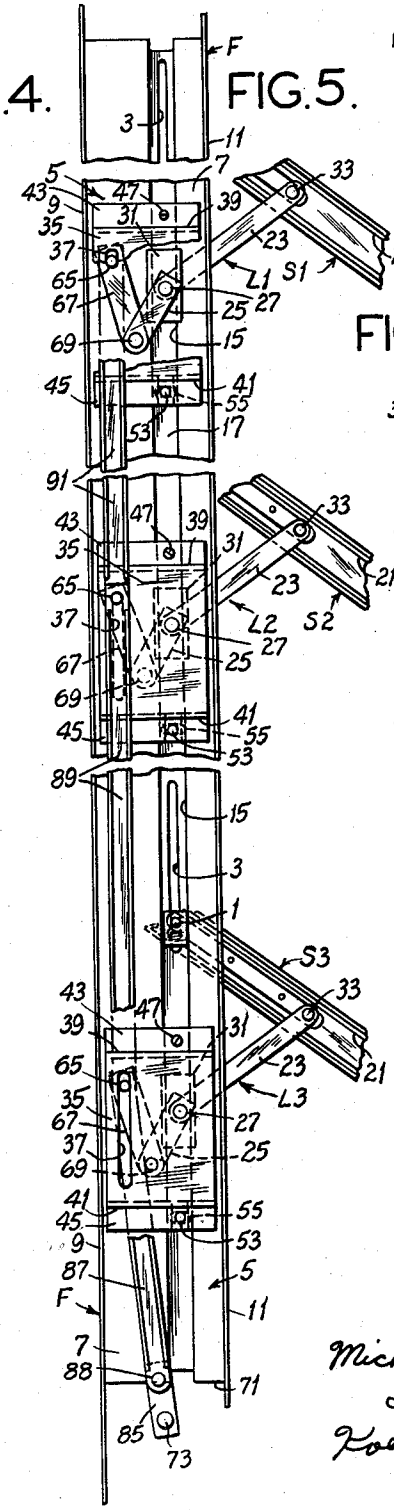


FIG.5.

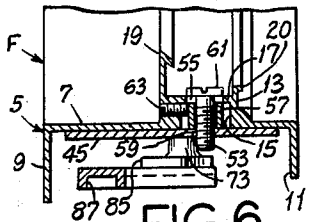


FIG.6.

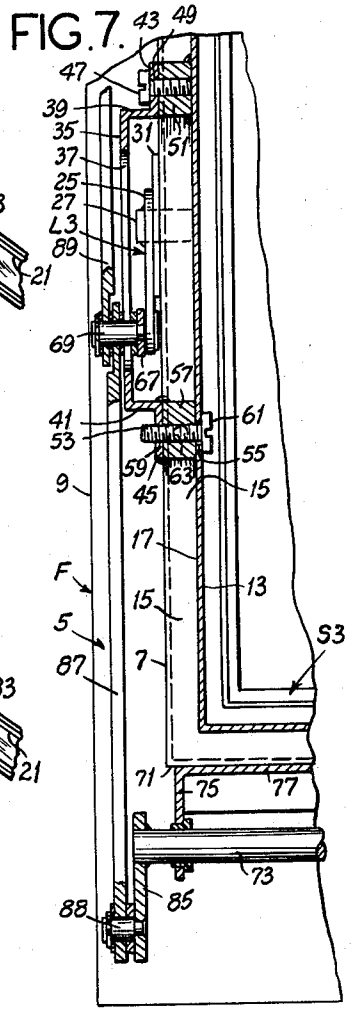


FIG.7.

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FIG. 11.

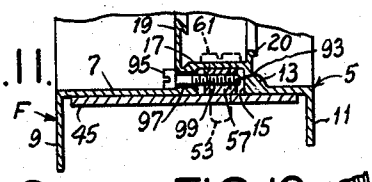


FIG. 12.

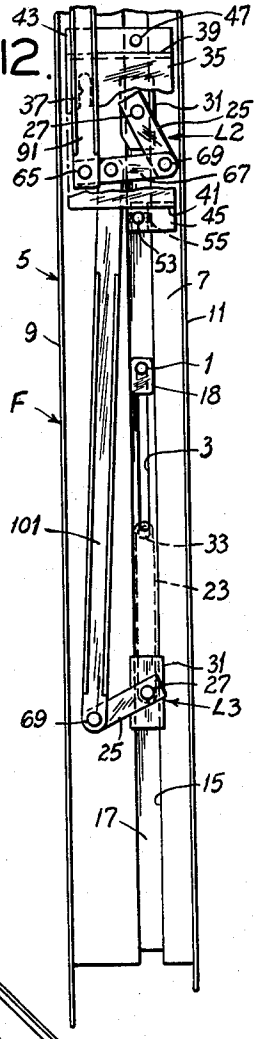


FIG. 9.

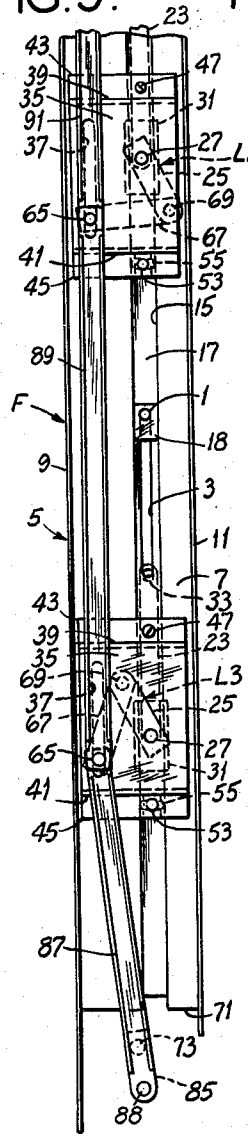
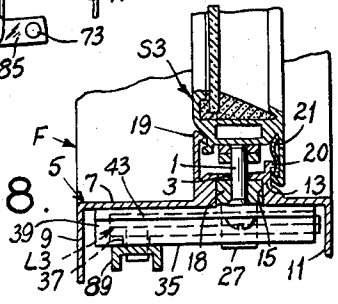


FIG. 10.

FIG. 8.



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United States Patent Office

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CLOSURE-OPERATORS

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Filed July 3, 1958, Ser. No. 746,407

7 Claims. (Cl. 20—42)

This invention relates to closure-operators, and more particularly to such mechanisms for awning type windows, It will be understood that by "awning type window" I mean a window of a type having a plurality of sashes mounted in the window frame one above another for movement between a closed vertical position and an open position angled downward and outward.

Among the several objects of the invention may be noted the provision of an improved and simplified operating mechanism for awning type windows adapted for operation by a crank which is continuously rotatable in one direction or the other; the provision of operating mechanism of this class having simplified means for adjustment to effect tight closure of the sashes; the provision of operating mechanism of this class adapted for use of identical parts to manufacture plural-sash windows in which the sashes are operated simultaneously in phase (i.e., all the sashes open simultaneously and close simultaneously), or to manufacture plural-sash windows in which the sashes are operated in sequence (e.g., one sash opens before the others) or to manufacture a type of window in which the upper sashes are operated by the opening and closing of the lower sash; and the provision of operating mechanism of this class which is relatively economical to manufacture and easy to operate. Other objects and features will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the constructions hereinafter described, the scope of the invention being indicated in the following claims.

In the accompanying drawings, in which several of various possible embodiments of the invention are illustrated,

Fig. 1 is a view in exterior elevation of an awning type of window in which is incorporated operating mechanism of this invention adapted for simultaneous operation of the sashes, all the sashes being shown closed;

Fig. 2 is a greatly enlarged vertical cross section taken on line 2—2 of Fig. 1, with parts broken away;

Fig. 3 is an enlarged horizontal section taken on line 3—3 of Fig. 4;

Fig. 4 is an enlarged left side elevation of Fig. 1, parts being broken away;

Fig. 5 is a view corresponding to Fig. 4 showing all the sashes in fully opened position;

Fig. 6 is an enlarged horizontal cross section taken on line 6—6 of Fig. 4;

Fig. 7 is a vertical cross section taken on line 7—7 of Fig. 4;

Fig. 8 is an enlarged horizontal cross section taken on line 8—8 of Fig. 4;

Fig. 9 is a view similar to Fig. 4, showing a modification for obtaining sequential operation of the sashes;

Fig. 10 is a view corresponding to Fig. 9 illustrating the sequential operation;

Fig. 11 is an enlarged horizontal section taken on line 11—11 of Fig. 10; and,

Fig. 12 is a view showing another embodiment of the

invention in which the upper sashes are operated by the opening and closing of the lower sash.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

Referring to Figs. 1–8 of the drawings, an awning type window in which operating mechanism of this invention is incorporated is shown to comprise three aluminum sashes S1, S2 and S3 mounted in a rectangular aluminum frame F. Each sash has laterally projecting pivots 1 secured thereto at the top. These pivots are vertically slidable and rotatable in vertical slots 3 in the sides or jambs 5 of the frame F. The jambs 5 are aluminum extrusions generally of channel shape in horizontal cross section, the web of the channel being designated 7 and the flanges of the channel being designated 9 and 11 (see Figs. 3, 6 and 7). These flanges extend laterally outward. The web 7 of the channel has an inward offset 13 providing an outwardly facing vertical groove 15. Slots 3 are formed in the base 17 of the offset. Pivots 1 are journalled in bearing blocks 18 slidable in the grooves 15 (see Fig. 8). Each jamb 5 has laterally inwardly extending flanges 19 and 20 for engagement by the sashes when closed. The sashes are weather-stripped as indicated at 21.

The sashes S1, S2 and S3 are adapted to be moved vertically and swung on their pivots 1 between the closed position shown in Fig. 2 and the open position shown in Fig. 5 by operation of a pair of levers such as indicated at L1 for sash S1, a pair of levers such as indicated at L2 for sash S2, and a pair of levers such as indicated at L3 for sash S3. Each lever of each pair is pivoted intermediate its ends on a fixed horizontal transverse axis directly below the pivots 1 for the respective sash operated thereby. The levers are all identical, each being a bell crank lever having a long arm 23 and a short arm 25, these arms being fixed to a short pivot 27 axially offset one from the other (see Fig. 3). This pivot 27 extends through a hole 29 in the base 17 of offset 13 and through a bearing block 31 (see Fig. 3) fixed in the groove 15, the long arm 23 being on the inside of the jamb 5, the short arm being located on the outside of web 7 of jamb 5. The long arms 23 are pivotally connected at their outer ends as indicated at 33 to the sides of the respective sashes S1, S2 or S3. The arrangement is such that with the long arms 23 for a sash extending generally vertically upward from the pivots 27, the pivots 1 for that sash are at the upper ends of slots 3, and the sash is closed. By swinging arms 23 outward away from the frame F (clockwise as viewed in Fig. 4) the sash is swung open (counterclockwise as viewed in Fig. 4) the pivots 1 sliding down in the slots 3 (see Fig. 5). As shown in Fig. 4, the arms 23 and 25 are fixed on pivot 27 at such an angle to one another that when arm 23 is up in the closed position, arm 23 is angled downward and toward the exterior flange 11 of the jamb 5.

Associated with and covering each of the short bell crank arms 25 is a guide plate 35 mounted on the outside of web 7 of the jamb 5. In this plate extending heightwise thereof is an elongate guide slot 37. The guide plate has inwardly directed upper and lower horizontal flanges 39 and 41 (see Fig. 7). Flange 39 has an upwardly extending rim 43 and flange 41 has a downwardly extending rim 45. These rims engage the outside of web 7 of the jamb 5. A screw 47 extends through a hole 49 in the upper rim, being threaded in a block 51 fixed in the groove 15. This screw 47 constitutes a pivot for the guide plate 35 allowing for swinging of the guide plate on the horizontal transverse axis of the screw to vary the angularity of the slot 37 relative to the jamb 5. The slot may be exactly vertical, or slightly angled one way or the other off vertical.

Means is provided for facilitating fine adjustment of the plate 35 and for securing it in adjusted position. As shown in Figs. 6 and 7, the securing means comprises a locking screw 53 extending through a horizontal slot 55 in the base of offset 13 and threaded in a block 57 secured to the inside of rim 45 of the guide plate, rim 45 having a hole 59 receiving the screw. Block 57 is accommodated in groove 15, being narrower than the groove to allow for adjustment. Screw 53 has a head 61 engageable with offset 13 for locking the guide plate 35 in adjusted position. By loosening the screw, the plate 35 may be swung one way or the other within the limits imposed by engagement of the screw with one end or the other of slot 55. The adjusting means comprises a screw 63 threaded in the interior side of offset 13 and engageable with the respective side of the block 57 for making fine adjustments of the plate 35.

A slidable member constituted by a pin 65 is slidable up and down in the guide slot 37 of each guide plate 35. A link 67 on the inside of the guide plate 35 connects the pin 65 and the respective arm 25, the link being pin-connected to arm 25 as indicated at 69. The bottom member or sill 71 of the frame F (also an aluminum extrusion) is of box section as shown in Fig. 2. Extending endwise in the sill 71 is a shaft 73 journalled in depending flanges 75 (see Fig. 7) of a bracket 77 fixed to the top of the sill. At the center of the shaft is a worm wheel 79. In mesh with worm wheel 79 is a worm 80 on a shaft 81 extending toward the interior. Fixed on the interior end of shaft 81 is a crank 83. Turning crank 83 in one direction rotates shaft 73 in one direction; turning crank 83 in the opposite direction rotates shaft 73 in the opposite direction. Fixed on each end of shaft 73, outward of the web 7 of the respective jamb 5 of the frame, is a crank arm 85 (see Figs. 4, 5 and 7). Each crank arm 85 is connected to the respective pin 65 for the lower sash S3 on the outside of the respective guide plate 35 by a connecting rod 87. Rod 87 is pin-connected as indicated at 88 to the outside of crank arm 85. The pins 65 for the lower sash S3 are connected to the pins 65 for the intermediate sash S2 by links 89. Pins 65 for the intermediate sash S2 are connected to the pins 65 for the upper sash S1 by links 91.

Operation is as follows:

As shown in Fig. 4, when the crank arms 85 are in position extending downward from shaft 73, the pins 65 are at the lower ends of their strokes adjacent the lower ends of slots 37 in guides 35, levers L1, L2 and L3 are angled such that their long arms 23 extend upward from pivots 27, and all three sashes S1, S2 and S3 are closed. The tightness of closure of a sash depends upon the location of the pins 65 for the sash relative to the pivots 27 for the sash when the pins are at the lower ends of their stroke. By moving the pins toward the exterior of the window (toward the right as viewed in Figs. 4 and 6), the long arms 23 are moved counterclockwise to increase the tightness, and vice versa. The pins may be adjusted by swinging the guide plates 35 to vary the angularity of the slots 37 in the guide plates relative to the frame within limits, noting that if the angle of the slots is considerable, the pins will jam in the slots. This adjustment is initially made at the factory.

Upon turning the crank 83 in one direction or the other (it makes no difference which), crank arms 85 are rotated in one direction or the other (it makes no difference which), thereby driving the connecting rods 87 up and down. This reciprocates the lower pins 65 up and down and the lower pins, acting through links 89 and 91, reciprocate the pins 65 associated with sashes S2 and S1 up and down. A half revolution of crank arms 85 from their Fig. 4 position drives the pins up to the upper ends of slots 37 and a successive half revolution of arms 85 brings the pins back down. As the pins associated with each sash move up, the respective links 67 drag the arms 25 of the respective bell crank levers L1, L2 or L3 clockwise as viewed in Fig. 4 and thereby swing arms 23 clockwise (outward) to open the sash as shown in Fig. 5. All three sashes swing open simultaneously. As the pins move down, the levers L1, L2 and L3 are rocked counterclockwise back from the Fig. 5 position to close the sash. If the crank is continuously turned in one direction or the other, the sashes will simply continue to swing open and closed. There is no stop acting on the crank, eliminating any possibility of the mechanism being forced and damaged. This is particularly important in the case of use of the windows in penal and psychiatric institutions, for which they are especially suitable.

Figs. 9–11 illustrate a modification of the above adapted for sequential operation of the sashes, and more particularly operation in such manner that the lower sash S3 opens before the two upper sashes S1 and S2. The construction is substantially the same as that shown in Figs. 1–8, the only differences being a change in the disposition of short arms 25 of the lower levers L3 and a change in the means for adjusting the guide plates 35 for the lower pins 65. As shown in Fig. 9, the short arms 25 of the lower levers L3 are fixed to their pivots 27 diametrically opposite their position as shown in Fig. 4. Accordingly, when the lower sash S3 is closed, the short arms 25 therefor, instead of being angled downward and outward toward the exterior flanges 11 of the jambs 5, as in Fig. 4, are angled upward and inward away from flanges 11, and links 67 for the lower sash extend upward from the respective pins 65 to the arms 25, instead of being nearly horizontal as in Fig. 4. When crank arms 85 are rotated one way or the other from the Fig. 9 position, the pins 65 for all three sashes move upward in unison, but links 67 for the lower levers L3, by reason of their different disposition from links 67 for the upper levers L2 and L1, act to swing levers L3 substantially completely open while the levers L2 and L1 are swinging only through a small angle (see Fig. 10), and the lower sash S3 is thereby swung substantially completely open before sashes S2 and S1 are completely opened. This enables sash S3 to be substantially completely opened without any substantial opening of sashes S2 and S1. On closing, the action is reversed, sashes S2 and S1 closing substantially completely while levers L3 and sash S3 are swinging only through a small angle.

For tightening the lower sash S3, the guide plates 35 for pins 65 associated with the lower sash must be swung clockwise as viewed in Fig. 9 (instead of counterclockwise as in Fig. 4), and the adjusting means for these guide plates is accordingly modified from that shown in Fig. 6 to that shown in Fig. 11. As shown in Fig. 11, the modified adjusting means comprises a screw 93 having a head 95 and extending loosely through a hole 97 in the interior side of offset 13, the screw being threaded in a tapped hole 99 in block 57. By turning the screw in the appropriate direction, block 57 may be moved in the direction toward the interior (toward the left as viewed in Figs. 9 and 10) for swinging the guide plate 35 clockwise.

Fig. 12 illustrates a modification in which the upper sashes are operated by the opening and closing of the lower sash S3. In this instance, the guide plates 35, pins 65 and links 67 for the lower sash S3 are eliminated, as well as the shaft 73, crank arms 85, connecting rods 87. The short arms 25 of the lower levers L3 are fixed to their pivots 27 at such an angle that, with the lower sash S3 closed, these arms are angled downward and rearward from the pivots 27. Also, arms 25 of the lower levers L3 are connected to the links 67 for the sash S2 by connecting rods 101. When sash S3 is swung out, levers L3 are swung clockwise as viewed in Fig. 12, driving rods 101 upward, thereby driving links 67 for sash S2 upward and acting through links 91 to drive pins 65 for sash S1 upward.

In view of the above, it will be seen that the several

objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. Operating mechanism for a plurality of awning type window sashes, said sashes being mounted in a frame, comprising a plurality of levers, one for each sash, each of said levers being pivoted intermediate its ends on a fixed horizontal transverse axis at one side of the frame, each lever having one end thereof connected to a respective sash, a plurality of members, one for each lever, mounted for up and down sliding movement at said side of the frame adjacent the respective levers, each slidable member being connected to the other end of the respective lever by a link, means connecting the slidable members for conjoint movement thereof, and means connected to the slidable member for one of the sashes for reciprocating this slidable member and, through said means which connects the slidable members for conjoint movement, reciprocating the remainder of the slidable members.

2. Operating mechanism for a plurality of awning type window sashes, said sashes being mounted in a frame one above another, comprising a plurality of levers, one for each sash, each of said levers being pivoted intermediate its ends on a fixed horizontal transverse axis at one side of the frame, each lever having one end thereof connected to a respective sash, a plurality of slidable members, one for each lever, a plurality of guides, one for each slidable member, each adapted to guide the respective slidable member for up and down movement at said side of the frame, each slidable member being connected to the other end of the respective lever by a link, each guide being adjustably mounted on said side of the frame for adjusting the position occupied by the respective slidable member at that end of its stroke corresponding to the closed position of the respective sash for effecting tight closure of the sash, means connecting the slidable members for conjoint movement thereof, and means connected to the slidable member for one of the sashes for reciprocating this slidable member and, through said means which connects the slidable members for conjoint movement, reciprocating the remainder of the slidable members.

3. Operating mechanism as set forth in claim 2 wherein each guide is pivoted on the side of the frame for swinging movement on a horizontal transverse axis, and wherein means is provided for securing the guide in various angular positions.

4. Operating mechanism for a plurality of awning type window sashes, said sashes being mounted in a frame one above another, comprising a plurality of bell crank levers, one for each sash, each pivoted on a horizontal transverse axis at one side of the frame, each lever having a first arm on the inside of said side of the frame pivotally connected to a respective sash and a second arm on the outside of said side of the frame, a plurality of pins, one for each lever, a plurality of guides, one for each pin, each adapted to guide the respective pin for up and down sliding movement on the outside of said side of the frame, each pin being connected to the second arm of the respective lever by a link, means connecting the pins for conjoint movement thereof, and means connected to the pin for one of the sashes for reciprocating this pin and, through said means which connects the pins for conjoint movement, reciprocating the remainder of the pins.

5. Operating mechanism as set forth in claim 4 wherein each guide comprises a plate having a guide slot therein receiving the respective pin, said plate being pivoted on the frame for swinging movement on a transverse horizontal axis for varying the angularity of the slot relative to the frame, and wherein means is provided for securing the plate in various angular positions.

6. Operating mechanism for a plurality of awning type window sashes, said sashes being mounted in a frame one above another, comprising a plurality of pairs of bell crank levers, one pair for each sash, the two levers of each pair being pivoted at opposite sides of the frame on a horizontal transverse axis, each lever having a first arm toward the inside of the frame pivotally connected to a respective sash and a second arm toward the outside of the frame, a plurality of pins, one for each lever at the sides of the frame, a plurality of guides, one for each pin, each guide being adapted to guide the respective pin for up and down movement at the respective side of the frame adjacent the respective lever, a link connecting each pin to the second arm of the respective lever, means connecting the pins at each side of the frame for conjoint movement thereof, a shaft extending transversely at the bottom of the frame, means comprising a manually operable crank continuously rotatable in one direction or the other for continuously rotating said shaft in one direction or the other, cranks at the ends of the shaft, and links connecting the last-named cranks and the pins for the lowermost sash, each guide comprising a plate having a guide slot therein receiving the respective pin, said plate being adjustably mounted on the respective side of the frame for varying the angularity of the slot relative to the frame.

7. Operating mechanism as set forth in claim 6, wherein each plate is pivoted on the frame for swinging movement on a transverse horizontal axis, and wherein means is provided for securing each plate in various angular positions.

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