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2,478,061

WINDOW STRUCTURE AND OPERATING MECHANISM THEREFOR

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3 Sheets-Sheet 1

Fig. 1.

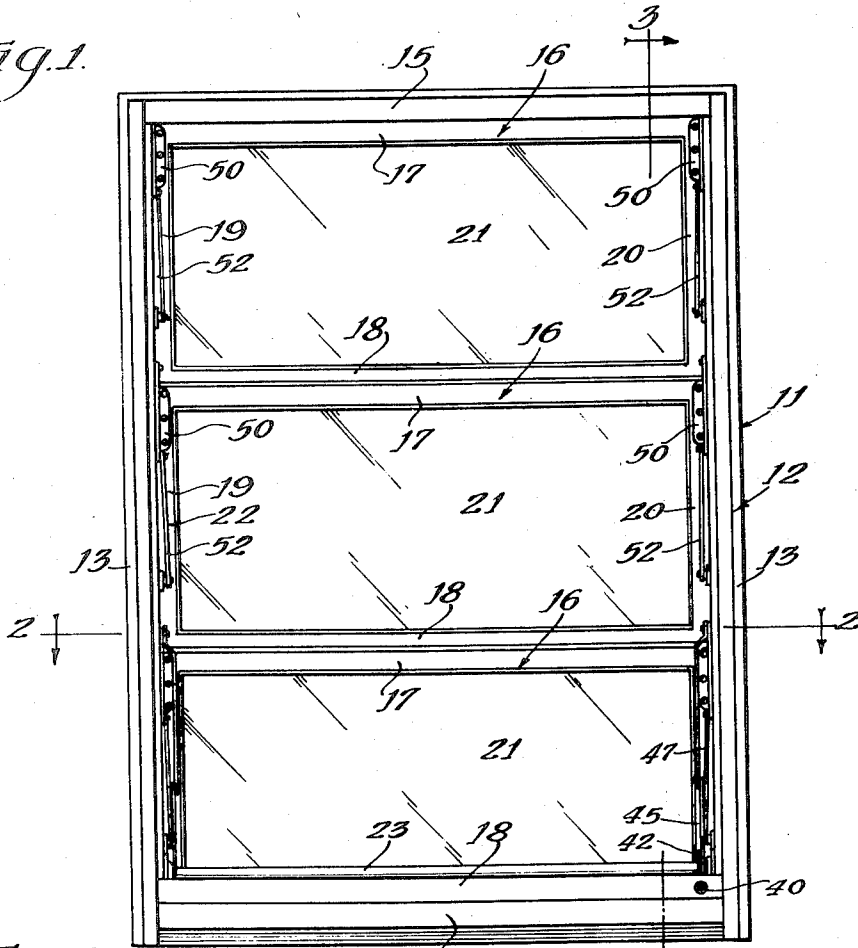
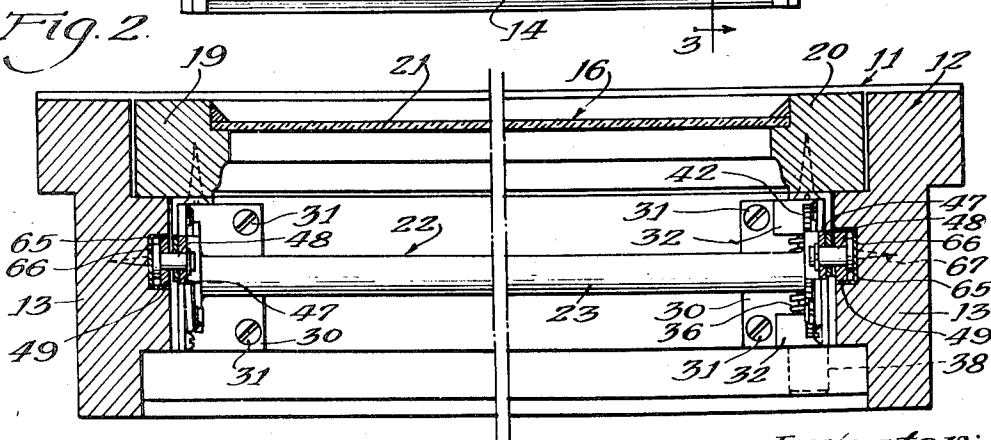


Fig. 2.



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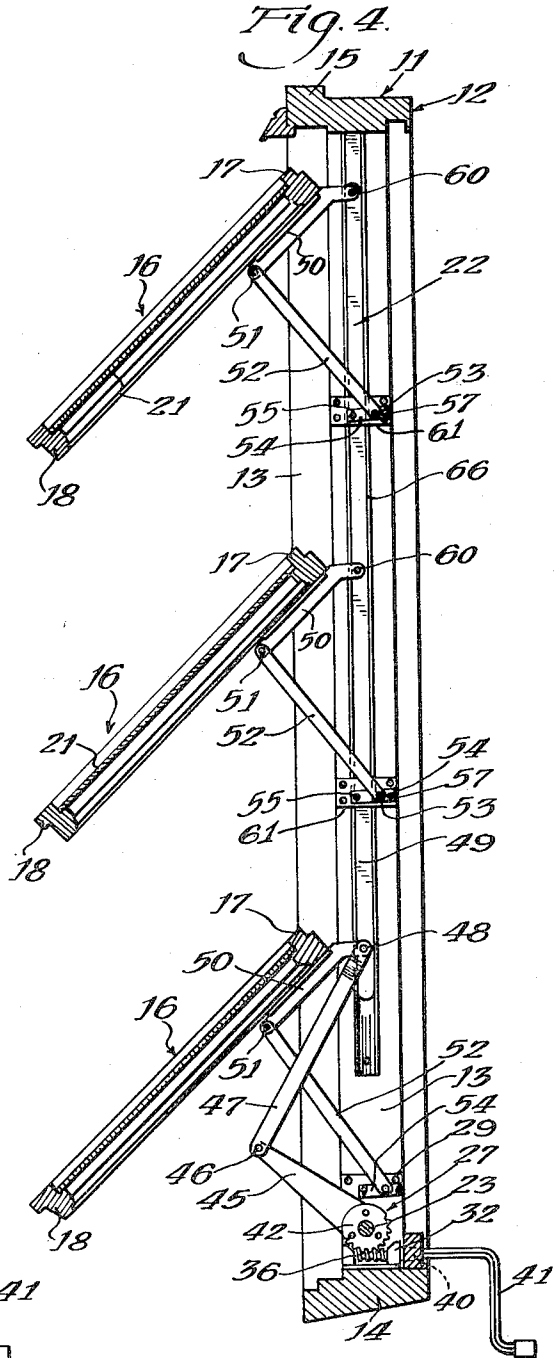
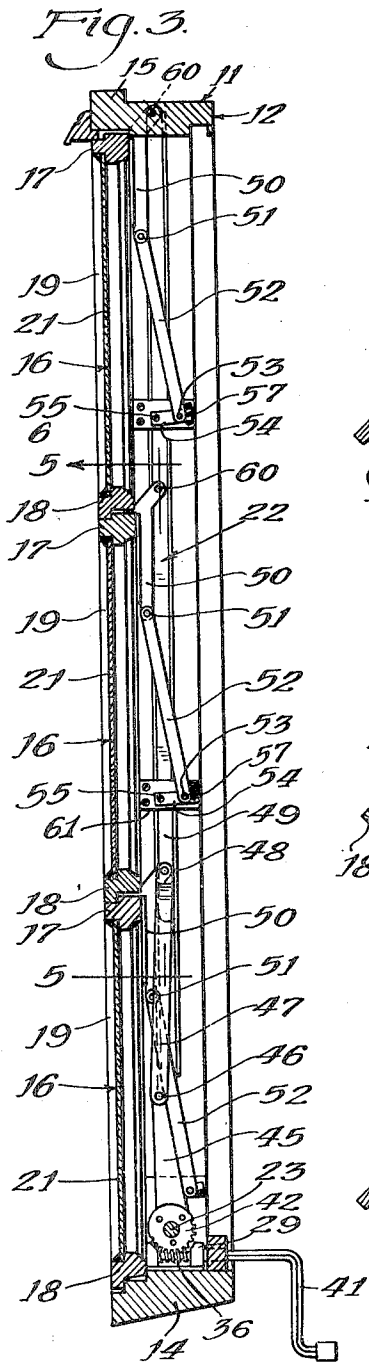
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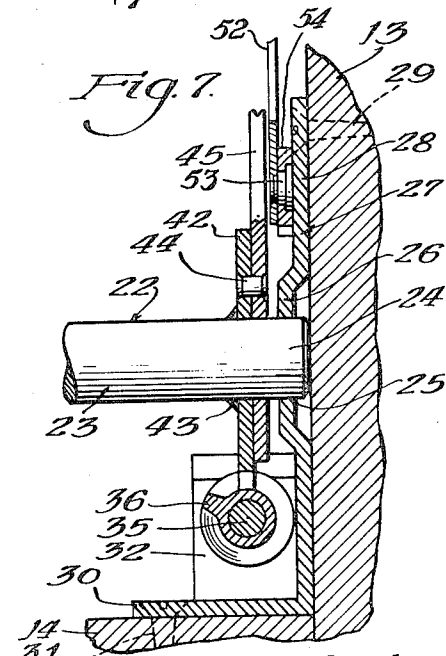
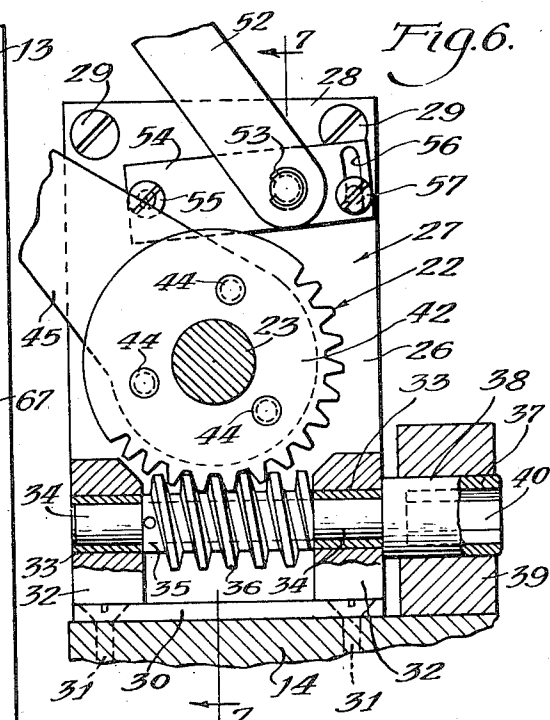
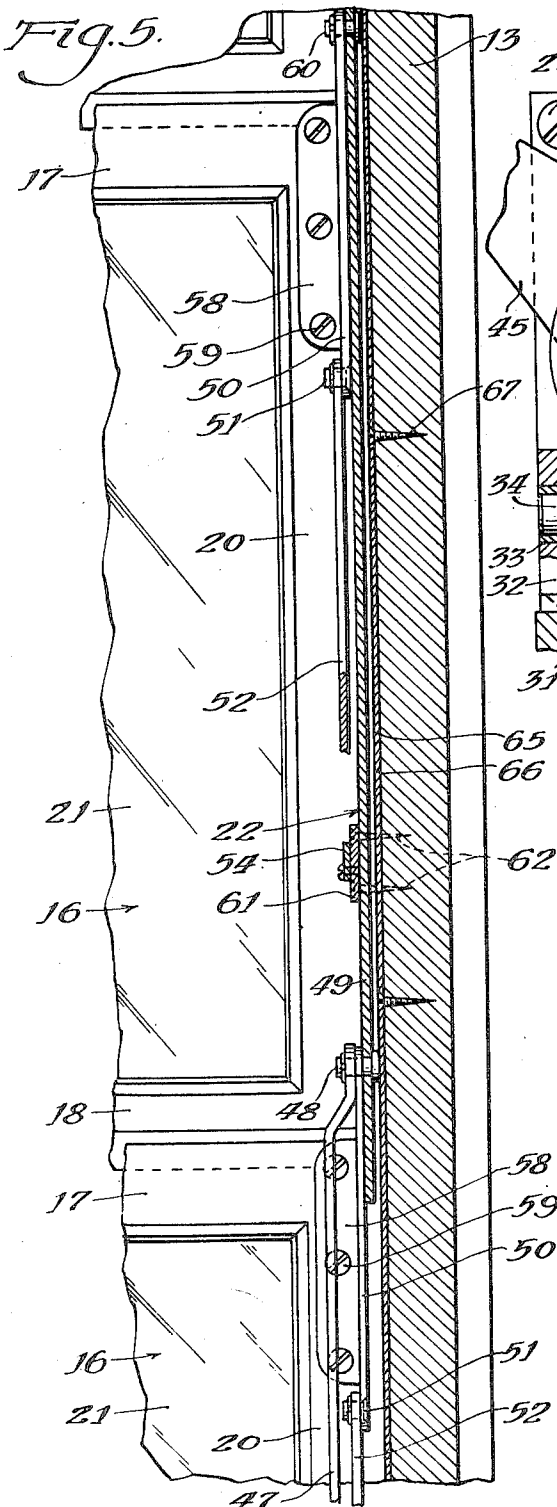
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WINDOW STRUCTURE AND OPERATING MECHANISM THEREFOR

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3 Sheets-Sheet 3



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# UNITED STATES PATENT OFFICE

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## WINDOW STRUCTURE AND OPERATING MECHANISM THEREFOR

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Application August 7, 1947, Serial No. 766,941

5 Claims. (Cl. 189-67)

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This invention relates to window structures and operating mechanisms therefor.

More particularly, this invention relates to a window structure embodying a window frame having a plurality of horizontally pivoted window sections arranged therein, and manually operable means for moving the said window sections simultaneously into and from open and closed positions by a combined sliding and swinging motion.

An object of the present invention is to provide a novel window structure embodying a window frame having a plurality of horizontally pivoted window sections mounted therein, and novel manually controlled operating mechanism for moving the said window sections simultaneously into and from open and closed positions by a combined sliding and swinging motion.

Another object of the invention is to provide in the new window structure a novel guideway in which each of the main operating bars is slidably guided for vertical movement during the operation of moving the window sections into and from open and closed positions.

A further object of the invention is to construct the new guideways for the main vertically slidable operating bars in such a manner that slidable movement of the main operating bars therein is facilitated and binding frictional engagement between the vertically slidable main operating bars and the said guideways therefor is prevented under the widely varying conditions of atmospheric temperature and humidity to which the new window structure and operating mechanism therefor may be subjected in use.

Still another object of the invention is to provide in the new window structure a novel construction and arrangement for properly adjusting and centering each of the supporting arms by which the window sections are attached to the window frame in which the said window sections are mounted so that when the window sections and attached supporting arms are installed in position of use they may readily be adjusted and centered relative to the vertically slidable main operating bars therefor so as to facilitate easy operation of the said window sections by the manually controlled operating mechanism therefor when in use.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, show preferred embodiments and the principles thereof and what I now consider to be the best

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mode in which I have contemplated applying those principles. Other embodiments of the invention embodying the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

Fig. 1 is an elevational view of a window structure embodying the present invention as seen from the outer side thereof;

Fig. 2 is an enlarged horizontal sectional plan view on line 2-2 in Fig. 1;

Fig. 3 is an enlarged view on line 3-3 in Fig. 1, partly in vertical section and partly in elevation, showing the window sections and the manually controlled operating mechanism therefor in the relative positions which they assume when the window sections are in closed position;

Fig. 4 is a view similar to Fig. 3 but showing the parts of the new window structure in the relative positions which they assume when the window sections are in open position;

Fig. 5 is an enlarged fragmentary view on line 5-5 in Fig. 3, partly in section and partly in elevation;

Fig. 6 is an enlarged fragmentary detail view, partly in section and partly in elevation, illustrating the manually controlled worm and gear unit for controlling the movement of the main operating mechanism and the window sections operated thereby; and

Fig. 7 is a sectional view on line 7-7 in Fig. 6.

A window structure embodying a preferred form of the present invention is illustrated in Figs. 1 to 7, inclusive, of the drawings, wherein it is generally indicated at 11, and comprises a window frame 12, which is preferably but not necessarily of wooden construction, and which includes a pair of side members or stiles 13, a bottom member or sill 14, a top member 15, and a plurality of horizontally pivoted outwardly movable window sections or sashes each of which is generally indicated, as a unit, at 16.

Each of the movable window sections 16 or sashes includes a horizontal top rail 17, a horizontal bottom rail 18, a pair of vertically extending side rails 19 and 20, and a glass window pane 21 mounted therein.

The operating mechanism for the movable window sections is generally indicated at 22 in the drawings, and comprises a main horizontally extending operating rock shaft which extends between the window stiles 13 immediately above the window sill 14, as shown in Figs. 2 and 7. Each end portion 24 of the main operating rock shaft

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23 is rotatably journaled in a bearing opening 25 which is provided in an offset bearing section 26 of a supporting bracket or metal casting 27, which is preferably a die casting of a light corrosion-resistant aluminum alloy. Each of the castings 27 includes an upright portion 28, in which the offset bearing section 26 is formed, and each of these upright portions 28 is suitably attached, as by screws 29, to one of the upright window stiles 13 on the inner side thereof (Figs. 6 and 7). Each of the castings 27 also includes a base plate or portion 30 and each of these base portions 30 is suitably attached, as by screws 31, to the window sill 14, on the upper surface of the latter. One of the castings 27 also includes a pair of spaced upright bearing elements or bosses 32 which are formed integral with the base plate or portion 30 thereof. Each of these bearing elements or bosses 32 has a bearing opening 33 formed therein and an end portion 34 of a shaft 35 is rotatably journaled in each of the bearing openings 33 (Fig. 6). The shaft 35 has a worm 36 formed thereon and the worm 36 is disposed between the upright bearing bosses 32.

As shown in Figs. 4 and 6, the worm shaft 35 has an extension 37 formed therein and this extension 37 is journaled in a bearing opening 38 which is formed in a bearing block 39 which is mounted on the window sill 14. The extension 37 has a socket 40 formed therein for the reception of the inner end portion of a hand crank 41 (Figs. 3 and 4).

The worm 36 on the shaft 35 meshes with a segmental gear 42 which is fastened, in any suitable manner, as by welding 43, upon and to the horizontal operating shaft 23 (Fig. 6). The segmental gear 42 is, in turn, fastened, as by rivet 44, to a power arm 45 or, if desired, the segmental gear 42 and the power arm 45 may be made integral with each other in the form of a die casting or the like.

The power arm 45 is pivotally connected, as at 46, to the lower end portion of a link 47, and the link 47 is, in turn, pivotally connected at its upper end, as by a headed pin 48, to a main vertically slidable operating member or bar 49.

A power arm, similar to the power arm 45, is mounted on the other end portion of the main horizontal operating rock shaft 23 except that in this instance the power arm is fastened directly to and upon the main horizontal operating rock shaft 23 and the worm shaft 35—36 and segmental gear 42 are eliminated. Otherwise the parts of the operating mechanism arranged at both sides of the window structure, including the link 47, main vertically slidable operating member or bar 49, and other parts which are to be described hereinafter, are similar. Hence, only one of the two substantially similar operating mechanisms arranged at opposite sides of the window structure will be described hereinafter.

Each of the lowermost window sections 16 has a supporting member 50 attached thereto on the inner side thereof and each of these lowermost supporting members 50 is pivotally connected, at its upper end, to a headed pin 48, between the main vertically slidable operating bar 49 and the adjacent link 47 (Figs. 4 and 5). Each of the lowermost supporting members 50 is pivotally connected at its lower end, as by a headed pin 51, to a supporting arm 52 and each of the lowermost supporting arms 52 is, in turn, pivotally mounted, as at 53, upon an adjustable supporting plate 54. As shown in detail in Fig. 6, one end portion of each of the adjustable supporting

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plates 54 is pivotally fastened, as by a screw 55, to the upright portion 28 of one of the castings 27, and the other end portion of each of the supporting plates 54 has an arcuate or curved slot 56 formed therein. The shank of a screw 57 extends through each slot 56 and is anchored in a threaded opening provided therefor in the upright portion 28 of the corresponding casting 27, the head of the screw 57 spanning the slot 56 (Fig. 6). The purpose and operation of this arrangement will be described hereinafter.

As shown in Fig. 5, each of the supporting members 50 includes an attaching arm or extension 58 which is attached, as by screws 59, to the side rail 20 of the corresponding window section 16.

As shown in Figs. 3 and 4, each of the middle or intermediate window sections 16 and each of the uppermost window sections 16 also has one of the supporting members 50 attached thereto and each of these middle and upper supporting members 50 is pivotally connected at its upper end, as by a headed pin 60, to one of the main vertically slidable operating bars 49. Similarly, each of the middle and upper supporting members 50 is pivotally connected at its lower end, as at 51, to one of the supporting arms 52, and each of the middle and upper supporting arms 52 is, in turn, pivotally connected at its lower end, as at 53, to one of the adjustable supporting plates 54. However, each of the middle and upper adjustable supporting plates 54, rather than being adjustably mounted on the upward extension 28 of one of the castings 27, as are the lowermost adjustable supporting plates 54, is similarly adjustably mounted upon a supporting plate or bracket 62 which is attached to one of the window stiles 13 on the inner side thereof by means of screws or the like 62. As shown in Fig. 5, each of the supporting plates or brackets 62 spans the corresponding main vertically adjustable slide bar 49 on the inner side of the latter.

As shown in Figs. 2 and 5, each of the window stiles 13 has a centrally arranged vertically extending channel-shaped groove 65 formed therein and a channel-shaped metal guideway or liner 66 is arranged in each of the grooves 65 and is fastened therein by means of suitable fastening elements, such as screws 67, which are anchored in the window stiles 13. As is also shown in Figs. 2 and 5, each of the vertically slidable main operating bars 49 is arranged in and is slidably guided for vertical movement in one of the channel-shaped metallic guideways or liners 66.

The operation of the window structure and operating mechanism therefor illustrated in Figs. 1 to 7, inclusive, and which has been described hereinbefore, is as follows: When the movable window sections 16 are disposed in closed position the parts of the new window structure and operating mechanism therefor are disposed in the relative positions in which they are shown in Fig. 3 of the drawings. However, in order to move the movable window sections 16 into open position, as in Fig. 4, it is merely necessary for the operator to insert the end portion of the hand crank 41 into the socket 40 provided therefor in the outer end portion of the worm shaft 35—36 and then rotate the worm shaft 35—36 in a counterclockwise direction, as seen from the right in Fig. 3. Rotation thus manually imparted to the worm shaft 35—36 acts, through the segmental gear 42, to rock the main operating rock shaft 23 and the power arms 45 thereon in a counterclockwise direction from the position in which

these parts are shown in Fig. 3 into the position in which the same parts are shown in Fig. 4.

This movement of the main operating rock shaft 23 and attached power arms 45 acts, through the links 47, to move the main operating slide bars 49 downwardly in the channel-shaped metal guideways 65. This downward slidable movement of the main vertically slidable operating bars 49 acts, through the supporting members 50 and their pivotal connections 48 and 60 with the slide bars 49, in cooperation with the supporting arms 52 and their pivotal connections 51 with the supporting members 50, to impart a combined sliding and swinging motion to the window section 16, thereby moving the window sections 16 into open position, as in Fig. 4. During this operation the supporting arms 52 pivot at their lower ends, as at 53, upon the adjustable supporting plates 54 by which the supporting arms 52 and the window sections 16 supported thereby are attached to the stiles 13 of the window frame 12.

When it is desired to close the movable window sections 16 this may be readily accomplished by rotating the hand crank 41 and the worm shaft 35 and worm 36 in the opposite direction, that is, in a clockwise direction as seen from the right in Fig. 4. Rotation thus imparted to the worm shaft 35 and worm 36 thereon will act, through the segmental gear 42 to rock the main operating rock shaft 23 in a clockwise direction, as seen in Fig. 4, and this motion of the rock shaft 23 will act, through the power arms 45 and the links 47, to slide the main operating slide bars 49 upwardly in their channel-shaped metal guideways 65. Such upward movement of the main operating slide bars 49 will thereupon act, through the supporting members 50 and the supporting arms 51 to impart a combined sliding and swinging motion to the window sections 16 so as to move the movable window sections 16 back into closed position, as in Fig. 3.

In the use of the new window structure illustrated in Figs. 1 to 7, inclusive, and hereinbefore described, the channel-shaped metal guideways 66 serve to facilitate the sliding movement of the main vertically slidable operating bars 49 therein and to minimize the friction incidental to the movement of the said main operating slide bars 49 which results in ease and facility of movement of the movable window sections 16 and the operating mechanism therefor. In addition, the provision of the channel-shaped metal guideways 66 prevents binding of the main vertically slidable operating bars 49 in their guideways due to swelling and the contraction of the window stiles 13 in which the channel-shaped grooves 65 for the channel-shaped metal guideways 66 are formed, when the window frame 12 is made of wood, incidental to varying conditions of atmospheric temperature and humidity, since such swelling and contraction as may occur in the wooden window stiles 13 will not materially affect the channel-shaped metal guideways 66. In this manner one of the difficulties heretofore experienced in the use of somewhat similar wooden window structures and operating mechanisms therefor is eliminated.

When the window sections 16 and the operating mechanism therefor are assembled in the window frame 12 it is essential that the supporting arms 52 be properly centered and mounted relative to the main operating slide bars 49 and the pivotal connections 48 and 60 between the supporting members 50 and the main operating

slide bars 49 since otherwise a binding action might occur during the combined sliding and swinging movement of the movable window sections 16 into and from open and closed positions.

In the practice of the present invention, if the pivotal mountings 53 for the links 52 should be somewhat off their proper centers when the parts are assembled, the pivotal mountings 53 for the links 52 may be readily brought to their proper centers by loosening the screws 57 (Fig. 6) and pivoting the adjustable supporting plates 54 upon their pivotal mountings 55. The thus adjusted supporting plates 54 and the pivotal mountings 53 for the supporting arms 52, which are supported thereby, may then be clamped in the desired adjusted and properly centered position by adjusting the screws 57 in the slots 56 so that the heads of the screws 57 are disposed in binding engagement with the adjustable supporting plates 54.

It will thus further be seen from the foregoing description, considered in conjunction with the accompanying drawings, that the present invention provides a new and improved window structure, and operating mechanism therefor, having the novel features of construction hereinbefore described, and that the invention thus has the desirable advantages and characteristics, and accomplishes its intended objects, including those hereinbefore pointed out, and others which are inherent in the invention.

I claim:

1. A window structure comprising a window frame including spaced vertically extending frame side members each having a vertically extending groove therein, a slide bar slidably mounted in the groove in each of the said vertically extending frame side members, movable window sections pivotally connected to the said slide bars, a pair of supporting brackets each carried by one of the said window frame side members and each spanning one of the said slide bars and one of the said grooves and arranged in substantially horizontal alignment with each other, a pair of supporting arms arranged one at each side of each of the said movable window sections and having their upper end portions pivotally connected thereto, supporting plates each having an end portion pivotally mounted upon one of the said supporting brackets on the inner side thereof, the lower end portion of each of the said supporting arms being pivotally connected to a corresponding one of the said supporting plates, means for actuating the said slide bars in unison to open and close the said movable window sections, and means for adjustably mounting the other end portion of each of the said supporting plates upon the corresponding one of the said supporting brackets.

2. A window structure as defined in claim 1 in which the lower end portion of each of the said supporting arms is pivotally connected to one of the said supporting plates adjacent the adjustably mounted end portion thereof.

3. A window structure as defined in claim 1 which includes a plurality of the said movable window sections movably mounted one above the other in the said window frame and including a lowermost movable window section, a pair of castings mounted in the lower portion of the said window frame, one at each side thereof, and below the said vertically extending grooves, a supporting plate having an end portion pivotally mounted upon each of said castings, a pair of said supporting arms for the said lowermost mov-

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able window section each having an upper end portion pivotally connected to the said lowermost window section and each having a lower end portion pivotally connected between the ends of one of the said supporting plates mounted on one of the said castings, and means for adjustably mounting the other end portion of each of the said latter supporting plates upon the corresponding one of said castings.

4. A window structure as defined in claim 1 in which the lower end portion of each of the said supporting arms is pivotally connected to one of the said supporting plates adjacent the adjustably mounted end portion thereof, and in which each of the supporting plates has an arcuate slot formed therein adjacent one end portion thereof, and in which said window structure includes a headed threaded member carried by each of the supporting brackets and extending through the said arcuate slot in the corresponding one of the supporting plates for retaining the said supporting plate in a pre-selected adjusted position.

5. A window structure as defined in claim 1 which includes a plurality of movable window sections movably mounted one above the other in the said window frame and including a lowermost movable window section, a pair of castings mounted in the lower portion of the said window frame, one at each side thereof, and below the said vertically extending grooves, a supporting plate having an end portion pivotally mounted upon each of the said castings, a pair of said supporting arms for the said lowermost movable window section each having an upper end por-

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tion pivotally connected to the said lowermost window section and each having a lower end portion pivotally connected between its ends to one of the said supporting plates which is mounted on one of the said castings, and means for adjustably mounting the other end portion of each of the said latter supporting plates upon the corresponding one of the said castings, and in which the said means for adjustably mounting the said other end portion of each of the said latter supporting plates upon a corresponding one of the said castings includes an arcuate slot formed in each of the said latter supporting plates adjacent one end thereof, and a headed threaded member carried by each of the said castings and extending through a corresponding one of the said arcuate slots for retaining the corresponding one of the said latter supporting plates in pre-selected adjusted position.

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