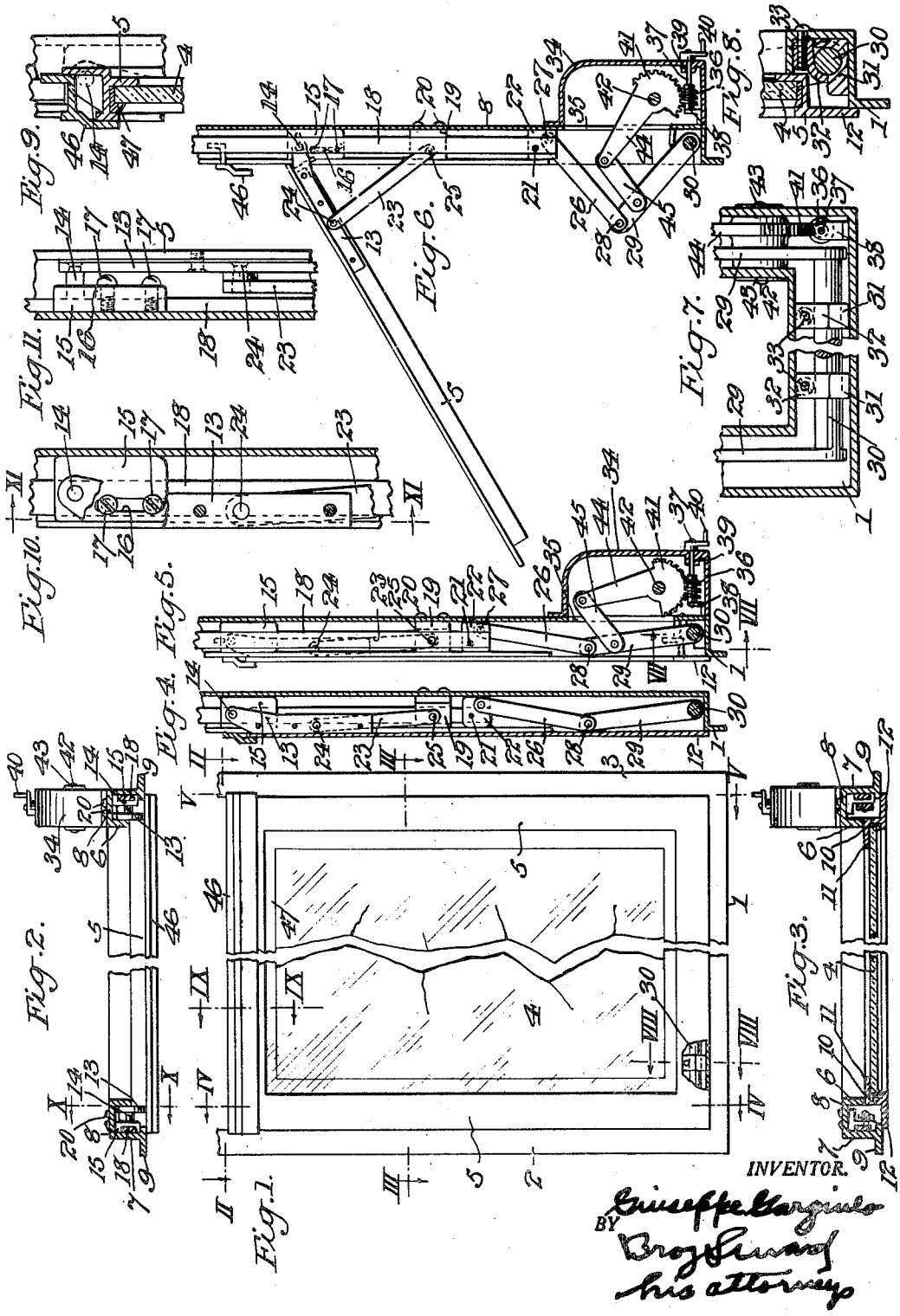
Aug. 2, 1949. G. GARGIULO 2,478,044

WINDOW STRUCTURE

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INVENTOR.

BY Giuseppe Gargiulo

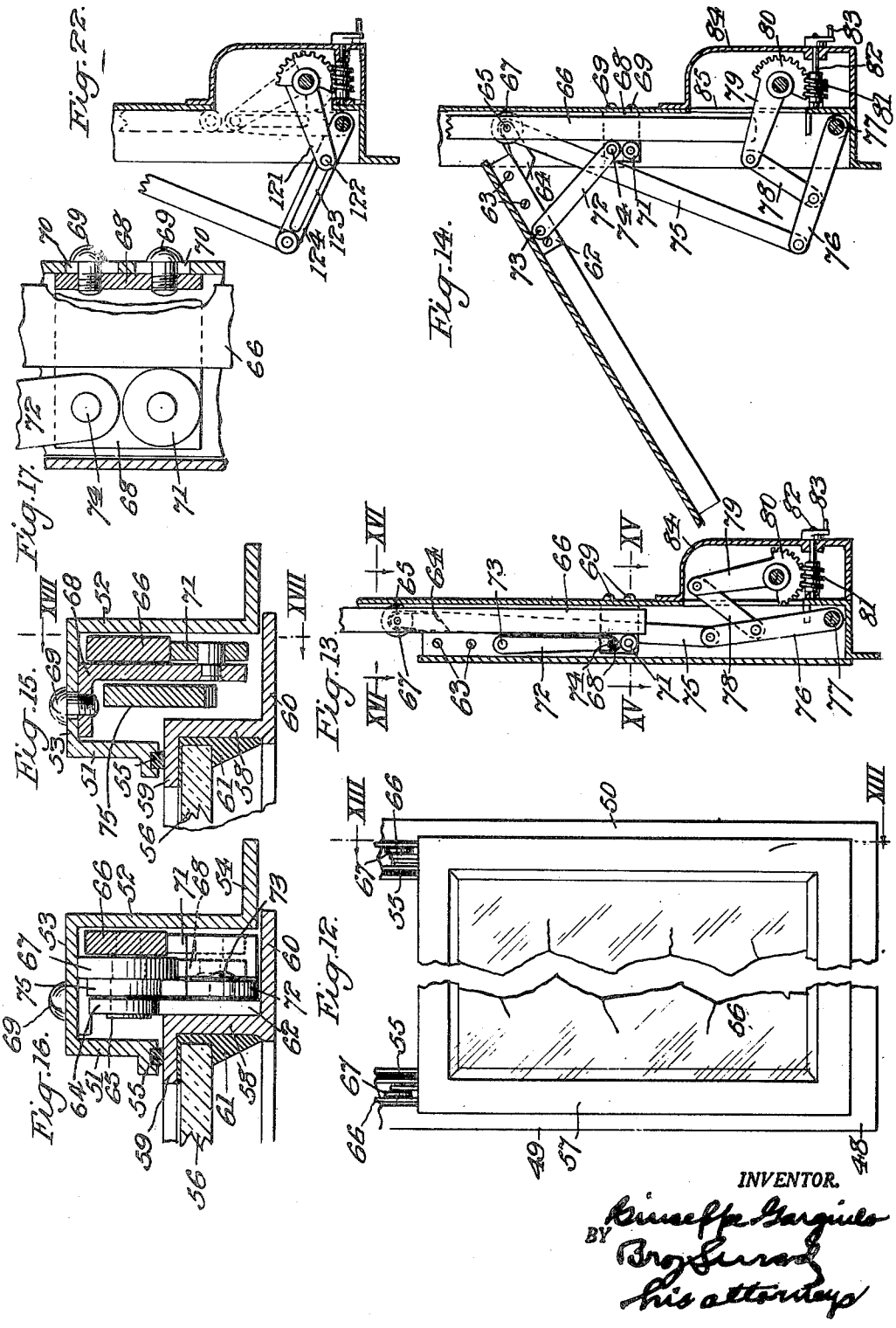
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WINDOW STRUCTURE

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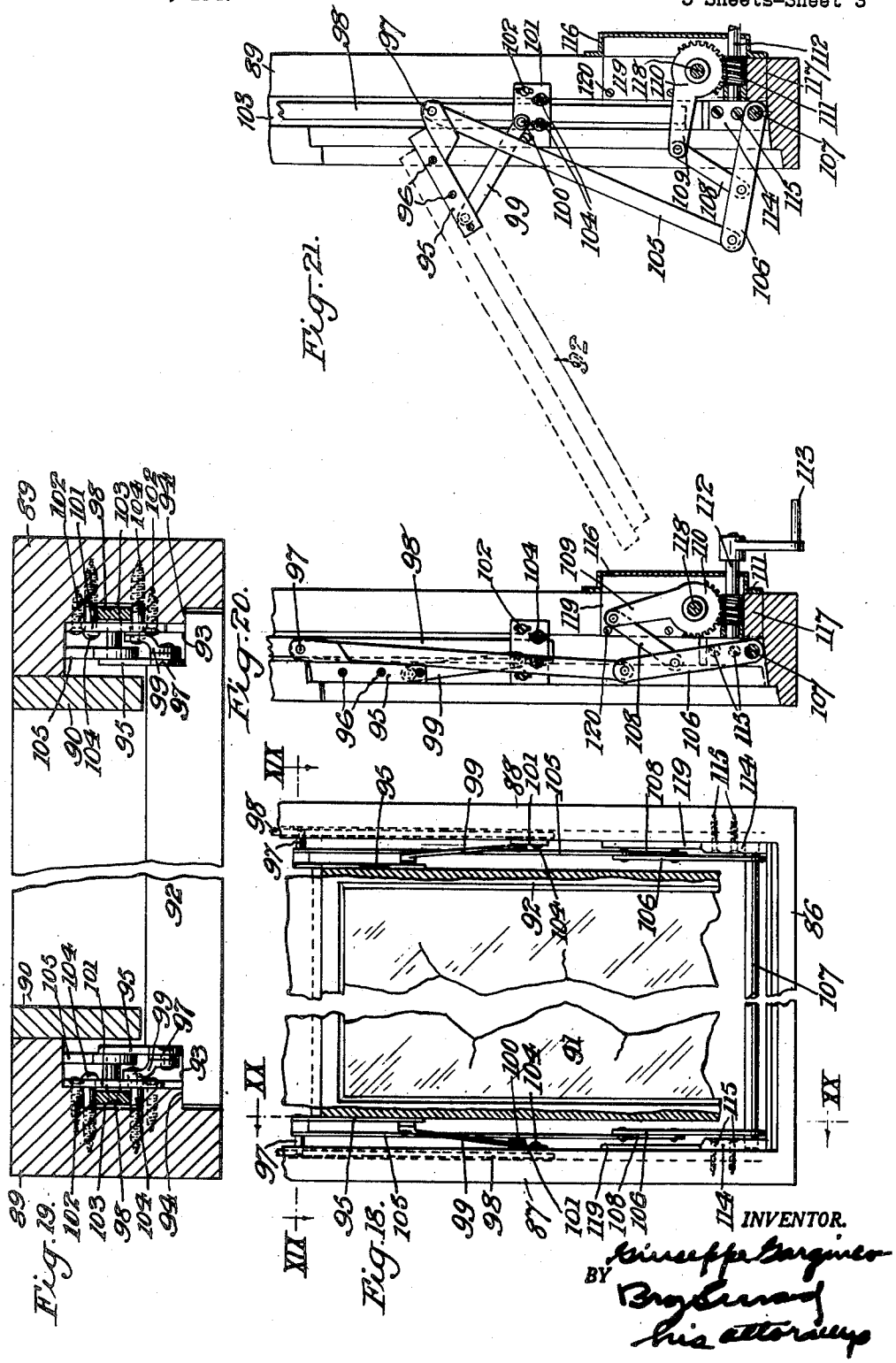


Fig. 21.

Fig. 20.

Fig. 19.

Fig. 18.

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2,478,044

WINDOW STRUCTURE

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5 Claims. (Cl. 189—67)

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This invention relates to window structures of the type embodying horizontally pivoted swinging sashes and has for an object to provide an improved construction and arrangement of frame and sash operating mechanism whereby production, installation and operation are facilitated and bettered.

Another object is to provide frame members so formed and arranged as to minimize size and permit ease of assembly while attaining and maintaining a high degree of strength and rigidity.

Another object is to provide a sash operating mechanism which embodies elements so formed and combined as to lend the structure to ease, smoothness and precision of operation; while cooperating nicely with the frame and sash structure.

Another object is to provide combined frame, sash and operating mechanism particularly adapted to the manufacture, shipment and installation of the windows as units, and in which the advantages of lightness, compactness and strength inhere to a meritorious degree.

Another object is to provide certain improvements in the form, construction and arrangement of the several parts whereby the above named objects and other advantages inherent in the invention may be effectively attained.

Practical embodiments of the invention are shown in the accompanying drawings in which

Fig. 1 represents a broken front elevation, partly in section, of a complete window unit provided with one sash;

Fig. 2 represents a horizontal section taken in the plane of the line II—II of Fig. 1, looking in the direction of the arrows;

Fig. 3 represents a horizontal section taken in the plane of the line III—III of Fig. 1, looking in the direction of the arrows;

Fig. 4 represents a vertical section taken in the plane of the line IV—IV of Fig. 1, looking in the direction of the arrows;

Fig. 5 represents a vertical section taken in the plane of the line V—V of Fig. 1, looking in the direction of the arrows;

Fig. 6 represents a view similar to Fig. 5 but showing the parts in a different position and with the sash open.

Fig. 7 represents an enlarged, detail vertical section taken in the plane of the line VII—VII of Fig. 5, looking in the direction of the arrows;

Fig. 8 represents an enlarged, detail vertical section taken in the plane of the line VIII—VIII of Fig. 1, looking in the direction of the arrows;

Fig. 9 represents an enlarged, detail vertical

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section taken in the plane of the line IX—IX of Fig. 1, looking in the direction of the arrows;

Fig. 10 represents an enlarged, detail vertical section taken in the plane of the line X—X of Fig. 2, looking in the direction of the arrows;

Fig. 11 represents a detail, vertical section taken in the plane of the line XI—XI of Fig. 10, looking in the direction of the arrows;

Fig. 12 represents a broken front elevation of a complete unit embodying a modified form of the invention;

Fig. 13 represents a vertical section taken in the plane of the line XIII—XIII of Fig. 12, looking in the direction of the arrows.

Fig. 14 represents a view similar to Fig. 13, but showing the parts in different positions and the sash open.

Fig. 15 represents an enlarged horizontal detail section taken in the plane of the line XV—XV of Fig. 13, looking in the direction of the arrows.

Fig. 16 represents a similar view taken in the plane of the line XVI—XVI of Fig. 13, looking in the direction of the arrows;

Fig. 17 represents a detail vertical section taken in the plane of the line XVII—XVII of Fig. 15, looking in the direction of the arrows;

Fig. 18 represents a broken front elevation, partly in section, of a complete unit embodying a second modified form of the invention on the same scale as Figs. 1 and 12;

Fig. 19 represents an enlarged horizontal section taken in the plane of the line XIX—XIX of Fig. 18, looking in the direction of the arrows;

Fig. 20 represents a vertical section taken in the plane of the line XX—XX of Fig. 18, looking in the direction of the arrows;

Fig. 21 represents a view similar to Fig. 20 with the parts in different positions and the sash open; and

Fig. 22 represents a detail view, similar to Figs. 6, 14 and 21, but showing a further slightly modified form of actuating mechanism which is particularly applicable, by way of substitution, to the forms of the invention shown in Figs. 12 to 17 inclusive and in Figs. 18 to 21 inclusive.

Windows of the horizontally pivoted or awning type, including either a single sash or a plurality of sashes arranged one above another, are in large and increasing popularity, and it is of paramount importance to provide for economy and efficiency in their production and installation, as well as to insure facility and accuracy in operation as well as durability and long life. Generally speaking, the present invention is directed to these ends, and it may be regarded as embodying im-

provements upon the structures disclosed in U. S. Patent 2,383,912 issued August 28, 1945.

Referring to the form of the invention shown in Figs. 1 to 11 inclusive, the window frame comprises a sill, denoted generally by 1, and a pair of side members or stiles 2, 3, uprising from the ends of the sill. These frame members may be composed of any suitable material, metallic being preferred. It will be observed that the side members 2, 3 are broken at their upper portions, as illustrated in the drawings, it being contemplated that they may extend further upwardly so as to accommodate a window including a plurality of sashes arranged in a vertical tier, and be crowned by a suitable top piece or member that is not shown as it constitutes no part of the present invention. A sash or window section is located within the frame and includes a pane 4 of glass or any other appropriate material, transparent, translucent, or opaque, surrounded by a rim 5, which latter is also preferably composed of a metallic substance although any other suitable material may be adopted if desired.

The side members or stiles 2, 3, are so formed in cross section as to be adapted to house operating mechanism for the sash or section 4, 5, as well shown in Fig. 3, being composed of inner wall portions 6, outer wall portions 7 and face wall portions 8, which latter are designed to face toward the interior of the building in which the window structure is intended to be installed. The outer wall portions 7 have laterally extending flanges 9 which are fitted to overlie the periphery of the opening in the building prepared for the reception of the window. As will be observed from Fig. 3 of the drawings, the portions 6, 7, and 8 constitute substantially three-quarters of a complete enclosure so that, as already indicated, operating mechanism may be housed therewithin to hide it from view and to protect it from the incidence of exterior effects. The sides of the rim 5 of the window section or sash are angular in cross section, consisting of intermediate portions 10, inner flanges 11 and outer flanges 12; the said portions being so shaped and arranged as to cooperate with the side members 2, 3 of the window frame to form a complete enclosure for the operating mechanism when the window is closed, in which condition the flanges 11 abut the frame parts 6 and the flanges 12 abut the flanges 9.

To the upper exterior face of each intermediate portion 10 of the window section rim 5 is secured, as by rivets or screws, an arm 13, the upper ends of which arms project beyond the rim 5 and are perforated to receive pivot pins 14, which pins are mounted in blocks 15 that are slidably located within the window frame side members or stiles 2, 3. The said blocks 15 have slots 16 formed therethrough which are traversed by a pair of screws 17 that are threaded into slide bars 18 in order to secure the blocks 15 thereto. The slots 16 are somewhat longer than the spacing of the screws 17 so that it is possible to adjust the blocks 15 upwardly or downwardly on the bars 18 and secure them in the desired adjusted position. This feature is of practical importance in assembling the parts and insuring their smooth and coordinated cooperation. It will also be noted that, as well shown in Fig. 2, the blocks 15 are substantially C-shaped in cross section so as to embrace three sides of the bars 18 and thus increase the rigidity of the association of the said parts.

Bearings 19 which slidably receive the bars 18 are fixedly secured to the face portions 8 of the side members or stiles 2, 3 as by a pair of screws 20, or in some other way, such as by welding, if preferred; and the lower ends of the bars 18 are fixed, as by pins 21, to lower blocks 22 which, like the upper blocks 15, are fitted to slide upwardly and downwardly within the side members 2, 3.

A pair of straps 23 have one end of each pivoted, as indicated at 24, to the arms 13 which are fastened to the sash rim 5, and the other end of each pivoted, as indicated at 25, to the fixed bearings 19; and a pair of links 26 have one end of each pivoted to the lower blocks 22, as indicated at 27, and the other end of each pivoted, as indicated at 28, to a pair of rock arms 29 that are keyed, pinned or otherwise suitably fixed to a rock shaft 30 which is horizontally mounted in the sill 1 and extends from side to side thereof. A pair of bearings are provided in the sill for the shaft 30, which bearings consist of lower members 31 that are suitably fixed within the sill, as by welding or in any other desired manner, and complementary cap pieces 32 which are removably secured in place, as by screws 33. This bearing construction has proved very effective and it is particularly desirable when occasion for cleaning, repair, or replacement arises.

A housing 34 is suitably secured, as by welding, riveting or the like, to the lower part of the face portion 8 of the frame side member or stile 3 and to the part of the sill 1 located therebeneath, and the part of the said face portion coincident with the housing 34 is vertically slotted, as indicated at 35. Actuating means for rocking the shaft 30 is positioned within the housing 34, and consists of a worm 36, fixed on a shaft 37 which is mounted in bearings 38 and 39, the former being suitably secured on the floor of the housing 34 and the latter being formed in the wall of the housing. A hand crank 40 is fixed to the end of worm shaft 37 which projects through bearing 39 and outside of the housing 34. A semi-circular worm gear 41 is fixed on a shaft 42 which is journaled in the sides of the housing 34, as indicated at 43; and said gear has an integral arm 44 which is connected to a rock arm 29 by a pivoted link 45.

From the foregoing description it will be clear that manual actuation of the crank 40 will cause the worm 36 and gear 41 to swing arm 44, which latter will, through the link 45 to which it is connected, swing the rock arm 29 to which said link is connected and correspondingly rock shaft 30. This movement of the said shaft will correspondingly swing the other rock arm 29 and, the swinging motion of the said pair of rock arms will, through the pair of links 26, slide bars 18 upwardly or downwardly in the frame side members or stiles 2, 3 according to the direction in which the crank 40 is turned. This sliding movement of the bars 18 will correspondingly move the pair of upper blocks 15 and thereby raise or lower the upper end of the window sash or section. As the sash is connected by the pair of straps 23 to the fixed bearings 19, the movement of parts just described will cause the sash to open or close, according to the direction of actuation of the parts, by a combined sliding and swinging motion. As the worm and gear couple are irreversible and cannot be actuated through force exerted on the gear, the window sash or section will be effectively locked in any position, either open, closed, or intermediate. When the sash is closed, its flange 12 will overlap the window frame and effectively seal the same against outside weather; while a rain shield 46, suitably fixed to

the side members 2, 3 of the window frame, will overlap the upper edge of the sash rim 5 to offer corresponding protection along this line when the window is closed. It may also be noted that the window pane 4 may be set in its rim 5 with the aid of a suitable lining 47 composed of rubber or any other appropriate material (see Fig. 9).

While the illustration of this form of the invention shows only one window sash or section, it will be understood that one or more similar sashes or sections could be located directly thereabove and similarly operated by multiplying the parts 13 to 17 inclusive, and 46, and without any multiplication of the parts 18 to 45 inclusive. It will be observed that, when the window is closed, as indicated in Figs. 4 and 5, the operating mechanism is entirely housed and concealed from view and that, even when the window is open, as illustrated in Fig. 6, the mechanism is largely housed and concealed, being almost entirely concealed from the view of an occupant within the building. Furthermore, the operating handle 40 extends within the building and is located at one side of the sill where it can easily be concealed by drapery without affecting its functional adaptability.

Referring now to the form of this invention shown in Figs. 12 to 17 inclusive, the sill of the window frame, here denoted by 48, is constructed as in the form of Figs. 1 to 11 inclusive, and the window frame side members or stiles, here marked 49 and 50, are similar to the corresponding members of the previously described form, having inner wall portions 51, outer wall portions 52, and face wall portions 53, as well as flanges 54, which portions are in substance the same as portions 6, 7, 8 and 9 of the previously described form. However, in this modified form, the inner wall portion 51 is grooved to receive a weather strip 55, which may be composed of rubber or any other suitable material, designed for contact by the window sash rim when the window is closed in order to cushion the abutment and improve the sealing contact.

The window sash or section is also like that of the previously described form, having a pane 56 and a rim 57 the sides of which, in cross section, consist of the intermediate portions 58, inner flanges 59 and outer flanges 60. The pane 56 may be set in the rim by the use of a surrounding lining 61, composed of rubber or any other appropriate substance.

Arms 62 are secured, as by screws 63, to the upper outer part of the side members of the sash rim 57 and have dog's-leg shaped projections 64, the extremities of which are pivoted, as indicated at 65, in vertically disposed slide bars 66, while antifriction guide rollers 67 are also mounted on the said pivots. The bars 66 are also guided in their sliding movement by L-shaped brackets 68 one of which is fixedly mounted in each frame side member or stile 49, 50, as by screws 69. The said screws traverse slots 70 in the frame in order to permit vertical adjustment of the brackets 68, which greatly facilitates attainment and maintenance of smooth and efficient operation, especially when a plurality of sashes are mounted in one window. As is clearly shown by Fig. 15 of the drawings, the said brackets confine the bars 66 between the brackets and the outer wall portions 52 of the frame; while each bracket has an antifriction guide roller 71 pivoted thereon for bearing against one edge of the bars 66 and completing their guiding confinement. A pair

of straps 72 have one end of each pivoted, as indicated at 73, to the arms 62 where they are secured to the sash rim, and the other end of each pivoted, as indicated at 74, to the brackets 68; which straps 72 are designed to perform the same function as the straps 23 of the form of the invention shown in Figs. 1 to 11.

A pair of elongated links 75 have their upper ends pivoted at the pivots 65 and their lower ends pivoted to rock arms 76 which are like the rock arms 29 of the previously described form of the invention, and are associated with actuating elements which are the same as those hereinbefore described in connection with the first form of the invention and do not call for further description other than to mark the principal elements such as the rock shaft 77, link 78, arm 79, worm gear 80, worm 81, worm shaft 82, hand crank 83, housing 84 and slot 85. The rock shaft 77 is mounted in bearings (not shown) but which are like the previously described bearings for the rock shaft 30.

It will be observed that in this modified form of the invention the vertical slide bars are each connected at one point only with the window sash and operating mechanism, i. e. at a pivot 65, and that the actuating mechanism which is under the control of the hand crank 83 is directly connected by a pair of elongated links 75 with the said pivot points 65. Consequently, actuation of the crank 83 will cause the links 75 to slide the bars 66 upwardly or downwardly and thereby close or open the window sashes or sections by a combined sliding and swinging motion. It will be understood, as in the previously described form of the invention, that operating elements, other than the worm and gear mechanism and its associated parts 78 and 79, are duplicated at each side of the window frame, and the rock shaft 77 serves to interconnect the said elements so that they are all subject to simultaneous actuation by the worm and gear mechanism. The adjustability of the brackets 68 is of importance when assembling the parts and in regulating the movement of the window sashes or sections, and it will be clear that, again as in the case of the previously described form of the invention, the window frame side members or stiles 49, 50 and the slide bars 66 may be extended upwardly in order to house and be connected with additional operating elements of the kind already described, for controlling the opening and closing of one or more window sashes or sections located above the one shown in the drawings of this modified form of the invention.

The second modified form which is shown in Figs. 18 to 21 inclusive of the drawings is directed to a construction which is designed to be composed mainly of wood, plastic, or other non-metallic substance, as distinguished from the two preceding forms which are directed chiefly to metallic structures.

In this second modified form, the window frame sill is marked 86 and its side members or stiles 87, 88. The said side members consist of two parts, a main body portion 89 and an inner flange 90 which latter is secured to the former in any suitable way, as by nails (not shown). The cross sectional shape of each frame side member 89, 90 is such as to leave an open interior space fitted to house the operating mechanism, which space is substantially three-quarters enclosed as is also the fact with respect to the metallic frame side members of the two forms of the invention heretofore described.

The window sash or section has a pane 91 and a surrounding rim 92 into which the pane is set and fixed in any well known or approved manner. The said rim 92 is cut away at its sides, as clearly shown in Fig. 19, to form shoulders 93 fitted to contact complementary shoulders 94 fashioned in the main portions 89 of the window frame side members when the window is closed; at which time the inner face of the sash rim 92 approximately contacts the flanges 90.

A pair of arms 95 are fixed, as by screws 96, to the outer sides of the rim 92 near the upper part thereof, which said arms have dog-leg projections that are pivoted, as indicated at 97, to vertical slide bars 98 which are housed within the frame side members. A pair of straps 99 have one end of each pivoted to the sash rim sides where the arms 95 are also fixed and the other end of each pivoted, as indicated at 100, to plates 101 which are secured, as by screws 102, to the inner sides of the main portions 89 of the window frame side members. The said plates 101 span vertical grooves 103 formed in the said portions 89, in which grooves the slide bars 98 are positioned, whereby the plates 101 serve to confine said slide bars within the said grooves and guide their up-and-down movement. Each plate 101 is also traversed by a pair of screws 104 which enter the frame members 89 at the side edges of the bars 98 and thereby serve as restraining elements and guides for the said bars against movement forwardly or rearwardly with respect to the window structure as a whole.

The operating mechanism of this second modified form is like that of the first modified form shown in Figs. 12 to 17 inclusive, including links 105, rock arms 106, rock shaft 107, link 108, arm 109, worm gear 110, worm 111, worm shaft 112, and crank 113 which correspond to the previously described parts 75, 76, 77, 78, 79, 80, 81, 82, and 83. However, in this second modified form, the rock shaft 107 is not fitted with bearings such as those described in connection with the two preceding forms, but has its ends journaled in bearing plates 114 which are secured, as by screws 115, to the lower inner part of the main portions 89 of the window frame side members. The mechanism is operated as described in connection with the form shown in Figs. 12 to 17, and adjustment of the guide plates 101 is afforded by providing slots therein for reception of the screws 102 and 104, as clearly shown in Figs. 20 and 21.

In this second modified form, the worm and gear mechanism is enclosed within a housing 116 that is secured to the rear face of the portion 89 of one window frame side member and also to a block 117 that is fastened, as by nails (not shown), to the top of the window frame sill 86. The worm gear is carried on a shaft 118 which has one end journaled in the casing 116 and the other end journaled in a plate 119 secured, as by screws 120, to the portion 89 of one frame side member.

The additional modified form of operating mechanism which is shown in Fig. 22 is the same as that illustrated in the modified forms shown in Figs. 12 to 17 inclusive and 18 to 21 inclusive; and is similar to the corresponding mechanism shown in Figs. 1 to 11 inclusive, the difference being that the worm gear arm, here marked 121, carries at its extremity a pin 122 which is slidably fitted in a slot 123 that is formed in the rock arm, here marked 124. Thus there is no link corresponding to links 45, 78 and 108 of the previously described forms of this mechanism, and the operative effect of the worm gear arm 121 on the rock arm 124, instead of being an indirect push or pull, is a direct wedge-like or cam-like action which tends substantially to increase smoothness of operation and to eliminate chattering or unsteady motions. While this modification of Fig. 22 is regarded as particularly applicable to the forms of the invention shown in Figs. 12 to 17 inclusive and in Figs. 18 to 21 inclusive, it may also, if desired, be applied to the form of invention shown in Figs. 1 to 11 inclusive.

As the operation of the structures is deemed to be abundantly clear from the foregoing description, it is regarded as unnecessary herein as set forth a description of the operation as such, but it may be noted, with respect to all the forms of the invention, that efficiency, sightliness, durability, smoothness of operation, and adaptability to installation in various kinds of building structures are inherent characteristics of this invention; and it may be added that, as will be readily appreciated, the force required to open the window section or sash, whether there be one or a plurality, can be varied by varying the length of the straps 23 with respect to the distance between the pivots 24 and 14, and by making similar changes in the other forms of the invention. If desired, these constructions can be used in connection with highly positioned windows or skylights by the simple expedient of securing to the worm gear shaft any well known or approved form of downwardly projecting extension fitted for manual operation to have the same effect as the hand crank herein shown.

I desire it to be understood that various changes may be resorted to in the form, construction, arrangement and material of the several parts without departing from the spirit and scope of the invention; and hence I do not intend to be limited to details herein shown or described except as they may be included in the claims or required by the disclosures of the prior art.

What I claim is:

1. In a window structure comprising a frame including vertically extending hollow frame side members each having an open front, an elongated substantially smooth flat laterally constrained slide bar positioned in each of the said hollow vertically extending frame side members, a plurality of window sections arranged one above the other in the said window frame and each pivotally connected to the said slide bars, vertically spaced pairs of vertically adjustable angle brackets mounted on the said rear walls and disposed in the said hollow frame side members with the members of each of said pairs arranged substantially horizontally opposite each other, vertically spaced pairs of links connecting the said window sections to the respective pairs of the said adjustable angle brackets, each of the said window sections having a pair of laterally extending side flanges and the said side flanges extending over and closing the said open fronts of the said hollow frame side members with the said slide bars and the said pairs of adjustable angle brackets and the said pairs of connecting links all housed and sealed within the said hollow frame side members when the said window sections are in closed position.

2. A window structure as defined in claim 1 in which each of the said vertically extending hollow frame side members includes a substantially flat side wall, and in which each of the said adjustable angle brackets includes a substantially flat wall portion spaced from and ex-

tending substantially parallel to the said substantially flat side wall of the corresponding one of said hollow frame side members, and in which each of the said slide bars is slidably guided in the space between the said side wall of one of said hollow frame side members and the said substantially flat wall portion of one of the said adjustable angle brackets.

3. A window structure as defined in claim 1 in which each of the said vertically extending hollow frame side members includes a substantially flat side wall, and in which each of the said adjustable angle brackets includes a substantially flat wall portion spaced from and extending substantially parallel to the said substantially flat side wall of the corresponding one of said hollow frame side members, and in which each of the said slide bars is slidably guided in the space between the said side wall of one of said hollow frame side members and the said substantially flat wall portion of one of the said adjustable angle brackets, and in which an antifriction roller is mounted on the said substantially flat wall portion of each of the said adjustable angle brackets in the space between the said substantially flat wall portion and the adjacent side wall of the corresponding one of said hollow frame side members and in engagement with the corresponding one of the said slide bars.

4. A window structure as defined in claim 1 in which each of the said hollow frame side members includes a substantially flat side wall portion, and in which each of the said adjustable angle brackets includes a substantially flat wall portion spaced from and extending substantially parallel to the said substantially flat side wall portion of the corresponding one of the said hollow frame side members, and in which the said window structure includes means carried by one of the said parallel wall portions and extending between and cooperating with the said parallel wall portions to provide a guiding space having a corresponding one of the said slide bars slidably guided therein.

5. In a window structure comprising a frame

including vertically extending hollow frame side members each having an open front and each including spaced substantially parallel side walls and a rear wall extending therebetween, an elongated substantially smooth flat laterally constrained slide bar positioned in each of the said hollow vertically extending frame side members, a plurality of movable window sections arranged one above the other in the said window frame and each pivotally connected to the said slide bars, vertically spaced pairs of vertically adjustable angle brackets each mounted within one of the said hollow frame side members on the inner surface of one of the said walls thereof with the members of each of the said pairs of angle brackets arranged substantially horizontally opposite each other, vertically spaced pairs of connecting links connecting the said movable window sections to the respective pairs of the said vertically adjustable angle brackets, means arranged within each of the said hollow frame side members for laterally constraining the said slide bar disposed therein, each of the said movable window sections having a pair of laterally extending side flanges extending over and closing the said open fronts of the said hollow frame side members with the said slide bars and the said pairs of vertically adjustable brackets and the said pairs of connecting links and the said constraining means housed within and sealed within the said hollow frame side members when the said window sections are in closed position.

GIUSEPPE GARGIULO.

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