No. 681,688.

Patented Sept. 3, 1901.

O. M. EDWARDS.

WINDOW.

(Application filed Dec. 5, 1899.)

(No Model.)

4 Sheets—Sheet 1.

Fig. 1

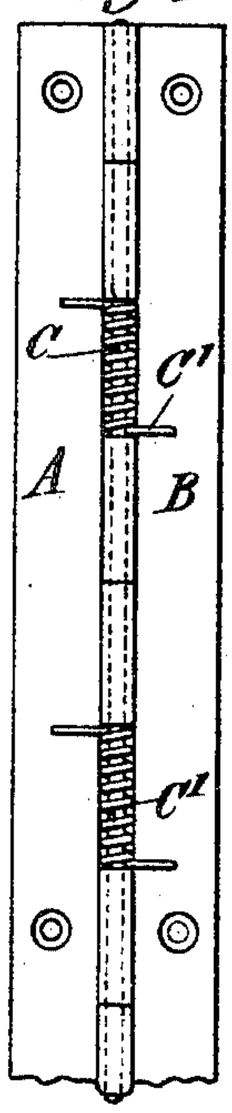


Fig. 2

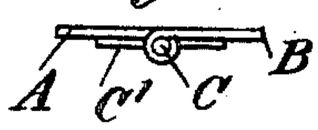


Fig. 2a

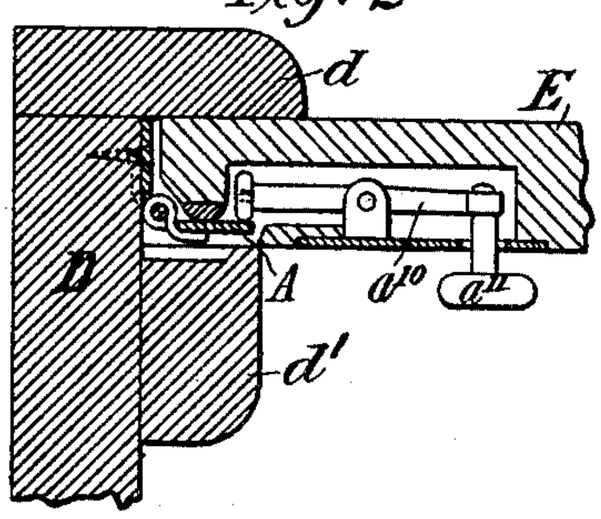


Fig. 2b

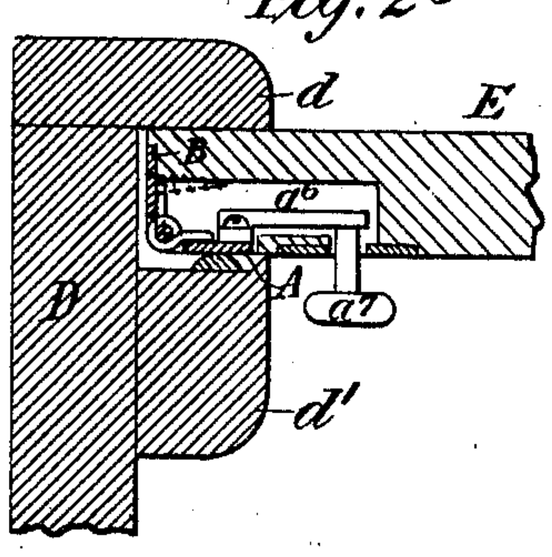


Fig. 3

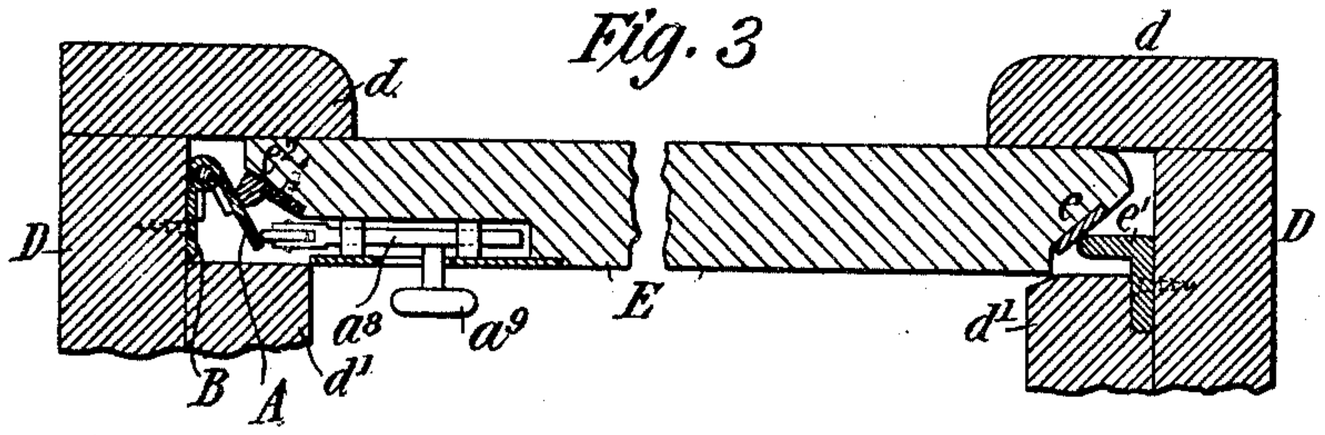


Fig. 4

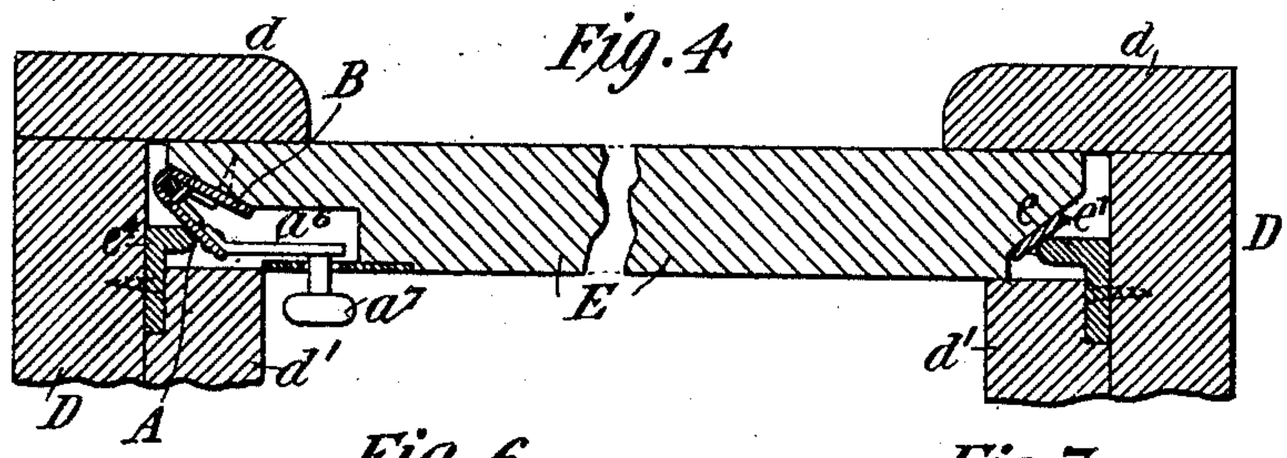


Fig. 5

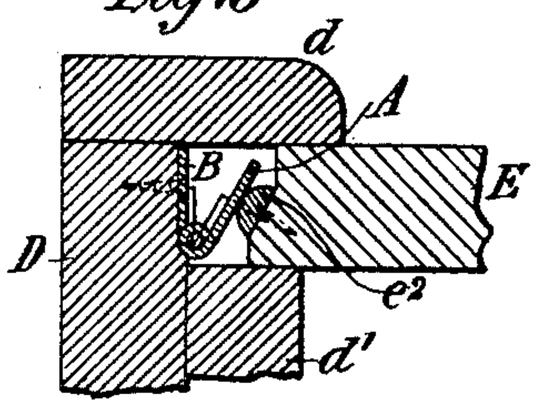


Fig. 6

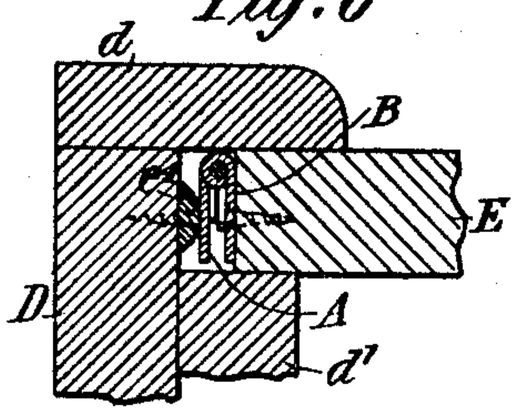


Fig. 7

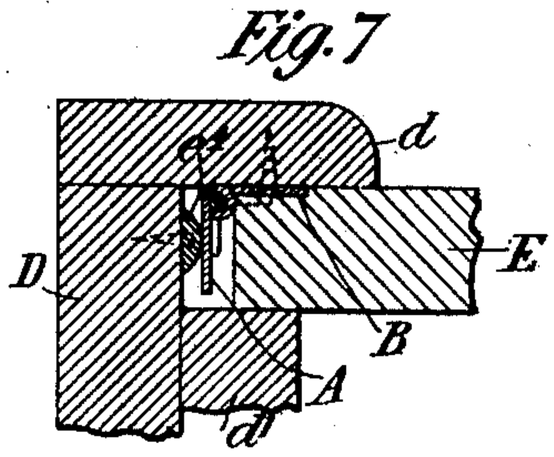


Fig. 8

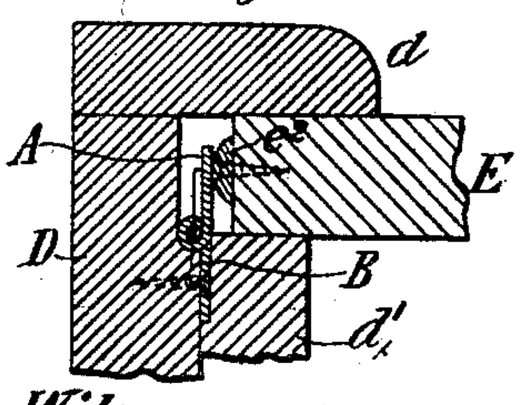


Fig. 9

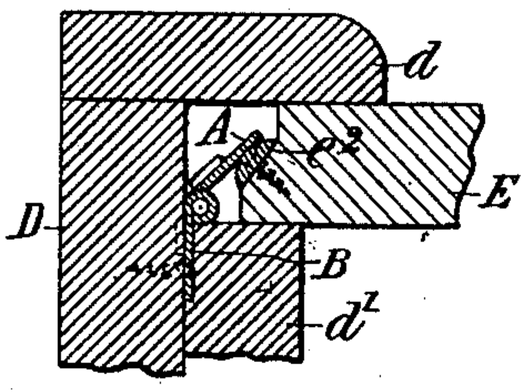
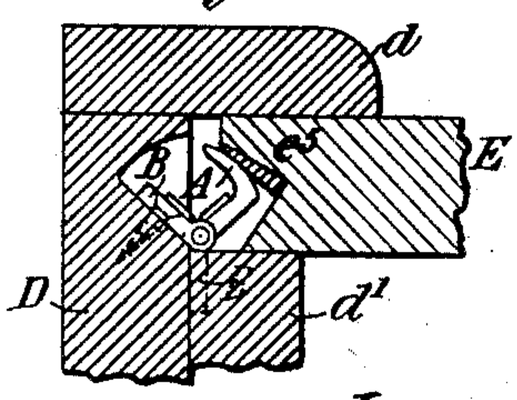


Fig. 10



Witnesses:
Raphael Netter
Florence E. Newbury.

Oliver M. Edwards Inventor
by H. L. Newbury Atty.

No. 681,688. Patented Sept. 3, 1901.

O. M. EDWARDS.

WINDOW.

(Application filed Dec. 5, 1899.)

(No Model.)

4 Sheets—Sheet 2.

Fig. 9a

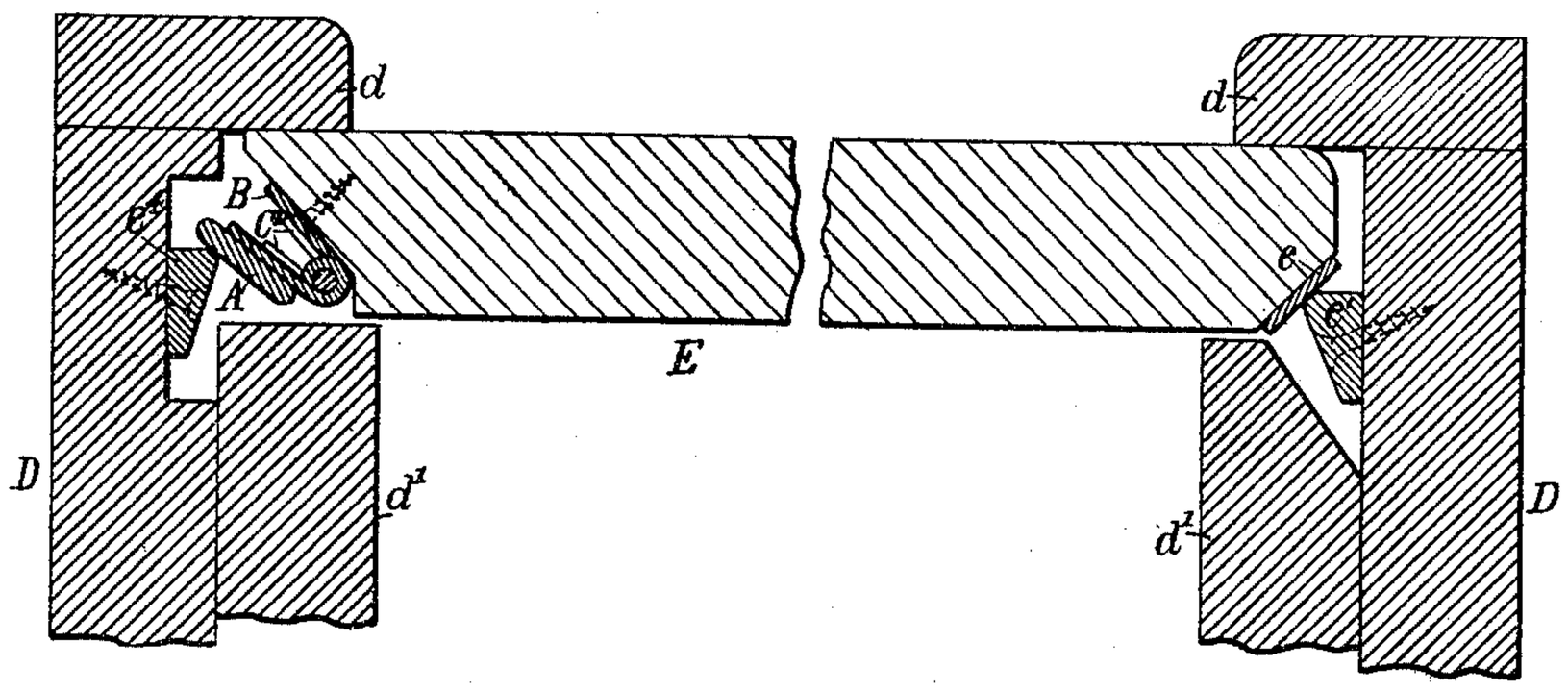


Fig. 9b

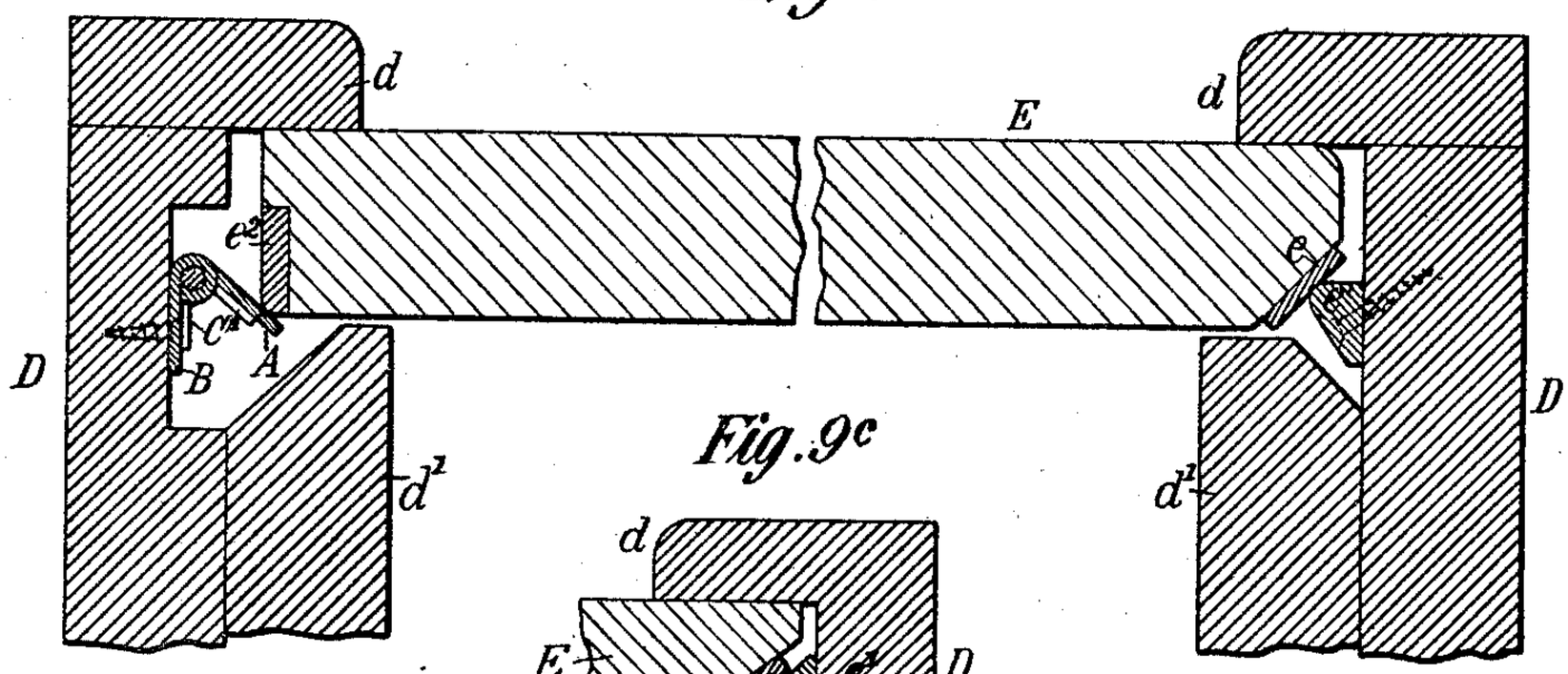


Fig. 9c

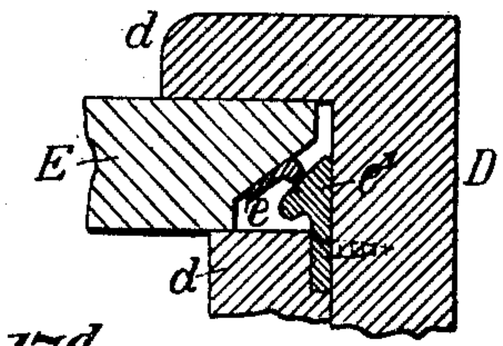


Fig. 17d

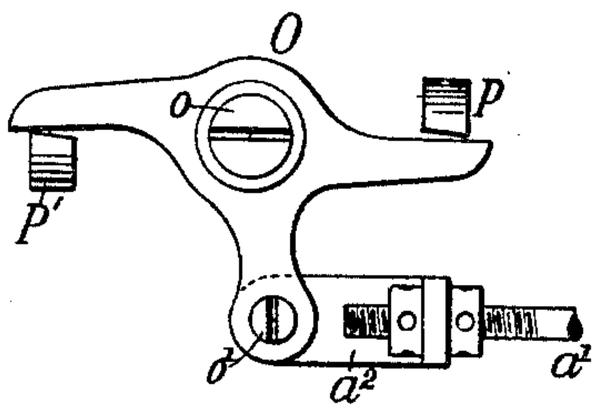
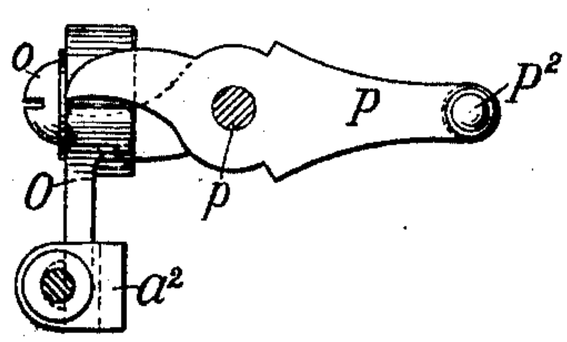


Fig. 17e



Witnesses:
Raphael Netter
Florence E. Newbury.

Inventor
Oliver M. Edwards
by H. F. Newbury. Att'y.

No. 681,688. Patented Sept. 3, 1901.

O. M. EDWARDS.

WINDOW.

(Application filed Dec. 5, 1899.)

(No Model.) 4 Sheets—Sheet 3.

Fig. 11

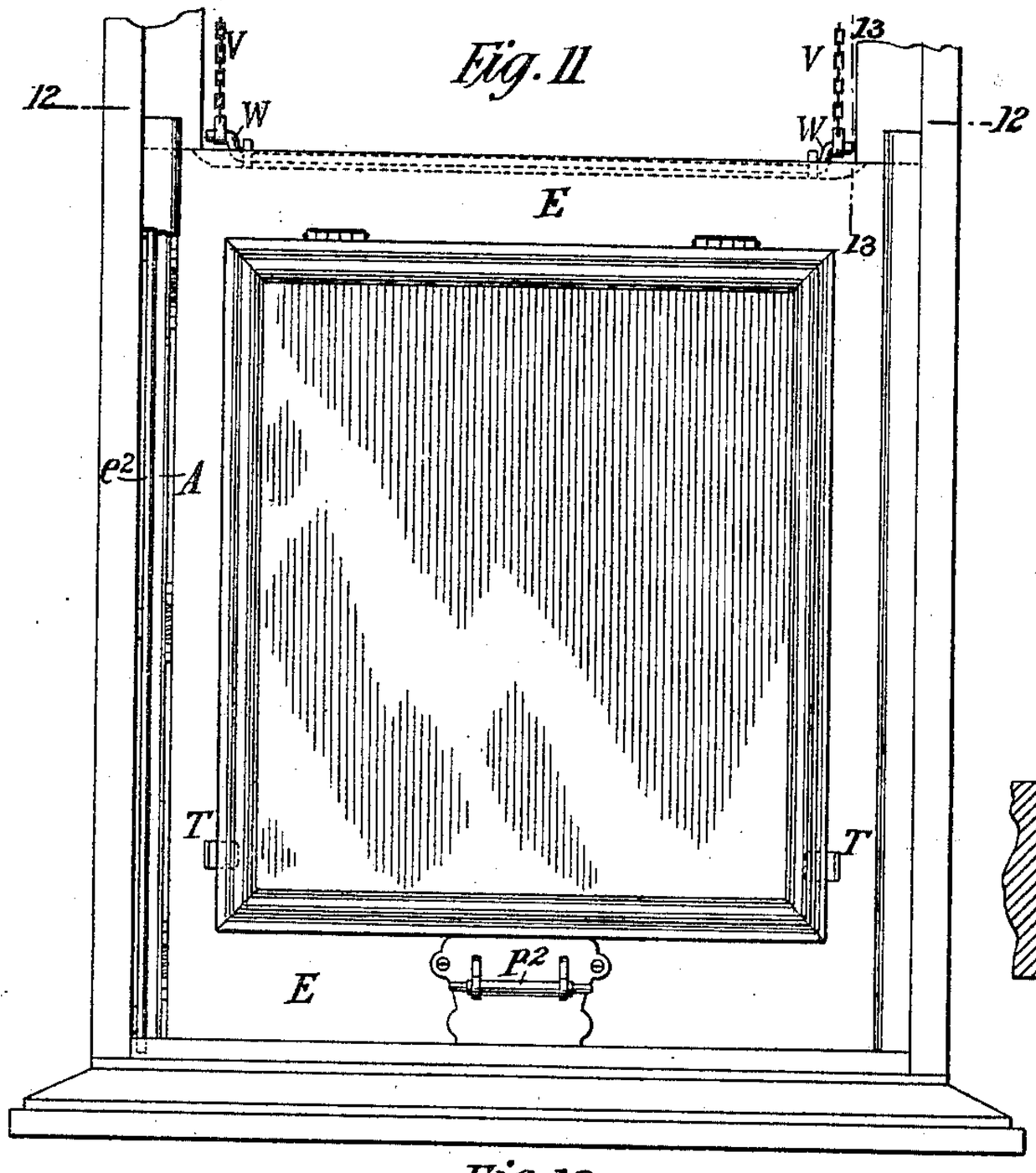


Fig. 18

Fig. 13

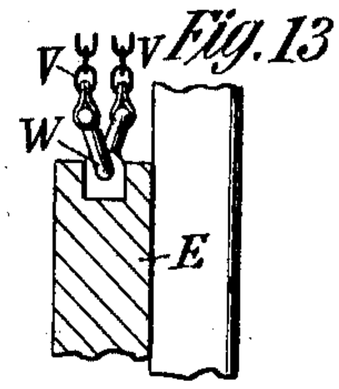


Fig. 17

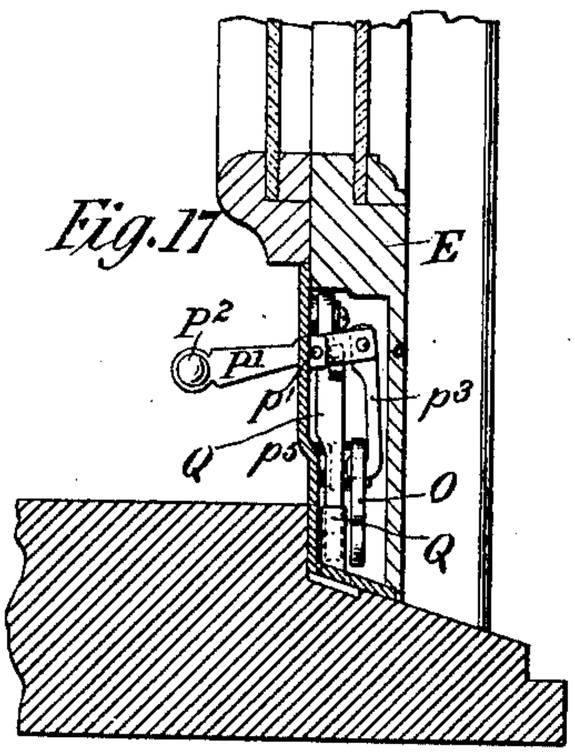


Fig. 12

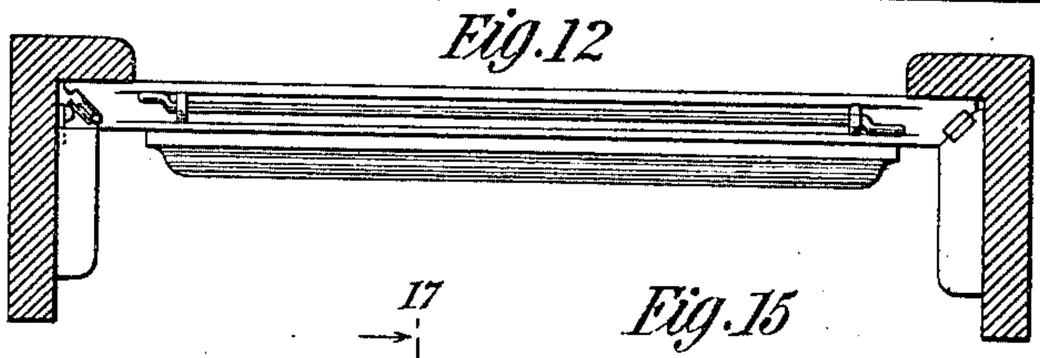


Fig. 15

Fig. 14

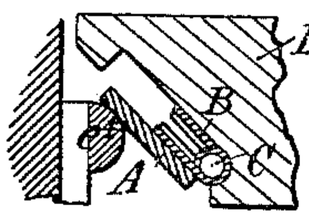


Fig. 17a

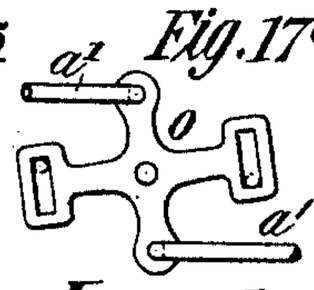


Fig. 17b

Fig. 16

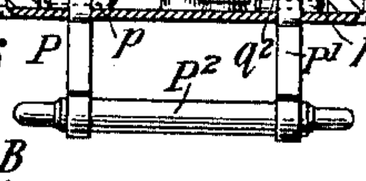
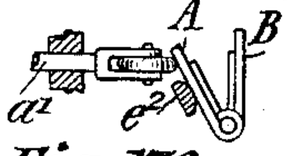


Fig. 17c



Witnesses
Raphael Netter
Florence E. Newbury.

Inventor
Olivir M Edwards
by H. F. Newbury. Atty.

No. 681,688. Patented Sept. 3, 1901.

O. M. EDWARDS.

WINDOW.

(Application filed Dec. 5, 1899.)

(No Model.) 4 Sheets—Sheet 4.

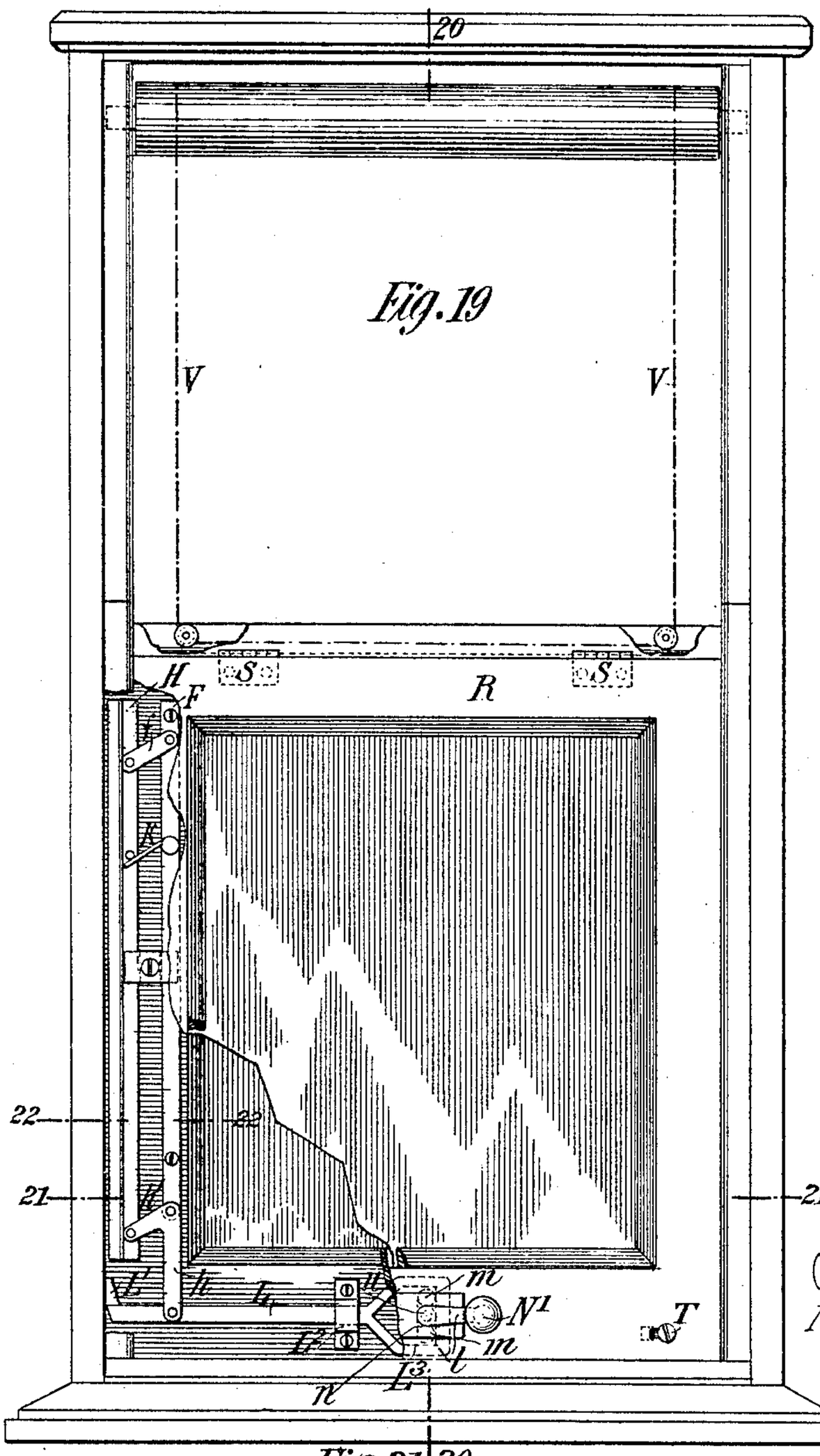


Fig. 19

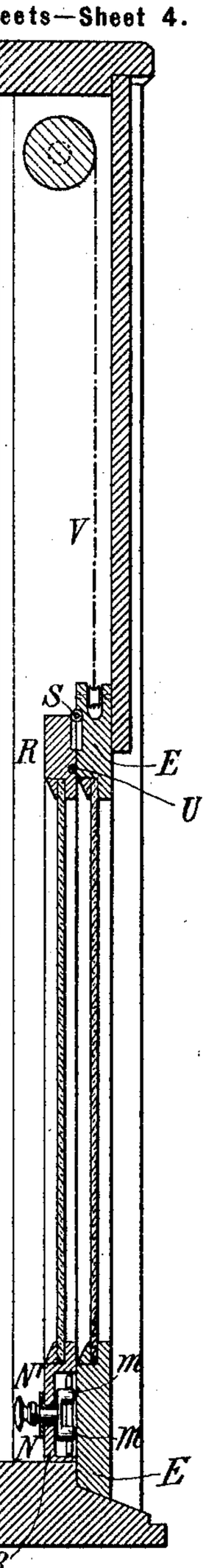
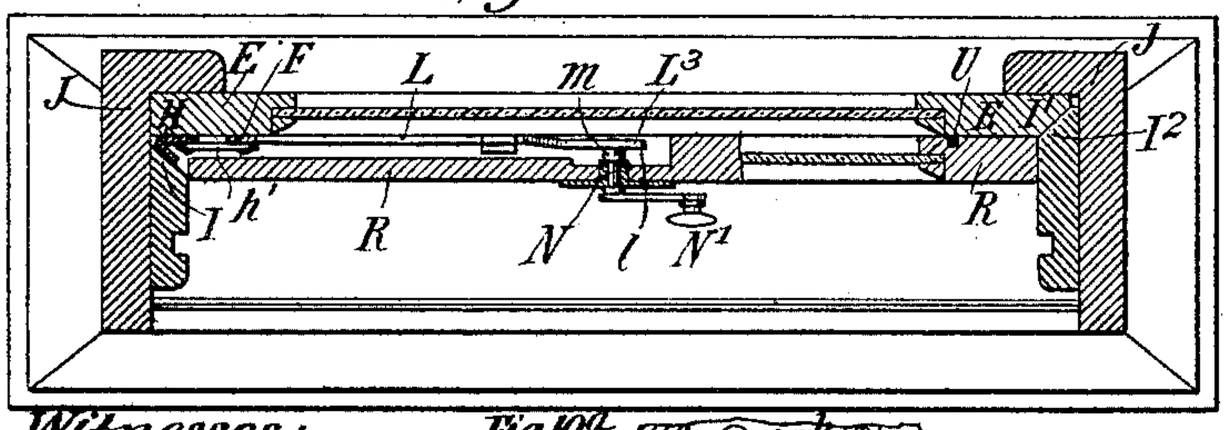


Fig. 20

Fig. 21



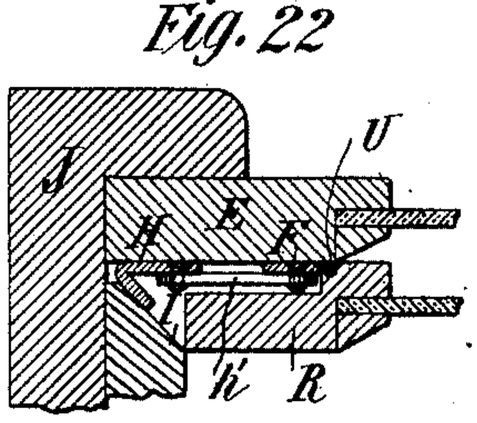
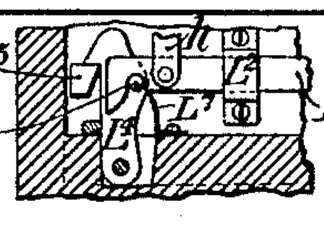


Fig. 22

Fig. 19a



Witnesses:
Raphael Netter
Florence E. Newbury

Inventor:
Oliver M. Edwards
by H. F. Newburn
Atty

UNITED STATES PATENT OFFICE.

OLIVER M. EDWARDS, OF SYRACUSE, NEW YORK.

WINDOW.

SPECIFICATION forming part of Letters Patent No. 681,688, dated September 3, 1901.

Application filed December 5, 1899. Serial No. 739,323. (No model.)

To all whom it may concern:

Be it known that I, OLIVER M. EDWARDS, a citizen of the United States, residing at Syracuse, in the county of Onondaga, State of New York, have invented certain new and useful Improvements in Windows, of which the following is a full, clear, and exact description, reference being had to the drawings accompanying and forming a part of the same.

My invention relates to devices used in opening and closing window-sashes and holding them in desired positions, releasing the same, and under some circumstances automatically moving the sashes in one direction; and it has for its main objects the production of simple and compact means whereby the sash may be frictionally held in the desired position, also whereby one sash may take the place of two in existing structures, and also the improvement of sash holding, operating, and locking devices whereby the same force that operates said devices may, if desired, also open and close the window.

My invention consists, first, in the combination of parts by which window friction holding device or devices are obtained which can be arranged in various positions relatively to the window-sash and its frame and as thus arranged need, necessarily, occupy but little, if any, greater space than the thickness of the sash itself; second, in the combination, in a window, of a sash made in two parts, each part being provided with a glass, and means securing such parts together, with an air-chamber between them, and so that such parts will move in the frame as a single structure when desired and are adapted, by manipulating the securing means, to be moved relatively to each other to give access to such air-chamber, and, third, in the combination of a sash-holding device or devices with a window, means for operating the same, and means mounted on the sash and connected with the means for operating the holding device or devices by which force may be applied to the means mounted on the sash in the direction it is desired to be moved and cause the holding device or devices to be operated to release the sashes from their holding action and the sash itself to be moved; and my invention also consists in certain other combinations of parts, all of which will be hereinafter fully described and then pointed out in the claims.

I have shown in the drawings embodiments of my improvements as applied to windows of a railway-car; but it is obvious that they may be embodied in any kind or style of a window, whether containing one or two sashes.

Like characters of reference wherever they occur indicate corresponding parts in all of the figures.

Figure 1 is a view of one embodiment of my window friction holding device when the same is not connected to the window and its two parts are moved away from each other by the stress of the springs connected therewith or otherwise and a portion is broken away. Fig. 2 is an end view of the same. Fig. 2^a is a cross-sectional view of an arrangement of a friction holding device of the general character of the form seen in Figs. 1 and 2, but arranged so that it tends to press the sash directly outward in the direction of the exterior of the car, the device being attached to the frame of the window. Only a portion of the frame and sash is shown, it being understood that a duplicate of what is here shown may be arranged at the opposite edge of the window. Fig. 2^b is a view of a construction similar to that seen in Fig. 2^a, except that the holding device is attached to the sash instead of to the frame and a different means for operating the movable member of the device is employed. Figs. 3, 4, 5, 6, 7, 8, 9, 9^a, and 9^b show different ways in which the general form of window friction holding device shown in Figs. 1 and 2 may be arranged relatively to the window-sash and its frame, if desired, as well as different forms and arrangement of bearing-surfaces therefor. Fig. 9^c shows a modification in the arrangement of parts seen in some of the foregoing figures. Fig. 10 illustrates a somewhat different shape of friction holding device, although of the general construction seen in the foregoing figures, which may be arranged as seen or as shown in dotted lines in this figure. Fig. 11 shows in front elevation one embodiment of my invention in a railway-car window, but with the upper portion of the frame broken away. Fig. 12 is a plan view of the two parts of the sash and a sectional view of

the window-frame on line 12 12 of Fig. 11. Fig. 13 is a vertical section on line 13 13 of Fig. 11, as seen, showing the means in side elevation for connecting the chains or straps (by which the sash may be held in the counterbalanced position or be moved, if desired) to the sash. Fig. 14 shows in section and on an enlarged scale that portion of the sash, the friction holding device, and its bearing-surface seen at the left-hand portion of Fig. 12. Fig. 15 is a vertical sectional view on line 15 15 of Fig. 16, showing the sash and frame in section and other parts in full, but with all such parts turned around from what they are in Figs. 11 and 16 and as seen from the direction the arrow-head points in Fig. 16. Fig. 16 is a cross-sectional view on line 16 16 of Fig. 15, showing in plan view the sash locking and friction holding devices seen in Fig. 15. Fig. 17 is a vertical sectional view on line 17 17 of Fig. 15, showing in end elevation the same parts seen in Figs. 15 and 16. Figs. 17^a, 17^b, and 17^c show modifications of certain details of construction of some of the parts seen in Fig. 17, and the parts are seen from the same direction as those are seen in that figure. Figs. 17^d and 17^e show a modification of the construction shown in some of the preceding figures. Fig. 18 shows a modification of the means for connecting the straps or chains by which the sash may be held in the counterbalanced position or be moved, if desired, seen in Figs. 11, 12, and 13, straps of leather, woven fabric, or other material being indicated in Fig. 18 instead of chains, as in Figs. 11, 12, and 13. Fig. 19 is a front elevation of a modification of certain features of the embodiment shown in Figs. 11 to 17, inclusive, one part of the sash, with its glass, being broken away to expose parts between to view, but with the upper portion of the window-frame present, and the means for counterbalancing the weight of the sash or for moving it, if desired, also present, which are not shown in the former figures. In this modification a different sash-holding device from the one shown in Figs. 1 to 17, inclusive, is illustrated, it being of the general self-locking form set forth in Letters Patent No. 482,344, granted me September 13, 1892. Also a different manner of movably connecting the counterbalancing or automatic raising devices to the shaft is illustrated from what is seen in preceding figures of the drawings. Fig. 20 is a vertical sectional view of the parts seen in Fig. 19 on line 20 20 of this last-named figure, but with both parts of the sash and their glasses present. Fig. 21 is a cross-section on line 21 21 of Fig. 19 looking downward, but with both parts of the sash shown, except that the front part is broken away and on a lower section-line than 21 21 to better illustrate the means mounted upon the sash for operating the sash locking and holding devices. Fig. 22 shows in cross-section the two parts of the sash, the sash-holding device, and a portion of the window-frame on line 22 22 of Fig. 19, but on an enlarged scale.

In many railway-cars—such, for instance, as those commonly known as "sleeping-cars"—it is customary to employ two complete sashes, each sliding in suitable guideways provided with the usual "stops" and the two being entirely independent of one another, although both close the same opening by reason of one being directly behind the other when both are in the closed position. This use of two complete and independent sashes has been thought necessary in order to properly exclude dust and dirt from the interior of the car. When two such independent sashes are used, the stops, forming in part the guideways for the sash to slide in, have to be quite narrow as compared with the width of stops in car-windows where only a single sash is used, as in ordinary day-coaches, owing to the fact that the two sashes have to occupy substantially the same space that is occupied by the single sash. This has rendered it impracticable to apply to cars provided with these two independent sashes those forms of sash holding and operating devices which have been applied to a considerable extent to cars with only a single sash for each window-opening owing to the lack of space in which to apply such devices.

The present improvements provide a form of friction holding device which can be arranged, if desired, within the space occupied by the thickness of the sash, even when the thickness is such as is usually found in the windows of sleeping-cars. The means by which these friction holding devices can be operated to release the sash from the holding action of such devices, if it be deemed desirable to employ such means, may be simple and be readily arranged within the space found between the sashes of such windows, as will be seen upon an examination of Figs. 2^a, 2^b, 3, and 4, which will hereinafter be described in detail. This form of friction holding device consists, generally speaking, of two members, which may or may not, as desired, be of equal dimensions, hinged together at one edge in any convenient way or somewhat in the manner common in ordinary door-hinges, so that one member is movable relatively to the other on a common axial line at or near one edge of the device. One of these two members is to be attached or secured to the window sash or frame at one or both edges of the sash, as desired, and the other member is made, by the stress or tension of a spring or springs or otherwise, to move relatively to the member attached or secured to the sash or frame and frictionally bear against the portion or portions of the sash or frame adjacent to the secured member or members—as, for instance, if one member is attached or secured to the window-sash the other member will frictionally bear against the portion of the frame adjacent to the member secured to the sash; but if the member be

secured to the window-frame, then the movable member will frictionally bear against the sash, as is fully illustrated in the drawings.

As seen in Figs. 1 and 2, the two members A and B, one on each side of the pin or pins C, which pivot or hinge them together, are adapted to move relatively to each other, as the case may be, and a spring C′ is arranged between the members A and B and around the pin C, with one end bearing on one member and the other end on the other member, so that the stress or tension of the spring C′ tends to force the members A and B away from each other in an opening direction—that is, from the positions they occupy in Figs. 3 to 6 toward that of Fig. 1. As shown in Fig. 1, either member is adapted to be secured to the sash or frame of the window accordingly as desired; but ordinarily only one member, as B, will be constructed so as to be secured to the sash or frame, as the case may be. When this form of friction holding device is applied so as to coöperate with bearing-surfaces of the form shown in Figs. 3, 4, 9^a, and 9^b, wherein the pressure of the movable member moves the sash in two directions, sidewise and edgewise, after the manner shown and described in Letters Patent No. 562,935, granted June 30, 1896, only one holding device is necessarily employed to hold the sash tightly against its guideway and by the frictional contact occasioned thereby hold the sash in the desired position, as well as to exclude the dust and dirt, until released by the movement of the movable member against the stress or tension of the spring or springs. Where only one of these friction holding devices is employed for the holding of a single sash, it is preferably arranged in the manner shown in Figs. 4 and 9^a, although it may be arranged as shown in Figs. 3 and 9^b or otherwise, and wherein beveled or inclined surfaces are arranged to cause the movable member of the device to move the sash both edgewise and sidewise and cause frictional contact between the sash and its frame and the holding device in both of these directions. As thus arranged the friction holding devices do not extend beyond the thickness of the sash itself and, in fact, occupy a space less than the thickness of the sash. Instead of arranging the friction holding devices as seen in Figs. 3, 4, 9^a, and 9^b they may be arranged as seen in Figs. 2^a and 2^b; but when thus arranged the sash is moved in only one direction, which is toward the exterior of the cars and two holding devices are required, arranged at opposite edges of the sash or side, of the window-frame. Also instead of arranging the friction holding devices as shown in Figs. 3, 4, 9^a, and 9^b they may be arranged as in Fig. 6; but in this case the sash is forced edgewise only and not both edgewise and sidewise, as in Figs. 3, 4, 9^a, and 9^b.

In Figs. 3, 4, 9^a, and 9^b the sash E is seen in sectional edge view, with the portions of the window-frame D and the stop-beads d and d' composing the guideway for the sash in section. The sash at its side edges is cut away, as seen, and it is preferably provided with a metal bearing-strip e, as seen at the right-hand edge, which in turn is preferably adapted to bear against a metal strip e' on the window-frame, preferably of the forms shown, and in Figs. 3 and 9^b the left-hand edge of the sash is preferably provided with a metal strip e^2 of the forms shown or of other desired form, against which the movable member A of the friction holding device bears. In Figs. 4 and 9^a the movable member A of the holding device preferably bears against a metal strip e^4 of the forms shown or of other desired form.

In Fig. 5 the movable member of the holding device tends to move the window-sash toward the interior of the car or in a direction opposite to the direction the sash is moved in Figs. 3, 4, 9^a, and 9^b, the sash in each case being forced both sidewise and edgewise.

In the construction shown in Fig. 6 two friction holding devices may, if desired, be employed—one at each of the opposite edges of the sash—each device tending to move the sash toward the other, only one edge of the sash and its frame and holding device being there represented, the opposite edge being practically a duplication of that shown. If desired, the holding devices may be arranged as seen in Fig. 7, wherein the operation of the holding device is identical with that shown in Fig. 6 and the entire holding device is arranged within a space less than the thickness of the sash itself. These hinged holding devices may also be arranged as seen in Figs. 8 and 9; but when thus arranged the entire holding device is not contained within the thickness of the sash, although the arrangement is such that the mode of operation of the device is the same, except that the stress or tension of the spring or springs may, if desired, be exerted in an opposite direction in order that the movable member of the device be forced against the sash to the desired extent. Also, if desired, the movable member of this holding device instead of being made of a flat piece of material, as shown in the foregoing figures of the drawings, may be formed as shown in Fig. 10 or otherwise, and yet the mode of operation will be the same as in the form heretofore shown. In Fig. 10 the movable member is designated as A, and it bears against the sash E, which is provided with a metal strip e^5, and the member secured to the window-frame is designated as B, and it is shown in full lines so secured to the frame that the entire holding device is contained within a space less than the thickness of the sash and so that the movable member may be forced into the recess formed in the window-frame and the sash be removed from the frame without disturbing the secured member of the holding device. This member B may be secured to the window-frame as indicated in dotted lines in Fig. 10 instead

of as in full lines, and when this is done the movable member A can be forced into the recess in the frame and the sash removed as before, and yet the mode of operation in either case is essentially the same as in the forms shown in preceding figures.

If desired, the window-frame may be recessed, as seen in Figs. 9^a and 9^b, and the bearing-strip e^4 or the secured member B of the friction holding device be arranged more or less within such recess. The arrangement of these parts within the recess, as shown in Figs. 9^a and 9^b, permits of the sash being removed whenever the stop-bead d' at the edge of the sash where the holding device is located is removed without the removal of any of the other parts which hold the sash in place or in any way disturbing the adjustment of the parts which actually hold the window-sash in working position.

It is desirable to be able to remove the sash from its frame with the least labor and disturbance of the operative parts which hold the sash in position and form the active or operative guideway in which the sash moves in opening and closing the windows.

When the metal strips e' and e^4 are used, as seen in Figs. 4 and 9^a, the stop-beads d' do not form a portion of the active or operative guideway in which the sash moves, such stop-beads serving simply to cover over and hide the metal strips e' e^4, the holding device, and adjacent parts and form a portion of the "trim" or finish of the window. This is substantially the case in the construction shown in Figs. 3 and 9^b. In these cases the stop-beads d, the metal strips, and friction holding devices form the active operative guideway in which the window-sash moves up and down in opening and closing of the window.

The hinged form of friction holding device shown in the foregoing figures of the drawings acts upon the sash with a yielding pressure, and hence a window provided with the same can always be opened and closed by the application of force directly to the sash in the direction it is desired to move it sufficient to overcome its frictional resistance in its operative guideway, which resistance is substantially equal in both opening and closing directions, and it is not sufficient in extent to preclude the use, in many instances, of these hinged holding devices in this way. Notwithstanding this fact it is desirable to open and close the window with a less expenditure of force than is necessary when the entire frictional resistance of the sash in the several constructions herein shown is to be overcome by a direct application of force thereto, and in order that this result may be accomplished I have shown and described different forms of means by which the movable member of these holding devices may be moved or operated to an extent sufficient to overcome the frictional resistance of the sash in its operative guideway to a greater or lesser extent, as desired.

Instead of forming the beveled bearing-surface upon the sash itself, as shown at the right of Figs. 3, 4, 9^a, and 9^b, it may be formed on the metal strip e', as seen in Fig. 9^c, in which case the operation of the parts as a whole are the same as when the beveled surface is formed on the sash itself. The essential thing is that the beveled surface and its coacting bearing-surface shall be so arranged relatively to each other that the sash by the action of the movable member of the holding device will be forced both in sidewise and edgewise directions.

A hinged frictional holding device of the general form heretofore shown is seen in Figs. 11, 12, 14, 15, and 16 as the same is applied to a window-sash in the manner indicated in Figs. 4 and 9^b, the sash and frame being provided with what are, in effect, beveled or inclined bearing-surfaces, so that the sash is forced in two directions—that is, both edgewise and sidewise—by the action of the movable member of the holding device. This construction of holding device is shown in end section, on an enlarged scale, in Fig. 14 and in Figs. 15 and 16 in rear elevation and end section, respectively. As here shown, the movable member is designated as A, and it is one continuous flat piece of material of about the length of the sash, as indicated in Fig. 11, and it is hinged to the member B by three extensions, which member in turn is secured to the sash, as shown. As here shown, the member B is of less width than the movable member A, and it is not continuous, as is the case with the movable member; but it is in three parts, as indicated in Fig. 11, one part being arranged near the top of the sash, one near the center, and the other near the bottom, each part being of a length about equal to that of the extensions on the member A. The lowest part, with the corresponding extension on the member A, is clearly seen in Fig. 15, where the construction and arrangement of a spring C', by means of which the movable member A is forced away from the member B, secured to the sash E, are also clearly indicated. This spring C' in the present case is one of three, one for each one of the three parts of the member B, which act upon the movable member A to hold the sash in position. As here shown, the body of the spring C' is coiled around the pin or pintle C, with one end of the spring bearing against the movable member A and the other end bearing against the member B, secured to the sash in a manner well known to mechanics. Other well-known forms of springs and also other arrangements of a spring or springs may be employed, if desired; but I prefer this form and arrangement for many reasons, among which are the ease with which they may be made and applied, their elasticity and evenness in stress or tension, the small space occupied by them when applied, and the small danger of the spring or springs becoming broken or disarranged in applica-

tion and use. I prefer to use more than one spring with each friction holding device, because where one spring is used if it breaks, as it may do, the sash if being frictionally held in a raised position, will be relieved of the entire holding action of the holding device and be free to fall, while if there be more than one spring employed—three, for instance, as shown in the present case, or more than three—the breakage of either one of the three or more springs would not relieve the sash of the entire holding action of the holding device and the sash would not be free to fall, and if it fell at all it would be at such a slow rate of speed as to be harmless to any one who might have an arm, a hand, or portion thereof underneath the sash and within its path of travel.

Accidents to passengers caused by window-sashes falling in railway-cars is a source of considerable expense and annoyance to railway companies by reason of the injuries received by passengers and the settlement of the damages resulting therefrom. Therefore it is desirable to reduce such accidents to the minimum. The use of a plurality of springs in connection with each frictional holding device tends to this result.

The form of frictional holding devices shown in Figs. 11 to 16 is, like the other forms mentioned, arranged within a space less than the thickness of the sash to which it is secured. When these hinged friction holding devices are so secured to the sash or frame as to press the sash inward or outward relatively to the car, the sash is held at all times except when opening and closing against its guideway, so as to exclude dust or cinders from entering the car around the edges of the sash when it is closed. In addition to this the sash is at all times held so as to prevent its rattling and making a noise. If these friction holding devices be applied so as not to press the sash inward or outward—as, for instance, as seen in Figs. 6, 7, and 8—the sash may be held as firmly in the desired position as when it is pressed inward or outward; but the dirt or cinders will not necessarily be as fully excluded as when the sash is pressed inward or outward. The preferred way of applying such holding devices is so that the sash will be pressed outward relatively to the car; but they may be otherwise applied, as shown, if desired.

Another form of frictional holding device is shown in Figs. 19 to 22, inclusive, and while it is adapted to frictionally hold the window in desired positions it requires more space than the hinged form shown in preceding figures of the drawings, and consequently it is not adapted to be arranged within a space equal to the ordinary thickness of sashes in sleeping-cars without cutting away the sash to an undesirable extent and one not thought practicable. This form of holding device is of the general construction illustrated in Letters Patent of the United States No. 562,935, heretofore referred to, which were granted June 30, 1896, and therefore do not here need an extended description. As here shown, this holding device is applied in the manner illustrated in Fig. 15 of said Letters Patent, and, generally speaking, it consists of one of the two portions which compose what is therein termed a "movable stop G." This portion is what is therein called the "working parts" of this movable stop G; but as therein shown this portion differs somewhat in details of construction from the holding device herein. Fig. 19 shows this device in front elevation and Fig. 22 shows it, on an enlarged scale, in cross-section. As here shown, this holding device consists of two bars of metal, one, which is designated as F, is flat and it is secured to the front of the sash by screws, as indicated, and the other, which is designated as H, is angular in cross-section, (see Figs. 21 and 22,) and it is attached to the bar F by a link *f* and an angle-lever *h*, one arm *h'* of the latter acting as a link, the same as link *f* acts to pivotally attach the bar H to the bar F, so that as the other arm of this angle-lever *h* is moved the bar H is moved to and from the bar F through the link *f* and arm *h'*, as just explained. While these bars F and H are pivotally connected together by the link *f* and arm *h'*, as just explained, they are not "hinged" together in the sense in which that term is used herein. The hinging together herein mentioned gives to the two members a movement relatively to one another in only one axial line, which is the axial center of the hinge pin or pintle connecting the two members together. This angular bar H is arranged to bear against a beveled or inclined surface I on the guideway at this edge of the sash. At the opposite edge of the sash there is formed an inclined or beveled surface I', which bears on an inclined or beveled surface I^2, formed on the guideway at this edge of the sash, the portions of the frame marked J J forming the other portions of the guideway for the sash. A spring or springs K, as here shown, are secured to the bar F so as to exert their stress or tension upon the bar H in a direction to force the bar H away from the bar F and against the bearing-surface I, which by reason of the inclination or bevel given to the several surfaces mentioned the sash is moved both edgewise and sidewise and is thus held in the desired position until the stress or tension of the spring or springs is overcome and the bar H is moved toward the bar F and the sash to which it is secured, when the sash is entirely free to be moved in either the opening or closing direction. The movement of this bar H is accomplished through the movement of the downwardly-extending arm of the angle-lever *h*, which when moved toward the center of the sash forces the bar H to move downward and toward the bar F, the link *f* and arm *h'* of the angle-lever *h* turning on their pivotal connections to the bar F and the bar H, describing arcs of circles whose radius

is the distance between the pivotal connections of the link and lever to the two bars. The lower end of the downwardly-extending arm of this angle-lever *h* is pivotally connected to a bar L, which bar at its left-hand end is beveled, as shown, and is adapted to engage with a catch or stop L′, secured to the frame of the window. This bar L near its opposite end passes through a suitable guideway L^2, so that the endwise movement of this bar is nearly horizontal. This end of this bar is provided with a sort of a stirrup L^3 or opening of considerable width and length and a straight vertical portion *l* at its extreme end. Within this stirrup L^3 and adjacent to this vertical portion or bar *l* two crank-pins *m m* are arranged, attached to crank-arms *n n*, placed directly opposite each other on a crank-shaft N, (which crank-shaft is seen in detail between Figs. 19 and 20,) so that if the crank-shaft N be turned in one direction one crank-pin *m* will move toward *l* and force it and the bar L away from and out from under the catch or stop L′, carrying the lower end of the angle-lever *h* with it and moving the bar H toward the bar F and against the stress or tension of the spring or springs K and also away from the inclined bearing-surface I, thus leaving the sash free to be moved in opening or closing direction, as the case may be. Whenever the crank-shaft N is moved in the opposite direction, then a similar result is accomplished by the movement of the opposite crank-pin *m* toward and against the vertical bar *l*. This crank-shaft N is provided with a crank-handle N′, (seen in Figs. 19, 20, and 21 and in the detail between Figs. 19 and 20,) so that this crank-shaft may be moved by the application of force to the crank-handle in either an upward or a downward direction.

If the window-sash is in the raised or open position and it is desired to close it, the application of force to the crank-handle in a downward direction causes the upper one of the two crank-pins *m* to move toward and against the vertical bar *l*, and as soon as the pressure upon the crank-handle N′ is sufficient to move the bar H out of contact with the inclined surface I, or nearly so, a continuation of that pressure in the same direction continues to hold the bar H in position, so that the sash will move downward by the force of gravity if not otherwise prevented, and if the sash is counterbalanced, as it may be, so that gravity cannot act to move it downward, then a slightly-increased pressure upon the crank-handle will move the sash downward and close it, as well as at the same time holding the bar H sufficiently out of contact with the bearing-surface I to permit of this being done. This moving of the bar H away from the bearing-surface I sufficiently to close the window may also move and hold the beveled end of the horizontal bar L away from the catch or stop L′, so that this end of the bar L is free to pass the stop or catch L′, and as soon as the window is fully closed and the pressure on the crank-handle is relieved the spring or springs K are free to exert their force upon the bar H and move it into frictional contact with the bearing-surface I, forcing the sash both sidewise and edgewise and at the same time moving the bar L toward and under the catch or stop L′, and thus locking the sash in the closed position. The beveled end of this bar L forms a movable locking-detent, which is mounted on the sash, and the catch or stud L′ also forms a locking-detent which is immovable relatively to the part to which it is secured. If at any time the window is closed by pressure not applied to the crank-handle N′, the beveled form of the catch or stop and the end of the bar L will as the one strikes the other force the bar L backward against the springs K, so as not to interfere with the closing of the windows.

If the window is closed and the sash locked and it is desired to open it, then by the application of force to the crank-handle N′ in an upward direction the bar H will also be moved toward the bar F and sufficiently out of contact with the bearing-surface I to free the sash and by the continued application of force in the same direction raise the sash to the desired extent, when upon the removal of the force from handle N′ the bar H is forced against the bearing-surface I by the action of the spring or springs K, and by reason of the frictional contact of the bar H with the surface I the sash is forced both sidewise and edgewise, and also is held in the raised position until released by again manipulating the bar or movable member H. This bar L, with its stirrup, constitutes a movable part, which is moved, as explained, by the handle portion N′ and the connections between such portion and the movable part, which in this case consist of the crank-arms *n n* and the crank-pins *m m*. It will thus be seen that the movable member H is manipulated by the application of force to the crank-handle N′ in either an upward or downward direction, and that by continued application of force in the same direction the window may be opened or closed, as the case may be, by a single movement of the hand of the operator in the direction it is desired to move the sash.

As shown in Fig. 19, the movable locking-detent is mounted upon the sash; but, if desired, it may be mounted on the window-frame, as seen in Fig. 19ª, wherein a corresponding locking-detent L^4 is thus mounted, the immovable stud or locking-detent L^5 being mounted upon the window-sash, and it is carried thereby, the same as is the bar L^6, which corresponds to the bar L in Fig. 19. In Fig. 19ª the movable locking-detent L^4 is movable relatively to the part to which it is secured, and it is actuated in the unlocking direction by the movement of the bar L^6 and the crank-handle N′. The stud or immovable locking-detent L^5, attached to the window-sash, is shaped as shown, so that as the

sash descends the inclined surface of L^5 strikes the inclined surface of the detent L^4, the hooked end of which will move to one side to permit the detent L^5 to pass, and this hooked end will move into locking position when the upper surface of L^5 reaches a position to permit of its doing so owing to the action of the spring L^7, which tends to press the movable detent into locking position. The free end of the bar or movable part L^6 is provided with an extension shaped correspondingly to the under surface of the detent L^5, and it is so related to this detent L^5 and a pin L^8 on the movable detent L^4 that when the under surface of detent L^5 strikes the upper end of the hooked detent L^4 the under surface of this extension on bar L^6 will also strike the pin L^8 upon the downward movement of the sash. The vertical portion of this extension on bar L^6 engages with the pin L^8, as shown, and when the bar L^6 is moved by the movement of the crank-handle it pulls the movable detent L^4 out of engagement with detent or catch L^5, and thus unlocks the sash. The operation of this locking-detent is essentially the same as that of the construction illustrated in Fig. 19.

A different form of means for operating the movable member A is shown in Figs. 11 to 17, inclusive, from that just described, although the same result is accomplished in so far as by the application of force in either an upward or downward direction the movable member is actuated and the window-sash is raised or lowered through a single movement of the hand of the operator.

As seen in Figs. 15 and 16, the lower end of the movable member or bar A is provided with an angular extension a, which may be formed by bending such bar at a right angle, as seen. By connecting one end of a rod a' to this extension a, also as seen, and connecting the opposite end of this rod to a pivoted piece, disk, or plate O, which is pivoted to the sash or to a base-plate attached to the sash at o so as to turn freely thereon, this movable member A is readily actuated by the movement of the part o. This pivoted piece or movable part O may be in the form of a plain disk or in that of a plate of any desired shape or in the forms here shown so long as it has the general mode of operation that the forms here shown have in actuating the movable member A, as before explained. As here shown, this rod a' is pivoted to the piece O at o' by means of a sort of link a^2, so that the pivotal points of the rod a' at a and o' can be adjusted by the screw-thread and nuts (seen in Figs. 15, 16, and 17^d) in a well-known manner. This pivoted piece O, as seen in Figs. 15 and 16, on opposite sides of its pivot o is provided with two oblong slots o^2 and o^3, as shown in Fig. 15. Two levers P and P′ are, as shown, pivoted or fulcrumed to the sash through the same base-plate that the piece O is pivoted to at p and p', respectively, the levers being connected together with a rod P^2, as seen in Figs. 11 and 16, the whole forming a lever a portion of which forms the handle portion of the operating mechanism secured to the sash to be used in raising and lowering the same, the pivoted axial line of which is substantially parallel with the surface of the glass of the window. To the ends of the levers P and P′ farthest from the rod P^2, as here shown, there are pivoted two depending pieces p^2 and p^3, respectively, at the lower ends of which are right-angled projections p^4 p^5, which engage with the oblong slots o^2 o^3, respectively, as shown in Fig. 15. As here shown, the projection p^4 engages with the bottom of the oblong slot o^2 and the projection p^5 with the top of slot o^3 when the handle portions of levers P and P′ stand as seen in Fig. 17. When these levers stand as thus seen, an application of force to the rod P^2 in an upward direction causes it and the levers P and P′ to move upward, the levers turning on their pivots or fulcrums p p' and forcing the depending pieces p^2 p^3 downward, and as the projection p^4 on piece p^2 rests on the bottom of slot o^2 any downward movement of the piece p^4 forces the pivoted piece O to turn on its pivot o, (the oblong slot o^3 permitting this to be done,) which in turn causes the pivot o' to correspondingly move, carrying with it the rod a', one end of which is connected with the extension a on the movable member A of the holding device and causing this member to turn on the hinge pin or pintle, which connects it to the member B, which is secured to the sash E, and thus to swing out of contact with the piece e^4, when the sash is free to move in an upward direction by a continued application of force in this direction. If, on the other hand, force be applied to the rod P^2 in a downward direction, the depending pieces p^2 and p^3 will be lifted upward, and as the projection p^5 on depending piece p^3 rests against the top of the oblong slot o^3 this projection forces the pivoted or movable piece O to turn on its pivot o (the oblong slot o^2 permitting this to be done) in the direction the projection moves—that is, in the same general direction that it moved before and with a like result upon the rod a' and the movable member A and sash E, except that the sash is lowered instead of being raised, as before. If desired, the oblong slots o^2 o^3, with their depending pieces p^2 p^3 and their projections p^4 p^5, may be dispensed with and the ends of the levers P and P′ farthest from the rod P^2 be made to engage with the piece O in a manner similar to that in which the projections p^4 and p^5 engage with the ends of the oblong slots o^2 and o^3, as is seen in Figs. 17^d and 17^e. As here shown, the mechanism is more compact than in the construction shown in Figs. 15, 16, and 17; but the mode of operation remains the same. In the construction shown in Figs. 17^d and 17^e the axial line of pivoting the levers P and P′ is the same as in Figs. 11 to 17, and the part O is movable by the handle portion of the levers

P P′, and the rod P² by reason of the connections between O and such handle portion consisting of the free ends of the levers P and P′, which bear upon the extending arms of the movable part O, as seen in those figures. It will thus be seen that in this construction of operating means, by which the movable member of the frictional holding device shown in Figs. 11 to 16, inclusive, the movable member of the holding device is actuated sufficiently, and the sash is raised or lowered through a single movement of the hand of the operator, just the same as is the case in the construction shown in Figs. 19 to 22, heretofore described.

The means here shown and described for operating the movable member or members of the friction holding device or devices are obviously adapted for use in operating the movable member or members of other forms of sash-holding devices than those here shown, whether they be of the friction holding class or not.

If it is desired to positively lock the sash in the closed position, the locking means shown in Figs. 15 and 16 may be employed. These consist of a hooked catch or detent Q, pivoted to the sash or base plate at *q* and engaging with the hooked detent or stop Q′, attached to the frame or sill of the window, a leaf-spring Q² being provided to force the detent Q into engagement with the detent or stud Q′ when free to exert its force on detent Q. This catch or detent Q is provided with a projection *q*′, which engages with a projection *q*² on the lever P′, so that whenever force is to be applied to the lever-handle in an upward direction the downward movement of the projection *q*² on lever P′ forces the projection *q*′ on the detent Q downward, which causes it to turn on its pivot at *q* and its lower or hooked end to swing away and out from under the part of the detent Q′ with which it engages, and it is thus swung away from said detent and the sash is free, so far as these detents are concerned, to move in the opening direction. The inclined or beveled construction of the hooked portions of the detents Q and Q′ enables the detent Q′ to force to one side the detent Q against the tension of its spring Q² and then to engage with one another on the downward or closing movement of the sash and they are brought into the locked position shown. These locking-detents Q and Q′ are, as shown, mounted on the sash and window-frame, respectively, nearly midway of the width of such sash and frame. This nearly-midway location of the locking-detents is advantageous. Railway-cars have a slight arching of the timbers and floor, which is lengthwise of the car. This arching of the timbers and floor is known as the "camber" of the car, which by reason of the twisting action on the body of the car and the strains thereon caused by the inequalities of the road-bed changes more or less the extent of such camber, and consequently the relations of the window-frames and the sashes held by them. This change in relationship of the sash and frame is usually less nearly midway of the sash and frame than it is near the opposite edges of the sash and opposite sides of the frame. Therefore at this nearly-midway location the change in relationship of the sash and its frame is usually less than elsewhere widthwise of the sash and frame. The construction of this pivoted piece O (seen in Figs. 15, 16, 17, 17ᵈ, and 17ᵉ) is designed for use when only one holding device at one edge of the sash is employed; but if for any reason one such device should be placed at each of the opposite edges of the sash, then the construction seen in Fig. 17ᵃ may be employed and a second rod *a*′ be used to connect the movable member of the second device to the pivoted piece O, as indicated, the operation of all of the parts remaining the same as when the forms seen in Figs. 15, 16, 17, 17ᵈ, and 17ᵉ are used.

It is manifest to those skilled in this art that the operating means for actuating the movable member or members of sash-holding devices and locking-detents as here shown may be used with like effect and result for actuating locking-detents alone, if desired, by simply discontinuing the connection of the bar L in Fig. 19 or the bar L⁶ in Fig. 19ᵃ or the rod *a*′ in Fig. 15 to the movable member or members of the sash-holding devices therein shown, when the operation of all of the parts, so far as the actuating of the locking-detents is concerned, will be identically as heretofore described. If it is desired to attach this hinged form of frictional holding device to the frame, as seen in Figs. 3 and 9ᵇ, instead of to the sash, as shown in Figs. 11 to 17, then the pivoted piece O seen in these latter figures will be changed to the form shown in Fig. 17ᵇ and the rod *a*′ be made to push instead of pull on the movable member A, the extension *a* being done away with and the rod *a*′ suitably guided in its movements and its outer end provided with an antifriction-pulley or other bearing-surface to bear upon the free edge of the member A, as seen in Fig. 17ᶜ, to move such member sufficiently out of contact with the surface of *e*² to permit the free movement of the sash in either an opening or closing movement, the antifriction-pulley or other bearing-surface remaining in contact with and sliding or moving over such movable member during the up and down movements of the sash in opening and closing of the window. The operation of all the parts, except as just explained, is the same when the holding device is secured to the frame as it is when secured to the sash. Two of these hinged holding devices may be employed, one at each of the opposite edges of the sash and secured to the frame instead of to the sash by using the form of pivoted piece O shown in Fig. 17ᵃ and attaching the rods *a*′ thereto so as to point in opposite directions to which they point in Fig. 17ᵃ and

suitably guiding such rods and providing each at their outer ends with antifriction-wheels or other bearing-surfaces to bear upon the free edges of the movable members, as indicated in Fig. 17^c and as explained in connection with the construction therein shown.

Other forms of operating means may be used, if desired, for actuating the movable member of these hinged holding devices than those heretofore described and which do not contain the features by which the movable member or members are actuated, and the sash is opened or closed by a single movement of the hand of the operator or by the application of force in the direction in which the sash is to be moved. One of these forms is seen in Fig. 4, and which consists of simply a short bar a^6, rigidly attached to the movable member A, and a knob or push-button a^7, connected therewith, so that by pressing upon the knob or button the movable member is actuated to relieve the sash from the holding action of the holding device. The operation of this knob or button in actuating the movable member A will be clearly apparent upon an inspection of this Fig. 4. A similar form to that of Fig. 4 is seen in Fig. 2^b and the parts are similarly designated. In Fig. 2^b construction of operating means the knobs a^7 may be used to raise and lower the sash after they have been pressed inward; but this will be done by the application of force in a different direction from that required to press the knobs inward. Another form is seen in Fig. 3, which consists of a sliding push-rod a^8, with a knob or button a^9 attached thereto and an antifriction-pulley or other bearing-surface affixed to the end of the rod opposite the knob or button to bear against the free edge of the movable member, as shown in Fig. 3, and after the manner hereto explained in connection with Fig. 17^c.

Another form of actuating means for operating the movable member of this hinged form of holding device is seen in Fig. 2^a, wherein the holding device is secured to the frame of the window and the movable member tends to force the sash toward the exterior of the car. In this case a lever a^{10} is pivoted to the sash, and at one end it is provided with a push-knob a^{11} and at its opposite end with an antifriction-roll to bear against the movable member A and force it away from the sash, and thus free it for movement in the opening or closing direction. In this construction, where holding devices are employed at each of the opposite edges of the sash, the knobs a^{11} may be used to open and close the window, but, as in Fig. 2^b, the force will be applied to them for this purpose in a direction different from that to force these knobs inward.

In the latter four constructions the application of force to the knobs or push-buttons to actuate the movable member or members of the holding device or devices is in a different direction from that required to open and close the window-sash.

In each embodiment of my improvements herein shown and described the movable locking-detent is positively moved in one direction only by the means mounted upon the sash, and such detent is free to move in the same direction independently of the means to which force is applied in moving the sash.

As before explained, in some railway-cars—as, for instance, in sleeping-cars—it has been thought desirable to use two complete window-sashes in one frame, one reason being the formation between the two of an air chamber or space in which the air is more or less confined from free circulation, and because of this the passage of heat and cold to and from the interior of the car is retarded over what is the case when only a single glass is used, as when a single ordinary car-window is employed. The reason for this is that glass is a very good conductor of heat and cold, while confined air is a very poor conductor—in fact, being known as one of the best non-conductors of heat and cold. Another reason is that the sash has to be sufficiently free to move up and down, and when this is the case there is more or less room for the sifting through the space around the edges of the sash of dirt and cinders, and as it is more difficult for the dirt and cinders to pass around two barriers than around one the two sashes exclude the dirt and cinders to a greater extent than one does. The necessary space between the edges of the sash and its guideway for the movement of these ordinary sashes precludes the confining of the air within the chamber between the two glasses placed in the two sashes as fully as if no such spaces existed.

In Figs. 19 to 22 there is shown a construction of a window-sash composed of two separable parts, each being adapted to receive a glass and the two parts being secured together, so that they move as a single structure, and yet they are separable by manipulating their securing devices to give access to the air space or chamber formed between such parts. As here shown, one part of this sash is designated as E, and it forms what might be used as a complete sash, as it is provided with the usual glass and is received by the guideway in the frame, which controls its path of travel and holds the entire structure in place. Attached to this part E is another part R, as here shown of nearly the size of the part E. Hinges S near the top of the part R and any suitable catches or buttons, as T, near the bottom secure these two parts E and R together, so that they move as a single structure; but by simply uncatching the catches or buttons T (only one being shown to save confusion) the part R may be moved away from the part E by swinging on the hinges S to give access to the space between the two parts for cleaning the glass or any other

desired purpose. As here shown, the part R is of a width to nearly fill the open space between the trim at the sides of the frame, and because of this the two parts of this sash have the general appearance of two independent and separate sashes; but this is not necessary, owing to the fact that nearly all of the advantages of this construction are obtained when the part R is of less size and so shaped as not to give the general appearance of two complete and independent sashes—as, for instance, when of the form seen in Figs. 11, 12, and 17. With this construction of two-part sash felt or some other form of packing may be employed, if desired, between the two parts of the sash to more fully confine the air within the space or chamber formed between the two parts as well as to more fully exclude the dust and dirt therefrom, as indicated at U in Figs. 20, 21, and 22. As stated, only one catch or button T is shown in Fig. 19; but two or more may be used, as thought desirable. This catch or button is formed on one end of a shaft, the other end of the shaft being provided with a head slotted like a screw and mounted in the part R so as to turn therein in a well-known manner, the catch engaging with a stationary projection on the part E when the shaft is turned in one direction and disengaging therefrom when the shaft is turned in the opposite direction. This catch T is shown in dotted lines in Fig. 19 in the engaged position.

The construction of two-part sash shown in Figs. 11, 12, and 17 is substantially the same as that of Figs. 19 to 22, except as to the relative size of the two parts, as heretofore explained, and two catches or buttons, which, as seen in Fig. 11, are of a different form from the one shown in Fig. 19. In Fig. 11 these catches or buttons are of a sliding type and are shown in the disengaged position. To engage them with the projection on the part E, it is only necessary to push them inward flush with the outer edge of the part R of the sash. This construction of two-part sash, in combination with a friction holding device or devices, forms a structure which gives substantially all of the practical advantages of excluding the dust and cinders from the car and the non-conducting qualities of confined air of two complete and independent sashes, with several advantages not possessed by such independent sashes—as, for instance, having a single structure to control instead of two—and also the holding of the sash when closed practically tight by a single device instead of by two or more against the entrance of dirt and from rattling at all times, except when it is desired to move it in its guideway, and then it is as free to move as either one of the two independent sash, thus providing in a single structure a dust-proof, antirattling, and heat and cold excluding window, which has the utmost freedom of opening and closing in all seasons of the year, regardless of the shrinking and swelling of the wood of the car, which always takes place, owing to the use and non-use of artificial heat for the comfort of the passengers as the seasons of the year change.

The constructions of friction holding devices herein shown and described have all of the dust-excluding and antirattling qualities of friction holding devices heretofore used with success, as must be apparent from the description heretofore given.

In certain constructions of railway-cars it is customary to use a movable sash and a stationary sash to close each window-opening, the stationary sash being placed near the roof of the car and the movable one in the customary place of such sashes. In this construction of cars if it is desired to use counterbalancing devices for the movable sash or means for automatically raising it no portion of those devices or means can be arranged directly in front of the glass of this stationary sash, because if so arranged the light from such sash would be more or less shut off or excluded, and this would render such sash more or less useless.

It is well known that the ordinary counterbalancing-weights commonly used in house-windows cannot be used in railway-cars owing to the want of sufficient space between adjacent windows and the strength required of the upright posts of the framing of the car, which pass up between adjacent windows.

A device similar to the well-known "curtain-fixture," only made of larger size and with much stronger springs, has been found when used with a web somewhat like a window-curtain to connect the top edge of the sash and fixture together quite satisfactory as a counterbalancing device or as a means for automatically raising the sash, the only difference between such device and means being the strength or force exerted upon the sash in the two cases. This web-like connection between the fixture and sash has been of about the width of the sash itself, and because of this as it is rolled upon the exterior of the roller or barrel of the fixture it exerts an even pull upon the sash throughout its width, and consequently the sash is raised evenly throughout its width and without any substantial tendency for one portion to move faster than any other portion. Where one portion of the sash moves faster than other portions, there is a cramping or binding of the sash in its guideway, which interferes with the opening and closing of the window. The presence of this stationary sash in the class of cars referred to precludes the use of this web-like connection between the movable sash and fixture without more or less shutting off the light passing through the glass in this sash. Different attempts have been made to use this curtain-fixture device in this class of cars by substituting chains, narrow, thin, and flexible strips of metal, or narrow webs of woven fabric at the edges of the sash, one chain, strip, or web at each of the opposite edges, so

that there would be an open and unobstructed space between such chains, strips, or webs; but for various reasons I have not known of their successful use for more than a short period of time. One of the main reasons for the unsatisfactory use of such chains, strips, or webs has been that each chain, strip, or web acted independently of the other, and hence one could not in any way aid the other in compensating for the inequalities inherent in the fixture, chains, strips, or webs, and, as a consequence, one chain, strip, or web would as it wound upon the roller or barrel of the fixture cause the portion of the sash to which it was attached to move faster than other portions of the sash would move, owing to the inequalities necessarily always present, caused either in manufacture or use, in the two chains, strips, or webs used on any one sash. I have overcome these difficulties by connecting the two chains, strips, or webs to the fixture, as heretofore indicated, so that they both wind thereon from the same direction and then connecting the opposite ends of such chains, strips, or webs together or to a device so that such ends are movably connected to the sash and can move relatively thereto and act one on the other to compensate for inequalities existing in the roller of the fixture or in the chains, strips, or webs, and thus permit all portions of the sash to move equally and without binding or cramping in its guideway in opening and closing the windows. These thin and narrow strips of metal and narrow webs form flexible straps.

In Figs. 11 and 13 two chains V V are shown attached to a rotative device W in the form of a rock-shaft, one end of each chain being attached to one arm of such rock-shaft. Of course the ends of flexible straps can be similarly attached to these arms of the rock-shaft, if desired. The opposite ends of these chains V V are attached to the roller or barrel of the "curtain-fixture" in the manner heretofore known—as, for instance, in the manner shown in Figs. 19 and 20. In Fig. 18 another form of rotative device W′ is shown, by means of which flexible straps may be movably connected to the sash. Instead of a rock-shaft, as in Figs. 11, 12, and 13, a plain shaft may compose this rotative device, as indicated in Fig. 18, or a plain shaft with cylindrical heads may be used in place of the rock-shaft, the ends of the straps being connected to such heads or to the shaft if the heads are not used from opposite sides, as shown in Fig. 18, the shaft rocking in its connection to the sash as in the case of the rock-shaft of Fig. 13. The operation of this shaft is the same as in the case of the rock-shaft seen in Fig. 13. In each case the shaft turns in its connection with the sash whenever one chain or strap pulls harder upon the sash than the other one does until the pull upon both is equal, whether this increased pull comes from one end of the roller being slightly larger than the other, so as to take up a greater length of chain or strap as it winds thereon, or from one chain or strap being thicker than the other, and for this reason a greater length of chain or strap is wound on one end of the roller than on the other, or from any other cause by which an increased pull on the sash from one chain or strap than the other may be occasioned. This turning or rocking of the shaft in its connection with the sash causes the ends of the chains or straps to move relatively to the sash, and thereby compensate for any inequalities in the roller, chains, or straps and permit the sash to move without binding or cramping in its guideway. Another way of movably connecting the ends of the chains or straps to the sash so that one may act upon the other with like result to the foregoing is seen in Figs. 19 and 20, wherein the two chains first pass over pulleys or antifriction-rolls mounted upon the sash and then pass to the center of the sash and are connected together, so that the same compensating action is had by the movement of the chains over the pulleys or supports and relatively to the sash as in the case of the rotative devices of Figs. 13 and 18.

The friction holding devices herein shown and described may have the spring or springs which act on the movable member of any stress or tension desired for the work such devices are designed to do—as, for instance, when the sashes are unconnected with counterbalancing or automatic raising means a greater holding force or action has to be exerted than when they are connected with such means, owing to the force of gravity not being overcome in one case and wholly or partially overcome in the other. Therefore whatever form the friction holding device may take on in the combinations hereinafter pointed out the strength or stress of the spring or springs may be such as to adapt it or them for the work to be done.

When the friction holding device is applied to the window as seen in Figs. 3, 4, 5, 6, 7, and others, such device tends to move the sash edgewise to hold it in the desired positions, and it need move but comparatively little, if any, in opening and closing the window, and then it may serve to keep the sash from moving edgewise, and thus aid in holding the sash from assuming a cramping position in its guideway, and it thereby aids in controlling the movement of the sash therein, and by so doing modifying the work that the roller, chains, or straps and their connection to the sash has to do. This is an advantage derived from this special location of the friction holding device relatively to the sash over what is derived from locating such device as seen in Figs. 2^a and 2^b.

The almost constant twisting of the body of the car and throughout its framework caused by the inequalities of the road-bed, including the necessary differences in the height of opposite rails on curves and in curves of different radii, makes the window-

openings between the framing-posts of the car-body, change more or less relatively to the sashes placed in such openings, and by reason of this the conditions under which the sashes move in such openings correspondingly change. This causes the sash to move differently at different times, and therefore the manner in which a sash works when the car is standing still is no warrantee of how it will work when the car is running or when standing on another portion of the road-bed. It is under these varying conditions that the several combinations hereinafter pointed out in the claims are designed to do their work.

The means herein described for connecting the chains or straps which have one end connected to the roller of the counterbalancing or automatic raising device to a window-sash composed of two separable parts and which is provided with friction holding devices as herein described produces not only a dust-proof, antirattling, and heat and cold excluding window, but also one that can be used in most any form of passenger-car and yet be readily and easily opened and closed when of considerable weight—as for instance, when substantially equal in weight to two independent and complete sashes. Such means enable the counterbalancing or automatic raising device to act upon the sash more evenly, and consequently the sash is moved in its guideway with a less expenditure of force. The sash as it is moved in its guideway tends to move with comparatively little or no lateral movement, and consequently moves with less frictional contact with its guideway, and the friction holding device is moved to a less extent to permit the sash to move with an equal extent of frictional contact than is the case when the chains or straps are connected directly to the sash, as before explained. Thus the action of the chains or straps upon the sash, the action of the sash in its guideway, the movement of the friction device in enlarging the guideway to permit the sash to move, and its action on the sash are modified by combining the parts or devices as herein described. Also the friction holding device may be so combined with the sash, its guideway, the chains or straps, and the roller that it will aid in keeping the sash from moving edgewise, even when from any cause it is given a tendency to move in that direction, and thus aid in the easy and even movement of the sash in its guideway, the action of the friction device upon the sash and of the sash in its guideway being thereby still further modified.

Various modifications of the combination and also of the construction and arrangement of the parts here shown will be suggested to those skilled in this art which will in all essential respects operate as the combinations and the construction and arrangement of parts here shown and described operate. Therefore I do not intend to limit myself to the specific forms and arrangements of parts or devices shown.

What I claim as new is—

1. A window friction holding device consisting of two members hinged together, one of which is adapted to be secured to a window sash or frame and the other is adapted to frictionally bear against the sash or frame adjacent to the secured member and also to move relatively thereto, and a spring or springs arranged to exert their stress or tension upon the movable member, whereby the holding device, when adjusted to a window, is adapted to frictionally hold the sash thereof in desired positions.

2. A window friction holding device consisting of two members hinged together, one of which is adapted to be secured to a window sash or frame and the other is adapted to frictionally bear against the sash or frame adjacent to the secured member and also to move relatively thereto, and a spring or springs arranged between the members, one portion of each spring bearing on one member and the other portion of each spring bearing on the other member, the stress or tension of the spring or springs tending to move one member relatively to the other member, whereby the spring or springs may be held in place by the two members.

3. A window friction holding device consisting of two members hinged together, one of which is adapted to be secured to a window sash or frame and the other is adapted to frictionally bear against the sash or frame adjacent to the secured member and also to move relatively thereto, and a plurality of springs arranged to exert their stress or tension upon the movable member, whereby the holding device, when adjusted to a window, is adapted to frictionally bear against its coacting bearing-surface after one of the springs is broken and proportionally hold the sash in the desired positions.

4. A window friction holding device consisting of two members hinged together and adapted to be secured in operative relation in a window within a space equal to substantially the thickness of the window-sash, one of which members is adapted to be secured to a window sash or frame and the other is movable relatively to the secured member and is also adapted to frictionally bear against the sash or frame adjacent to such secured member, and a spring or springs arranged to exert their stress or tension upon the movable member, whereby the holding device, when adjusted to a window, is contained within a space equal to substantially the thickness of the sash and is also adapted to frictionally hold the sash in desired positions.

5. In a window the combination, substantially as set forth, of a sash, a guideway in which the sash may move in opening and closing, a friction holding device or devices, consisting of two members hinged together,

one of which members is secured to the sash or frame and the other member is movable relatively to the secured member, and a spring or springs arranged to move the movable member or members by the stress or tension of the same, whereby the sash is held in the desired positions relatively to its frame.

6. In a window the combination, substantially as set forth, of a sash, a guideway in which the sash may move in opening and closing, a friction holding device or devices, consisting of two members hinged together, one of which is secured to the sash or frame and the other is movable relatively to the secured member, a spring or springs arranged to move the movable member or members by the stress or tension of the same, and means mounted on the sash adapted to actuate the movable member or members, whereby the sash is held in the desired positions relatively to its frame and is more or less released therefrom.

7. In a window the combination, substantially as set forth, of a sash, a guideway in which the sash may move in opening and closing, a holding device or devices secured to the sash or frame, a portion or portions of which are movable relatively to the sash or frame to which such device or devices are secured and means mounted on the sash adapted to actuate the movable portion or portions of the holding device or devices upon the application of force to such means in the direction in which it is desired to move the sash, whereby the movable portion or portions may be actuated sufficiently and the sash be moved in the desired direction as a single operation.

8. In a window the combination, substantially as set forth, of a sash, a guideway in which the sash may move in opening and closing, a holding device or devices secured to the sash or frame, a portion or portions of which are movable relatively to the sash or frame to which said device or devices are secured, means mounted on the sash adapted to actuate the movable portion or portions of the holding device or devices upon the application of force to such means in the direction in which it is desired to move the sash, and a locking-detent adapted to lock the sash in a given position and to be actuated by the movement of the means which actuate the movable portion or portions of the holding device or devices, whereby the sash is locked or unlocked and moved in the desired direction as a single operation.

9. In a window the combination, substantially as set forth, of a sash, a guideway in which the sash moves in opening and closing, a locking-detent mounted upon the sash and carried thereby, a locking-detent mounted upon the window-frame, one locking-detent being movable relatively to the other, and means also mounted on the sash and adapted to operate the movable locking-detent upon the application of force to such means in the direction in which it is desired to move the sash, whereby the sash is moved in opening or closing direction and is locked or unlocked as a single operation.

10. In a window the combination, substantially as set forth, of a sash, a guideway in which the sash moves in opening and closing, a locking-detent mounted upon the window-frame, a locking-detent carried by the sash, one locking-detent being movable relatively to the other, and means mounted on the sash and adapted to operate the movable locking-detent upon the application of force to such means in the direction the sash is to move, whereby the movable locking-detent may be actuated and the sash moved by the application of force to a single device.

11. In a window the combination, substantially as set forth, of a sash, a guideway in which the sash moves in opening and closing, a locking-detent mounted on the window-frame, a locking-detent carried by the sash, one locking-detent being movable relatively to the other, and means mounted on the sash and adapted to operate the movable detent upon the application of force to such means in the direction the sash is to move, such means positively moving the movable locking-detent in one direction only, the detent being free to move in the same direction independently of such means.

12. In a window the combination, substantially as set forth, of a sash, a guideway in which the sash moves in opening and closing, a locking-detent mounted on the window-frame nearly midway of its width, a locking-detent carried by the sash nearly midway of its width, one locking-detent being movable relatively to the other, and means carried by the sash and adapted to operate the movable locking-detent upon the application of force to such means in the direction the sash is to move, whereby the movable locking-detent may be actuated and the sash moved by the application of force to a single device.

13. In a window the combination, substantially as set forth, of a sash, a guideway in which the sash moves in opening and closing, a locking-detent mounted on the window-frame, a locking-detent carried by the sash and movable relatively thereto, and an operating device pivoted to the sash to move in the direction the sash moves and arranged to move the movable locking-detent upon the application of force to the operating device in the direction the sash is to move, whereby the movable locking-detent may be actuated and the sash moved by the application of force to a single device.

14. In a window the combination, substantially as set forth, of a sash, a guideway in which the sash may move in opening and closing, a holding device or devices mounted upon the sash to move therewith, a portion or portions of which are movable relatively to the sash upon which they are mounted, a spring or springs arranged to exert their stress or tension upon the movable member or mem-

bers of the holding device or devices, and means also mounted upon the sash and adapted to actuate the movable member or members upon the application of force to such means in the direction in which it is desired to move the sash, whereby the movable member or members may be actuated and the sash moved in the desired direction as a single operation.

15. In a window the combination, substantially as set forth, of a sash, a guideway in which the sash may move in opening and closing, a holding device or devices mounted upon the sash and carried thereby, a portion or portions of which are movable relatively to the sash upon which they are mounted, a spring or springs arranged to exert their stress or tension upon the movable member or members of the holding device or devices, means also mounted upon the sash and adapted to actuate the movable member or members upon the application of force to such means in the direction in which it is desired to move the sash, and a locking-detent adapted to lock the sash in a given position and to be actuated by the movement of the means which actuate the movable member or members of the holding device or devices, whereby the sash is locked or unlocked and moved in the desired direction as a single operation.

16. In a window the combination, substantially as set forth, of a sash, a guideway in which the sash moves in opening and closing, a holding device or devices mounted upon the sash and carried thereby, a portion or portions of which are movable relatively to the sash upon which they are mounted, a spring or springs arranged to exert their stress or tension upon the movable member or members of the holding device or devices, means also mounted upon the sash and adapted to actuate the movable member or members upon the application of force to such means in the direction in which it is desired to move the sash, and a movable locking-detent also mounted on the sash and adapted to lock the sash in a given position and to be actuated by the movement of the means which actuate the movable member or members of the holding device or devices, whereby the sash is locked or unlocked and moved in the desired direction as a single operation.

17. In a window the combination, substantially as set forth, of a sash, a guideway in which the sash may move in opening and closing, a holding device or devices secured to the sash or frame and having a movable member or members and operating means therefor consisting of a handle portion mounted upon the sash and adapted to be moved in opposite directions from a central or normal position, and means connecting the handle portion with the movable member or members of the holding device or devices, whereby the movable member or members may be actuated by the movement of the handle portion in either direction.

18. In a window the combination, substantially as set forth, of a sash, a guideway in which the sash may move in opening and closing, a holding device or devices secured to the sash or frame and having a movable member or members, operating means therefor consisting of a handle portion mounted upon the sash and adapted to be moved relatively thereto, means connecting the handle portion with the movable member or members of the holding device or devices, and a locking-detent arranged relatively to the operating means to be in position to be moved out of locking engagement by the movement of the operating means which actuate the movable member or members, whereby the sash may be unlocked and the movable member or members be actuated by a single movement of the handle portion of such operating means.

19. In a window the combination, substantially as set forth, of a sash, a guideway in which the sash may move in opening and closing, a holding device or devices secured to the sash or frame and having a movable member or members, operating means therefor consisting of a handle portion mounted upon the sash and adapted to be moved relatively thereto, means connecting the handle portion with the movable member or members of the holding device or devices, and a movable locking-detent mounted upon the sash and arranged relatively to the operating means to be in position to be moved out of locking engagement by the movement of the operating means which actuate the movable member or members, whereby the sash may be unlocked and the movable member or members be actuated by a single movement of the handle portion of such operating means.

20. An operating mechanism for window-holding devices consisting of a handle portion pivoted to a support, which portion is adapted to move in opposite directions, a movable part or parts mounted on a support, connections between the handle portion and the movable part or parts by which such part or parts are moved upon the movement of the handle portion in either direction, and a connection or connections connecting the movable member or members of the holding device or devices with such movable part or parts, whereby the movable member or members are moved upon the movement of the handle portion in either direction.

21. An operating mechanism for window-holding devices consisting of a handle portion pivoted to a support, the pivotal axial line of which is adapted to be parallel with the surface of the glass of the window, which portion is adapted to move in opposite directions, a movable part or parts mounted upon a support and adapted to move in a plane or planes substantially parallel with the axial line of pivoting of the handle portion, connections between the handle portion and the movable part or parts by which such parts

are moved upon the movement of the handle portion in either direction, and a connection or connections connecting the movable member or members of the holding device or devices with such movable part or parts, whereby the movable member or members are moved upon the movement of the handle portion in either direction.

22. An operating mechanism for window-holding devices consisting of a handle portion pivoted to a support, which portion is adapted to move in opposite directions, a pivoted piece having three or more points of attachment extending outwardly from the pivotal point of such piece, connections between the handle portion and the piece connecting such portion to points of attachment on different sides of the pivotal point of the piece, and a connection or connections connecting the movable member or members of the holding device or devices with another point or points of attachment on the piece, whereby the movement of the handle in either direction moves the movable member or members.

23. In a window the combination, substantially as set forth, of a sash provided at one of its edges with a beveled bearing-surface, a bearing-surface coacting therewith, a holding device arranged at the opposite edge of the sash and provided with a movable member adapted to force the sash in both sidewise and edgewise directions, and a bearing-surface coacting with the movable member of the holding device, the sash, holding device and bearing-surface coacting with the movable member being located relatively to each other substantially as shown, whereby the sash is free, upon the movement of the movable member, to be removed from its frame without disturbing the adjustment of the operative parts which hold the sash in workable position.

24. In a window the combination, substantially as set forth, of a sash provided at one of its edges with a beveled bearing-surface, a bearing-surface coacting therewith, a holding device arranged at the opposite edge of the sash and provided with a movable member adapted to force the sash in both sidewise and edgewise directions, a bearing-surface coacting with the movable member of the holding device, and a recess in the window-frame adapted to receive a portion of the movable member of the holding device when in position to act upon the sash, the recess, sash, holding device and bearing-surface coacting with the movable member being located relatively to each other substantially as shown, whereby the sash is free, upon the movement of the movable member, to be removed from its frame without disturbing the adjustment of the operative parts which hold the sash in workable position.

25. In a window the combination, substantially as set forth, of a window-frame provided with means for holding a sash in place and controlling its opening and closing movements, a sash bodily movable in the window-frame, which is composed of two separable parts, each of which is provided with a glass, the two forming a closed chamber between the parts, and means securing the two parts together as a single structure, whereby the sash is bodily movable in the window-frame as a single structure for opening and closing the window-opening, and, by manipulating the securing means, access is given to the closed chamber formed in the sash.

26. In a window the combination, substantially as set forth, of a window-frame provided with means for holding a sash in place and controlling its opening and closing movements, a sash bodily movable in the window-frame, which is composed of two separable parts, one of which is of greater edgewise dimensions than the other and is thereby adapted to be received in the window-frame and be controlled thereby and each part is provided with a glass, the two forming a closed chamber between the parts, and means securing the two parts together as a single structure, whereby the sash is bodily movable in the window-frame as a single structure for opening and closing the window-opening, and, by manipulating the securing means, access is given to the closed chamber formed in the sash by moving only the part thereof which has the smaller edgewise dimensions.

27. In a window the combination, substantially as set forth, of a window-frame provided with means for holding a sash in place and sliding therein during its opening and closing movements, a sash bodily slidable in the window-frame, which is composed of two separable parts, one of which is of greater edgewise dimensions than the other and is thereby adapted to be received in the window-frame and to slide therein, and each part is provided with a glass, the two forming a closed chamber between the two parts, and means securing the two parts together as a single structure, whereby the sash bodily slides in the window-frame as a single structure in opening and closing the window-opening, and, by manipulating the securing means, access is given to the closed chamber by moving only that part of the sash which has the smaller edgewise dimensions.

28. In a window the combination, substantially as set forth, of a sash, a guideway in which the sash may move in opening and closing, counterbalancing or automatic operating means provided with a roller, chains or flexible straps, one end of each being attached to the roller to wind thereon in the same direction and the opposite ends being movably connected to the sash so that such ends are adapted to move relatively to the sash and compensate for inequalities in the roller or in the chains or straps, whereby the sash remains free to move in the guideway as the chains or straps wind upon or unwind from the roller.

29. In a window the combination, substantially as set forth, of a sash, a guideway in

which the sash may move in opening and closing, counterbalancing or automatic operating means provided with a roller, chains or flexible straps, one end of each being attached to the roller to wind thereon in the same direction and the opposite ends are attached to a rotative device on opposite sides of the axis of its rotative movement, which device is mounted in bearings on the sash with its axis substantially parallel with the axis of rotation of the roller, whereby the sash remains free to move in the guideway as the chains or straps wind upon or unwind from the roller.

30. In a window the combination, substantially as set forth, of a sash, a guideway in which the sash may move in opening and closing, counterbalancing or automatic operating means provided with a roller, chains or flexible straps, one end of each being attached to the roller to wind thereon in the same direction and the opposite ends thereof are attached to arms of a rock-shaft mounted in bearings on the sash and whose arms are at different angles and extending upon opposite sides of the axis of rotation of the rock-shaft, whereby the sash is free to move in the guideway as the chains or straps wind upon or unwind from the roller.

31. In a window the combination, substantially as set forth, of a sash composed of two parts, each part adapted to receive a glass, and means adapted to secure the two parts together as a single structure with an air-chamber between the glass of the two parts and also to permit such parts to be separated, a guideway in which the sash may move in opening and closing, and a friction holding device or devices secured to the sash or frame and adapted to act upon the sash, whereby the sash is held in the desired positions and against rattling and to exclude dust or cinders when the sash is closed, and also to exclude heat and cold.

32. In a window the combination, substantially as set forth, of a sash, a guideway in which the sash may move in opening and closing, a friction holding device secured to the sash or frame and adapted to act upon the sash, a counterbalancing or automatic operating device, chains or flexible straps, one end of each attached to such device so as to wind thereon in the same direction, and means movably connecting the opposite ends of the chains or straps to the sash, whereby the space between the chains or straps is substantially unobstructed and the sash can move in its guideway without cramping therein.

33. In a window the combination, substantially as set forth, of a sash, a guideway in which the sash may move in opening and closing, a friction holding device secured to the frame or sash and adapted to act on the sash and hold it in an edgewise direction, a counterbalancing or automatic operating device, chains or flexible straps, one end of each attached to such device so as to wind thereon in the same direction, and means movably connecting the opposite ends of the chains or straps to the sash, whereby the space between the chains or straps is substantially unobstructed and the sash is more or less held in an edgewise direction in its guideway, and can move therein without cramping.

OLIVER M. EDWARDS.

Witnesses:
L. M. BUHAN,
A. MITCHELL.