March 21, 1939. W. C. RANDALL ET AL 2,151,231

WINDOW CONSTRUCTION

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FIG.1.

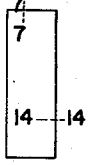


FIG.2.

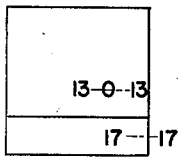


FIG.3.

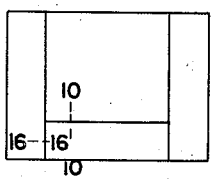
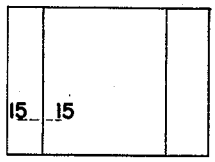


FIG.4.



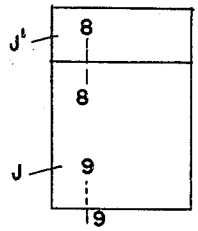


FIG.5.

FIG.6.

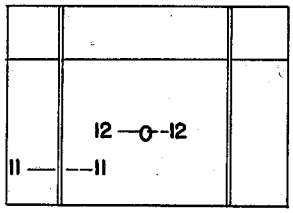


FIG.18.

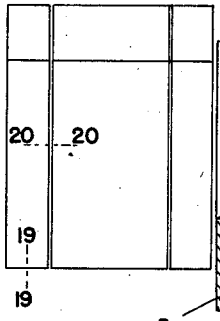
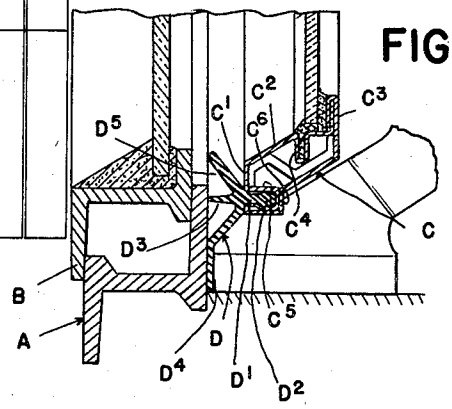


FIG.9.



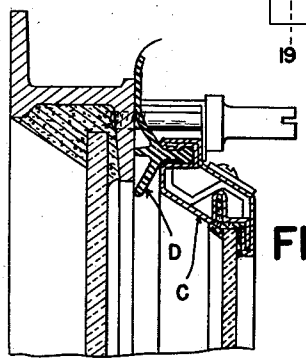
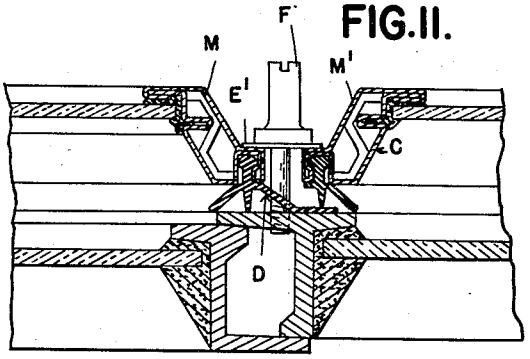


FIG.7.

FIG.11.



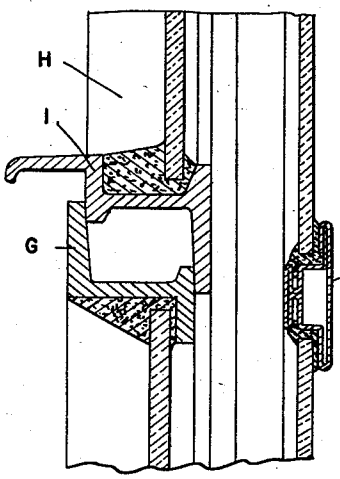


FIG.8.

INVENTORS
WILLIAM CLIFTON RANDALL
CLYDE W. KELLY

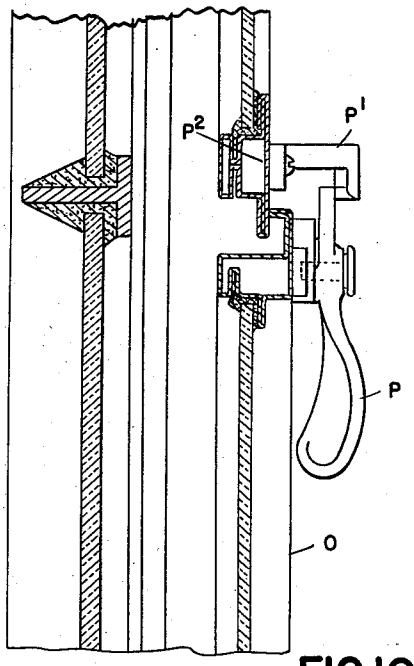
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FIG.19.



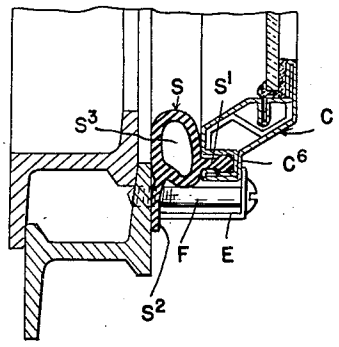


FIG.20.

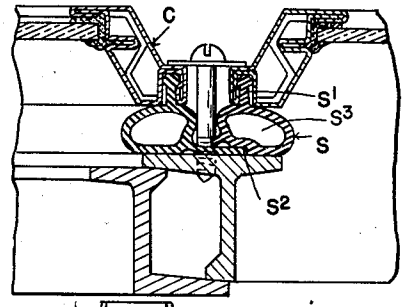
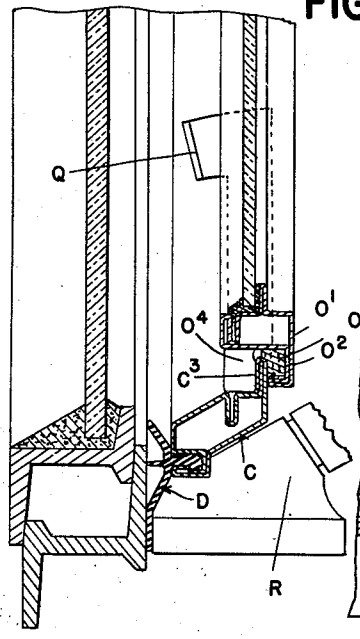


FIG.10.



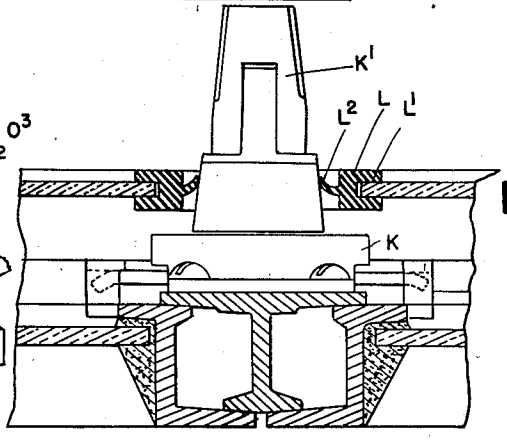


FIG.12.

INVENTORS
WILLIAM CLIFTON RANDALL
CLYDE W. KELLY

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WINDOW CONSTRUCTION

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FIG.13.

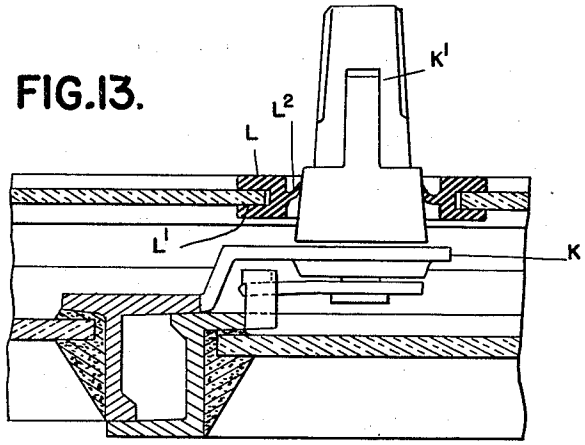


FIG.14.

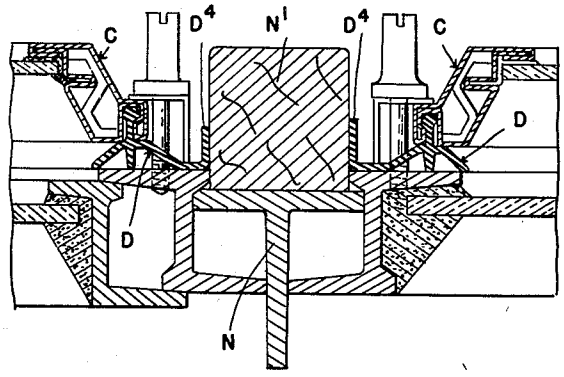


FIG.15.

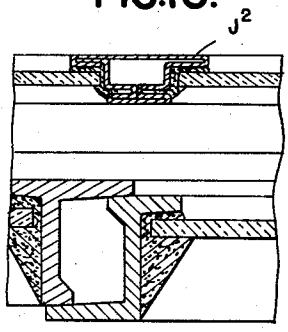


FIG.16.

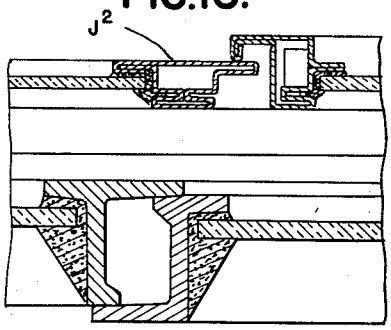
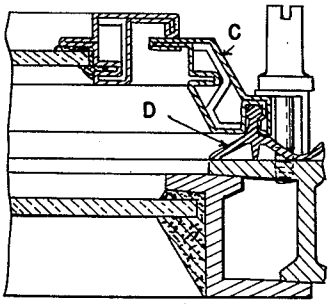


FIG.17.



INVENTORS
WILLIAM CLIFTON RANDALL
CLYDE W. KELLY

BY Whittemore Hulbert & Belknap
ATTORNEYS

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WINDOW CONSTRUCTION

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FIG.22.

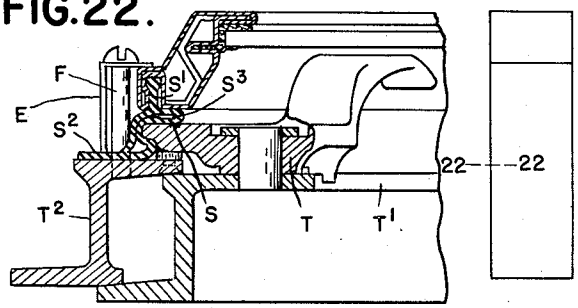


FIG.21.

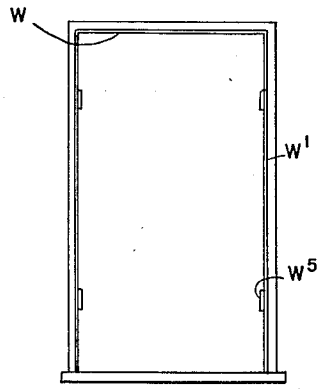


FIG.23

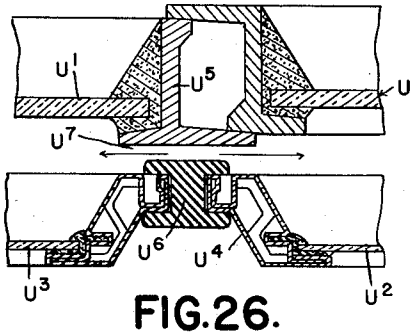


FIG.26.

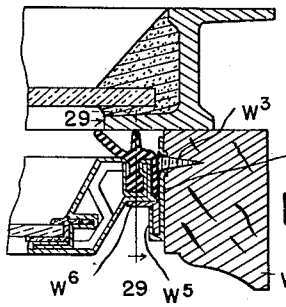


FIG.25.

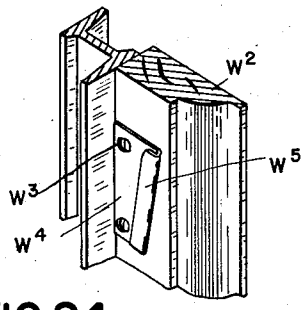


FIG.24.

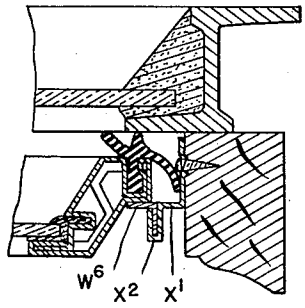


FIG.28.

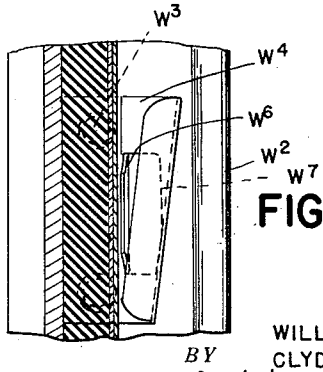


FIG.29.

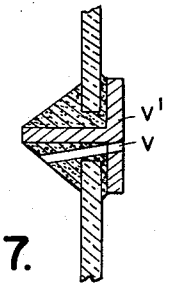


FIG.27.

INVENTORS

WILLIAM CLIFTON RANDALL

CLYDE W. KELLY

BY Whittemore Hulbert & Belknap

ATTORNEYS

Patented Mar. 21, 1939

2,151,231

UNITED STATES PATENT OFFICE

2,151,231

WINDOW CONSTRUCTION

William Clifton Randall and Clyde W. Kelly, Detroit, Mich., assignors to Detroit Steel Products Company, Detroit, Mich., a corporation of Michigan

Application May 17, 1937, Serial No. 143,216

16 Claims. (Cl. 189—64)

The invention relates to metallic frame window constructions and more particularly to auxiliary or winter windows designed for detachable engagement with the permanently installed windows. Among the objects of the invention are:

First to obtain a construction that is applicable to various types of main windows;

Second to obtain better heat insulation and particularly to minimize heat losses through the metallic portions of the window frame and ventilator;

Third to form an effective seal between the main and auxiliary frames upon the attachment of the latter to the former;

Fourth to avoid interference with and to seal about the locking and operating means for the main window ventilator;

Fifth to provide improved means for ventilation through the auxiliary window.

With these and other objects in view, the invention consists in the construction as hereinafter set forth.

In the drawings:

Figures 1, 2, 3, 4, 5 and 6 are diagrammatic elevations of various designs of auxiliary windows to which our improvements are applied;

Figure 7 is a vertical section on line 7—7 of Figure 1;

Figure 8 is a section on line 8—8 of Figure 5;

Figure 9 is a section on line 9—9 of Figure 5;

Figure 10 is a section on line 10—10 of Figure 3;

Figures 11 and 12 are sections respectively on lines 11—11 and 12—12 of Figure 6;

Figure 13 is a section on line 13—13 of Figure 2;

Figure 14 is a section through adjacent portions of individual window units;

Figure 15 is a section on line 15—15 of Figure 4;

Figure 16 is a section on line 16—16 of Figure 3;

Figure 17 is a section on line 17—17 of Figure 2;

Figure 18 is a diagrammatic elevation of a modified construction;

Figures 19 and 20 are cross sections on lines 19—19 and 20—20 of Figure 18;

Figure 21 is a diagrammatic elevation of another modification;

Figure 22 is a section on line 22—22 of Figure 21;

Figure 23 is a diagrammatic elevation indicating a modified attachment means for the auxiliary window;

Figure 24 is a perspective view showing the modified attachment member secured to the window casing;

Figure 25 is a horizontal section through the main and auxiliary window with the modified attachment means;

Figure 26 is a horizontal section showing a modification of detail in Figures 11 and 20;

Figure 27 is a view through a bar in the main window showing the method of securing outside air between the glass;

Figure 28 is a view similar to Figure 25 showing another modification;

Figure 29 is a vertical section on line 29—29 of Figure 25.

Metalic window frames permit a loss of heat therethrough on account of the high thermal conductivity of metal. Where auxiliary or winter windows are used which cover the main window, there is still loss of heat through the metallic frames. We have, therefore, devised a construction of attachable auxiliary window which while registering with the main window and minimizing the heat loss through the glazed portion thereof, also provides thermal insulation for the metaliic parts. We have further devised a construction applicable to windows having movable or ventilator sections which will allow the operation of the latter. Still further, we have provided an improved construction of ventilator section in the auxiliary window for cooperation with the ventilator in the main window.

One very important feature of our improvement is that the auxiliary window may be placed on the inside of the main window without danger of condensation of moisture on the outer glass which sometimes occurs. This we accomplish, first by preventing as far as possible any passage of air from the inner atmosphere to the space between the windows; and second, by providing ventilation between said space and the outer atmosphere, so as to permit breathing of the outside air to compensate for any expansion or contraction due to change in temperature.

As specifically shown, A is a metallic window frame of any suitable construction, but as shown is formed of a Z-bar. B is the ventilator section formed in either a single section or a plurality of sections. This is also of a Z-bar cross section and seats against the outer face of the frame A, or an interior framing member thereof. Our improved auxiliary window is adapted for attachment to the inner side of the window frame and is constructed as follows:

The bars of the frame are preferably formed from a hollow sheet metal member C having a

portion C' which is parallel and adjacent to the main window, and an obliquely extending portion C^2 terminating in an inwardly extending flange C^3 forming a seat for the glass. Parallel to this flange and outward therefrom is the return-bent portion C^4 which forms a groove for receiving the spline that secures the glass. The portion C' is also provided with a return-bent portion C^5 fashioned to provide an undercut or dovetail groove for receiving the shank of the flexible weatherstrip. The whole section may be formed from a single strip of metal having its opposite edges overlapped and seamed to form the flange C^3. The portion C' also provides on its outer side a shoulder C^6 engaging the securing means for the auxiliary window. The outer bars of the auxiliary window frame are formed as just described and are joined to each other by mitering and welding, or in any other suitable way. To complete the window it is provided with a resilient weatherstrip D, which in addition to its function of forming a hermetic seal with the main window, also provides thermal insulation therefor. Thus, as shown, the strip D formed of flexible material, such as felt or preferably rubber, has a shank portion D' for engaging the undercut groove in the return-bent portion C^5, and a head portion D^2 which is of slightly greater width than the entrance into the groove, so that it must be compressed in entering the same, and will hold the strip from accidental disengagement from the groove. The strip is further provided with a tongue portion D^3 which bears against the outer surface of the frame A to form a sealing joint therewith. On the outer side of this tongue portion is an obliquely extending flange or flap D^4 which also bears against the outer face of the frame A and extends over to completely cover the exposed portion of the same. A second oblique flange or flap D^5 may extend on the opposite side of the tongue D^3, but is shorter than the flange D^4. This serves to cover the inner portion of the bar. The auxiliary window is secured to the main window by suitable fasteners which as shown comprise angle clips E and screws F. One flange of the clips E engages the shoulder C^6, while the opposite flange bears against the flap D^4. The screw engages a threaded aperture in the frame and serves to hold the clip in position and to press the tongue D^3 and flaps D^4 and D^5 against the frame. Thus, there is no metal to metal contact between the auxiliary window frame and the main window frame, other than that through the threaded shanks of the screws F which are very small in cross section. As rubber is a good heat insulator and as the flaps completely cover the inner surfaces of the frame, this will materially reduce heat losses therethrough.

Where the permanent window is stationary and formed of a single panel, the construction of the auxiliary window is as thus far described. Where, however, the main window is formed of a plurality of panels and also where it is provided with a movable ventilator section and operating means and lock therefor, the construction of the auxiliary window must be modified. As shown in Figures 5 and 8, the main window has a lower ventilator G and a fixed transom H separated by a frame bar I. To correspond to this the auxiliary window is divided into a lower panel J and an upper panel J' separated from each other by the muntin or dividing bar J^2. This also is a hollow rail formed of sheet metal and provided with flanges forming seats for the glass and grooves for receiving the splines. There is not, however, any contact between this muntin and the registering portion of the main window.

As shown in Figures 2, 6, 12 and 13, a lock K for the ventilator of the main window has an operating handle K' which extends outward beyond the plane of the auxiliary window. To provide for this, the glass in the auxiliary sash has an aperture therein of sufficient size for the passage of this handle, and surrounding this aperture is a grommet L, preferably formed of rubber. This has a peripheral grooved portion L' for engaging the glass and an inwardly extending flexible flange portion L2 which bears against the shank of the operating handle K' to form an air seal therewith.

As shown in Figures 6 and 11, the main window has a central panel and panels upon opposite sides thereof. For covering this window separate auxiliary window frames M and M' are used for the two panels, and these are secured by an intermediate screw F' and clip E', and the flaps of the sealing strips D overlap each other and bear against the intermediate frame bar.

Figure 14 shows a construction where there is an intermediate bar N between two sashes of the main window. For this there is preferably used a wood filler strip N' covering the bar N and the flaps D^4 of the strips on the separate auxiliary window sashes are pressed against the sides of this strip. This will form effective heat insulation for the bar N.

For certain installations it is desirable to provide a ventilator in the auxiliary window for cooperating with the ventilator in the main window and such construction is shown in Figure 10. The ventilator section O is provided with a frame O' formed of hollow bars similar to those previously described, but provided with an outwardly opening channel portion O^2 for receiving a gasket or packing strip O^3. This is adapted to seat against the flange C^3 of the stationary auxiliary frame to form a sealing joint therewith. The ventilator is held in position by lugs O^4 projecting downward from the lower bar and engaging the outer side of the flange C^3, while at the top there is provided a locking lever P for engaging a keeper P' on a muntin bar P^2. When this lock is released the ventilator sash O can swing outward, but its movement is limited by stop flanges Q secured to the opposite side bars of this sash and engageable with the flange C^3 of the stationary frame.

With all the modifications as above described, the auxiliary window is easily attached to the main window and removed therefrom when not needed. When in position it not only provides an air space between the main and auxiliary windows, but also thermally insulates the metallic frame of the main window. Furthermore, as the bars of the auxiliary window are formed of sheet metal and are hollow, the air enclosed will provide additional insulation. The obliquely extending portion of the auxiliary frame rail will provide clearance for the operator of the main window, as indicated at R, Figure 10.

In Figures 18 to 22 are shown modified constructions more particularly designed for use where it is necessary to provide greater space between the auxiliary window and the main window, as for instance where close-in type of operating handles and locking means are used. For such constructions, in place of the weatherstrip D a modified form of weatherstrip S is used. This is provided with a shank portion S' similar to the shank D' for engaging the undercut groove

in the frame, also a hollow body portion S^3 and an obliquely extending flap S^2 similar to the flap D^4. The hollow body portion S^3 is of sufficient diameter to provide the additional space required between the auxiliary window and the main window and while forming a resilient cushion, nevertheless, has sufficient rigidity to hold the auxiliary window outward against its securing clips. An additional advantage of this construction is that space is provided for the locking latch T which secures the ventilator section T' to the frame bar T^2. This latch when engaged with the bar T^2 will laterally displace the hollow body S^3 which is sufficiently yielding to permit such action.

One difficulty encountered in the use of storm windows is the accumulation of condensation or frost on the inside surface of the outer window. This is due to the fact that warm air from the inside of the room normally has a higher moisture content than the cold outside air and, therefore, when the outside temperature chills the outer window glass, condensation may occur from the higher moisture content air between the windows. If the seal of the auxiliary window against the exterior window is good, this will minimize access of the warm air from within the house to the space between the windows, but this alone will not prevent condensation if the temperature of the inside surface of the glass in the outside window is below the dewpoint of the air between the main and auxiliary windows. To avoid this difficulty we have provided air communication from the outside to the space between the windows. This may be sufficiently restricted to not materially interfere with the heat insulating properties of the double window, but, nevertheless, will permit a slow exchange of cold air from outside which is lower in moisture content to replace the warmer air between the windows. As soon as this replacement air comes in contact with the auxiliary window, it will be to some extent heated, which will lower its relative humidity and render it capable of absorbing additional moisture and thus the moisture therein will not condense out and if there is any condensation on the inner face of the outer glass, this will soon be absorbed.

The effect just described can be readily obtained with windows that have external ventilator sections by merely leaving such ventilator slightly ajar. This need only allow greater ease of ingress to the space between windows of air from the outside than air from the inside. Where, however, the windows are stationary, other means must be provided. In case of a window having both stationary and ventilator sections, the desired result may be obtained by providing air communication between the space having the ventilator and that between the stationary panels. This is illustrated in Figure 26 in which U is a ventilator section of the main window, U' a stationary section and U^2 and U^3 sections of the auxiliary window respectively opposite the sections U and U'. Instead of seating the rails U^4 of the auxiliary windows against the dividing bar U^5 between the sections U and U', we have connected said rails U^4 of the sashes U^2 and U^3 by a strip U^6, preferably of H-shaped cross section. This strip which may be made of rubber or other suitable material forms a seal between the adjacent auxiliary window sashes, but as it is separated from the bar U^5 by a space U^7, this will permit air exchange between the section containing the ventilator and the stationary section. With windows that have no ventilator section the same effect may be obtained by boring a hole V through the muntin V' of the outer window, this permitting sufficient circulation for the gradual exchange of air.

For certain installations it may be necessary to replace the fasteners E, F previously described, with other securing means. For instance, where there is but slight clearance between the auxiliary window and the casement, there may not be room for the screws F and clips E. Also, as the screws F engage tapped holes in the window frame which are usually made prior to installation, these may become filled or accidentally covered during the erection of the building. We have, therefore, provided a fastening means which can be applied whenever the auxiliary window is to be placed in position, this being shown in Figures 23, 24 and 25. As indicated in Figure 23, the auxiliary window W has only a slight clearance between the same and the casing W' of the window opening. This casing may be formed of a finishing strip or moulding W^2 which is in close proximity to the outer rail of the window W. Secured to this strip W^2 by screws W^3 is a sheet metal member W^4 having a return-bent hook W^5, which hook is inclined from top to bottom. W^6 is an angle strip having the edge of one of its sides oppositely inclined from center to ends, as indicated at W^7 and at an angle substantially the same as that of the hook W^5. To secure the auxiliary window it is placed against the main window frame with its opposite side bars adjacent to the members W^4 on opposite sides of the casing, after which the angle members W^6 are inserted with the flange having the inclined edge W^7 engaging the hook W^5. By then pressing down this angle piece, the opposite flange thereof will press against the auxiliary window and hold it in position.

Where the clearance between the auxiliary window and the casing is greater than illustrated in Figure 23, it may be necessary to modify the construction of securing means, as shown in Figure 28. In this figure the member has an offset portion X' terminating in the return-bent hook X^2. The angle piece W^6 is the same as that previously described, but because of the offset the hook X^2 will be opposite the bar of the auxiliary window, even where the latter is separated some distance from the casement. The advantage of this construction as well as that just previously described, is that it can be quickly applied and is not dependent upon the boring of holes or other work performed prior to the installation of the window. A further advantage is that there is no metal-to-metal contact between the fastening means and the auxiliary window frame, thereby further minimizing heat losses.

What we claim as our invention is:

1. The combination with a main window having metallic parts, of an inside auxiliary window having metallic parts registering with a portion only of the metallic parts of said main window, sealing and heat insulating means interposed between the registering metallic parts and having an extension for covering substantially all of otherwise exposed metallic parts of said main window, and securing means for said auxiliary window.

2. The combination with a main window provided with a metallic frame, of an inside auxiliary window having a metallic frame registering with a portion only of the metallic frame of said main window, sealing and heat insulating means inter-

posed between said main and auxiliary frames provided with an extension for covering substantially all of an otherwise exposed portion of the metallic frame of said main window, and securing means for said auxiliary window.

3. The combination with a main window having a metallic frame, of an inside auxiliary window having a metallic frame registering with a portion only of the frame of said main window and spaced therefrom, a flexible sealing and heat insulating strip interposed between said main and auxiliary frames and including a portion for covering substantially all of an otherwise exposed portion of said main window frame, and means for securing said auxiliary window in position.

4. The combination with a main and an inside auxiliary window having registering metallic parts and means for holding the same in spaced relation there being other parts not in registration, of sealing and heat insulating means interposed between said registering parts comprising a strip of flexible resilient material secured to the one having a sealing portion, and a laterally extending flap for covering substantially all of an otherwise exposed metallic portion of said main window.

5. The combination with a main and an auxiliary window having registering metallic parts and means for holding the same in spaced relation, of sealing and heat insulating means interposed between said metallic parts comprising a flexible resilient strip having a shank portion secured to the metallic part of said auxiliary window, a sealing portion, and a flap projecting laterally from said sealing portion and covering an otherwise exposed metallic portion of said main window.

6. The combination with a main and an auxiliary window having registering metallic parts and means for holding the same in spaced relation, of sealing and heat insulating means interposed between said metallic parts comprising a flexible resilient strip having a shank portion secured to the metallic part of said auxiliary window, a tongue portion for pressing against a metallic part of the main window to form a seal, and a flap projecting obliquely from said tongue portion to contact with and cover an otherwise exposed metallic part of the main window.

7. The combination with a main and an auxiliary window having registering metallic parts and means for holding the same in spaced relation, of sealing and heat insulating means interposed between said metallic parts comprising a flexible resilient strip having a shank portion secured to a metallic part of said auxiliary window, a tongue portion for pressing against a metallic part of the main window to form a seal, and a pair of flaps projecting obliquely on opposite sides of said tongue portion to bear against and cover otherwise exposed metallic portions of said main window.

8. The combination with a main and an auxiliary window having registering metallic parts and means for holding the same in spaced relation, of sealing and heat insulating means interposed between said metallic parts comprising a flexible resilient strip including a shank portion having a dovetail engagement with the metallic part of said auxiliary window, a tongue portion for pressing against and forming a seal with a metallic part of said main window, and obliquely inclined flaps on opposite sides of said tongue portion for contacting with and covering otherwise exposed metallic portions of said main window.

9. In an auxiliary window, a frame bar of a cross section having a portion for seating the glass, and a portion extending obliquely therefrom laterally outward and toward the plane of the main window terminating in a portion for registering with the main window frame, the latter portion having a laterally outwardly extending ledge or shoulder for engagement with securing means.

10. In an auxiliary window, a hollow frame bar of a cross section having a flanged portion for seating the glass, and a portion extending obliquely therefrom laterally outward and toward the plane of the main window terminating in a portion for registering with the main window frame, the latter portion having a laterally outwardly extending ledge or shoulder for engagement with securing means, said bar being also provided with grooves for respectively receiving the glass holding splines and for engaging a sealing strip.

11. In an auxiliary window, a hollow frame bar formed of sheet metal and of a cross section having a return-bent portion forming an inwardly extending flange for seating the glass, an opposite return-bent portion forming a groove for the glass holding splines, parallel obliquely extending portions terminating in a laterally outwardly extending portion which forms a ledge or shoulder for engagement of securing means.

12. In an auxiliary window, a hollow frame bar formed of sheet metal having a return-bent portion forming an inwardly extending flange for seating the glass, an opposite return-bent portion forming a groove for the glass holding splines, and parallel obliquely extending portions terminating in a lateral outwardly extending portion which forms a ledge or shoulder for engagement with securing means, the latter portion being also provided with a return-bent portion forming a groove for securing thereto a sealing strip.

13. In an auxiliary window, a frame formed of outer and intermediate bars all provided with projecting flanges forming seats for the glass, and a ventilator section located between spaced bars of said frame, said section having a frame formed of bars with outwardly extending flanges for overlapping the flanges of the bars of the aforesaid frame, inwardly extending flanges forming a seat for the glass, a sealing gasket between the overlapping flanges, and lugs on one of the bars of said ventilator frame spaced from the outwardly projecting flange thereof to embrace the overlapped flange of the first mentioned frame and forming in connection therewith a hinge for the ventilator.

14. In an auxiliary window, a frame formed of outer and intermediate bars all provided with projecting flanges forming seats for the glass, and a ventilator section located between spaced bars of said frame, said section having a frame formed of bars with outwardly extending flanges for overlapping the flanges of the bars of the aforesaid frame, inwardly extending flanges forming a seat for the glass, a sealing gasket between the overlapping flanges, lugs on one of the bars of said ventilator frame spaced from the outwardly projecting flange thereof to embrace the overlapped flange of the first mentioned frame and forming in connection therewith a hinge for the ventilator, and means for limiting the swinging movement of said ventilator frame on said hinge.

15. The combination with a main window, of an auxiliary window secured in registration therewith, an operator for said main window extending through an opening in the glass of said auxiliary window, and a grommet formed of flexible material within said opening for sealing with said operating means.

16. The combination with a main window having metallic parts, of an auxiliary window having registering metallic parts and sealing and heat insulating means interposed between the registering metallic parts of said main and auxiliary windows including a hollow flexible and resilient strip, and a flap projecting from said strip to cover an otherwise exposed portion of the metallic parts of said main window.

WILLIAM CLIFTON RANDALL
CLYDE W. KELLY.