May 10, 1938. G. H. LENKE 2,116,838

DOUBLE GLAZED SKYLIGHT

Filed Jan. 28, 1937 3 Sheets-Sheet 1

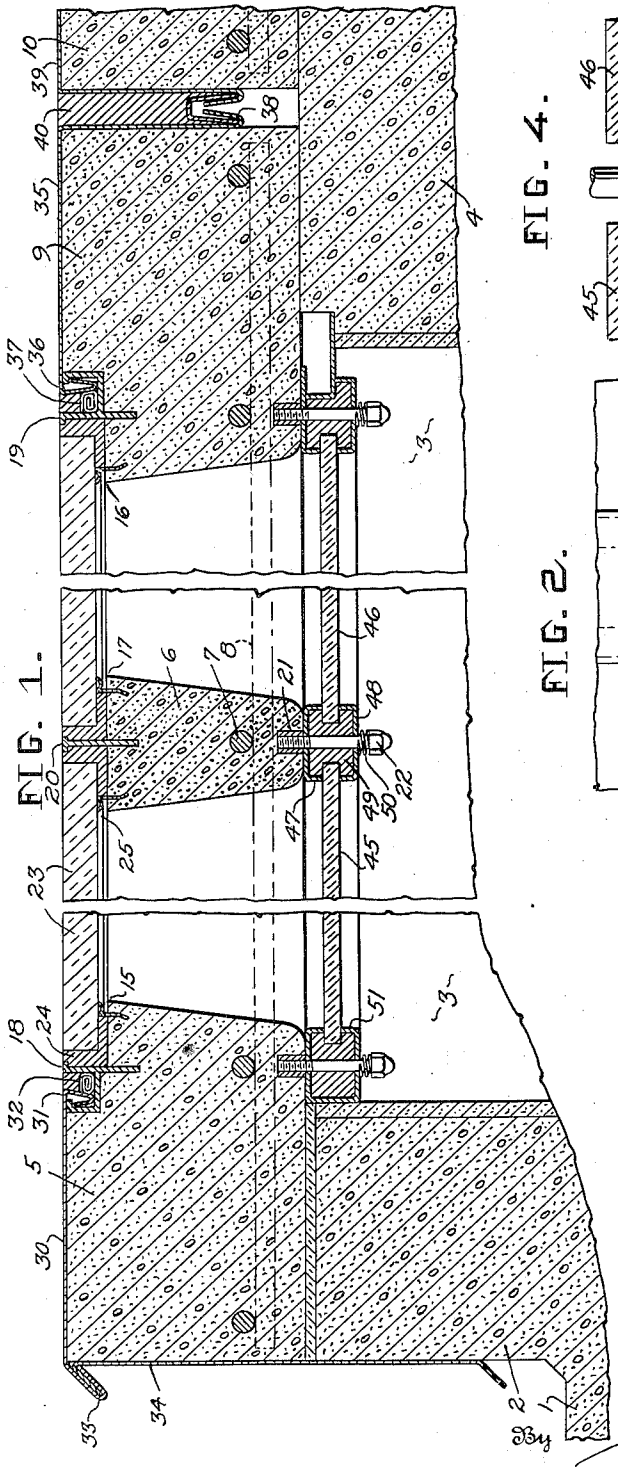


FIG. 1.

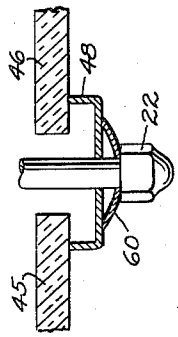


FIG. 4.

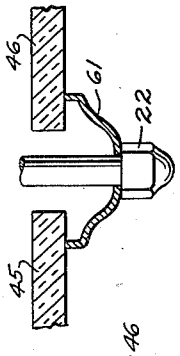


FIG. 5.

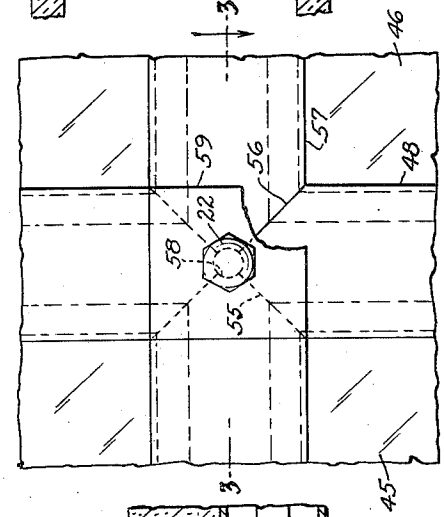


FIG. 2.

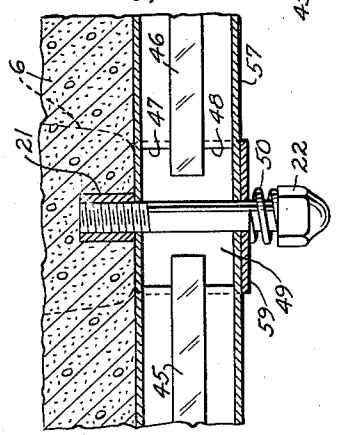


FIG. 3.

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DOUBLE GLAZED SKYLIGHT

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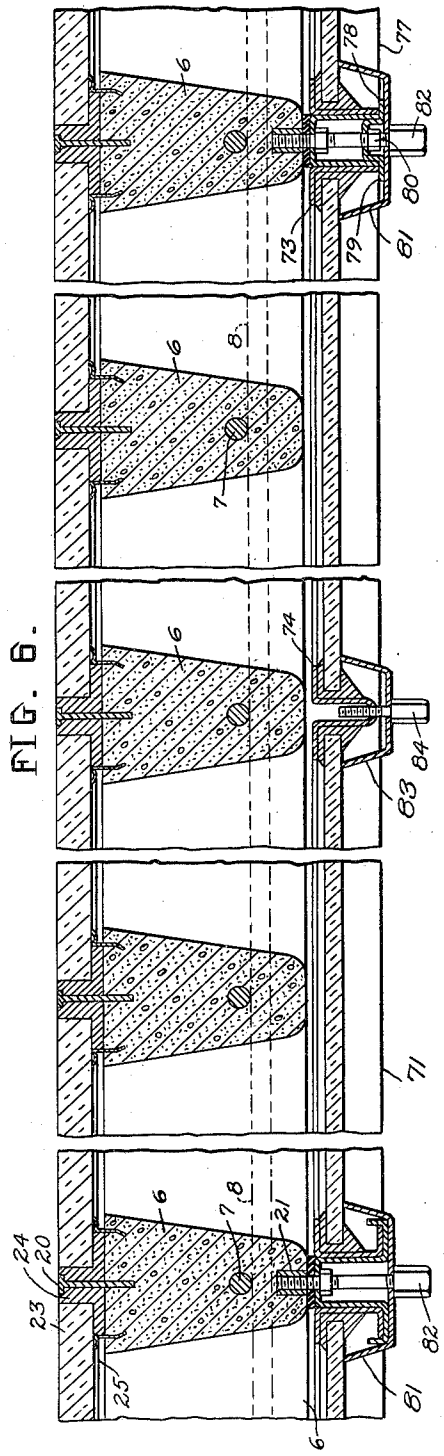


FIG. 6.

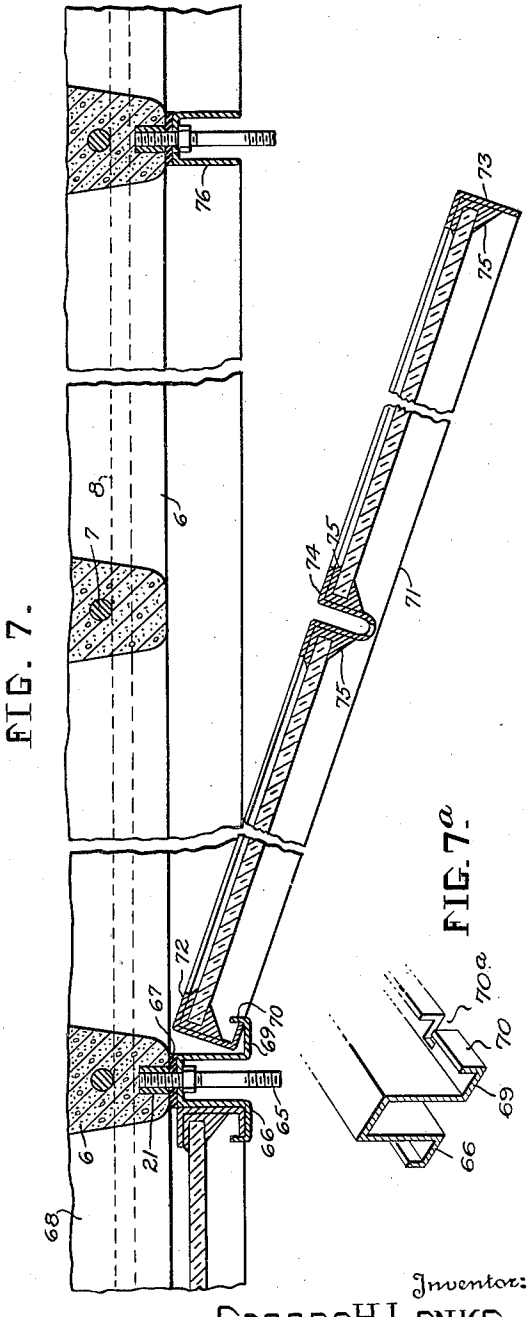


FIG. 7.

FIG. 7a.

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DOUBLE GLAZED SKYLIGHT

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FIG. 8.

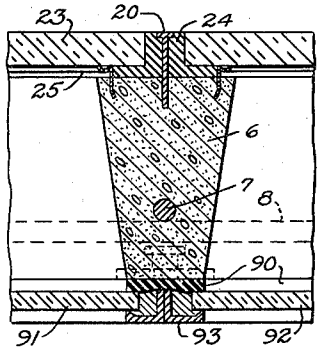


FIG. 9.

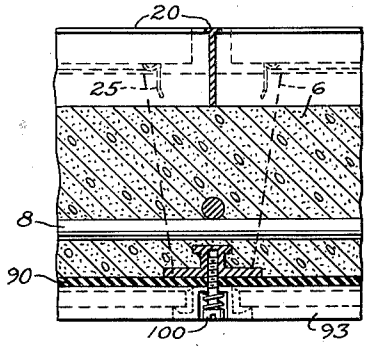


FIG. 10.

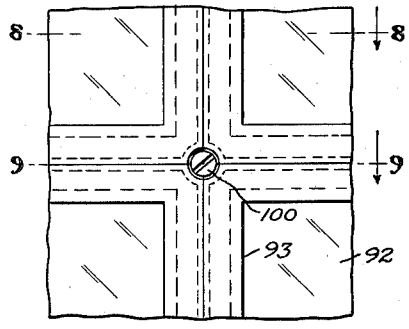


FIG. 11.

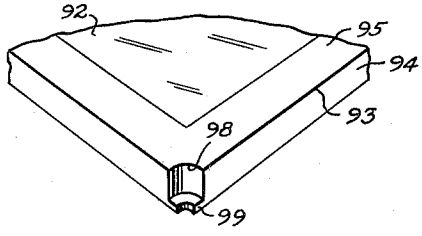
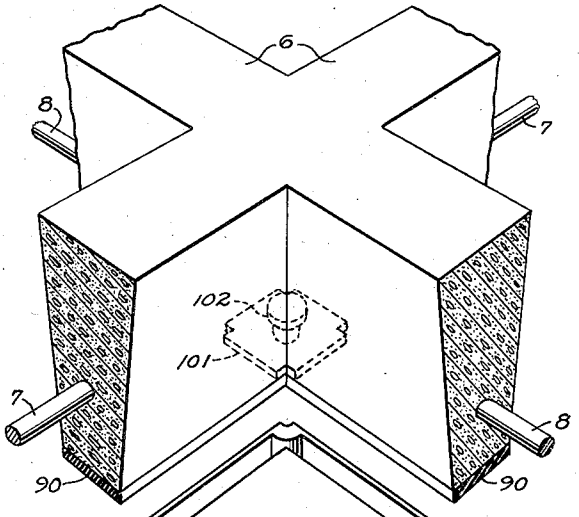


FIG. 12.



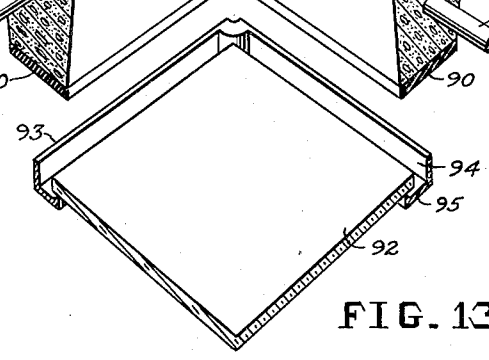
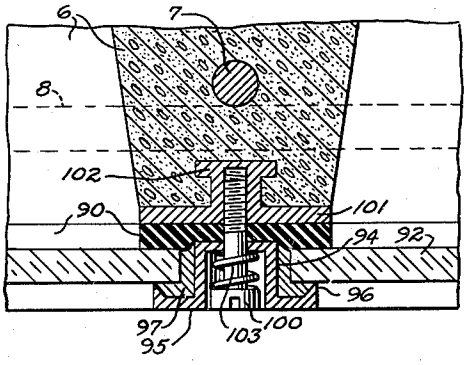


FIG. 13.

FIG. 14.



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Patented May 10, 1938 2,116,838

UNITED STATES PATENT OFFICE

2,116,838

DOUBLE GLAZED SKYLIGHT

George Henry Lenke, Elmhurst, Ill., assignor of one-half to Julius J. Ohlis, Oak Park, Ill.

Application January 28, 1937, Serial No. 122,849

18 Claims. (Cl. 108—16)

This invention relates to skylights and similar devices having for its object to provide a construction which is simple in parts and more efficient in use than those heretofore proposed.

With these and other objects in view the invention resides in the novel details of construction and combinations of parts as will be disclosed more fully hereinafter and particularly pointed out in the claims.

Referring to the accompanying drawings forming a part of this specification and in which like numerals designate like parts in all the views,—

Fig. 1 is a vertical sectional view through a skylight showing one form of this invention;

Fig. 2 is a partial bottom plan view of the junction of a plurality of lower skylight panes;

Fig. 3 is a vertical sectional view of the parts shown in Fig. 2 taken as on the line 3—3 thereof and looking in the direction of the arrows;

Figs. 4 and 5 are detail views of modified means for tensioning the lowermost panes in a skylight;

Fig. 6 is a view somewhat similar to Fig. 1 but showing a modification of the double glazing feature wherein the lower panes are mounted in a hinged sash;

Fig. 7 is a detail sectional view of the parts shown in Fig. 6 with the sash in partially lowered position;

Fig. 7a is a sectional detail view in partial perspective of a portion of a saddle bracket associated with a hinged sash;

Fig. 8 is a detail vertical sectional view showing a modification of the tension securement of the lowermost panes, said view taken as on the line 8—8 of Fig. 10 and looking in the direction of the arrow;

Fig. 9 is a view similar to Fig. 8 but taken as on the line 9—9 of Fig. 10 and looking in the direction of the arrow;

Fig. 10 is a bottom plan view of the modified construction shown in Figs. 8 and 9;

Fig. 11 is a partial perspective view of a corner of the shield for the lowermost panes shown in Figs. 8, 9 and 10;

Fig. 12 is a perspective view showing the junction of two intersecting concrete ribs with their reinforcements, and the metallic socket in the bottom thereof for receiving an anchor bolt;

Fig. 13 is a partial perspective view illustrating the application of a pane to its metal shield; and

Fig. 14 is an enlarged sectional view of the construction shown in Fig. 9.

This invention is particularly directed to skylights, vault lights and other similar structures wherein double glazing is employed, that is to say, where glass panes are provided in spaced planes to provide an air space between the panes. This invention also constitutes an improvement over that disclosed in U. S. Letters Patent No. 2,055,901 granted September 29, 1936 to George H. Lenke entitled Roof light and the like, in that double glazing is employed and a more efficient construction provided with respect to the upper panes and their supports.

Referring to the drawings, and more particularly Fig. 1 thereof, there is disclosed a roof generally indicated by the numeral 1 having an upstanding curb 2 defining or limiting a skylight opening generally indicated by the numeral 3, and 4 indicates an intermediate skylight supporting beam or the upper extremity of a partition wall, or any other structural part of the building, the parts 1, 2 and 4 being illustrated as formed of concrete. The skylight comprises a structure of poured concrete including side portions such as 5 and a plurality of intersecting ribs 6 extending from one side portion to another thereby creating light admitting openings in the skylight as readily understood, the ribs being provided with reinforcing elements 7 and 8 such as metal rods embedded within the concrete portions 5 and 6. 9 indicates another side portion of the skylight structure provided in the way of an underlying partition or structural beam such as 4 which may also support a concrete side portion 10 similar to the portion 9 and defining a side of an adjacent skylight opening, with a space between the portions 9 and 10 to be filled as hereinafter described.

The inner edges of the side portions 5 and 9 are recessed to provide the horizontal surfaces indicated at 15 and 16, and each of the ribs 6 is formed to provide the horizontal upper surface indicated at 17, which surfaces 15, 16 and 17 are in a common plane, and likewise the bottom surfaces of the members 5, 6 and 9 are formed in another common plane parallel to said first named plane.

A metallic grid for the skylight opening 3 is provided comprising a frame having side members indicated by the numerals 18 and 19 which are of substantially Y shape in cross section, and substantially flat grid bars such as 20, each bar centrally overlying a concrete rib, the members 18, 19 and 20 having their upper extremities lying in a common plane and their lower extremities embedded in the concrete of the members 5, 6 and 9. Preferably the extreme upper edges of the members 18, 19 and 20 are flanged as shown, the flange of the outer branch of each Y-shaped side member being inwardly directed or project-

ing in the direction of the companion branch for a purpose which will be disclosed later. Threaded sockets such as 21 extend inwardly from the bottom surfaces of the concrete members 5, 6 and 9 to receive the anchor bolts such as 22 for holding the lower panes in position.

The grid as above described will be understood to form a plurality of cells or openings and therefore the grid bars 20 constitute separators defining openings for receiving the upper panes of glass indicated by the numeral 23, each pane being slightly less in dimension than the size of the pane receiving opening so that, when the pane is properly positioned within its opening, sealing composition 24 may be applied around the marginal edge of each pane to cement it to the metallic grid, the flanges above described on the grid members serving to secure said composition in place.

Before each pane is put into its pane receiving opening in the grid, it has applied to one surface thereof a ring-like metallic seat generally indicated by the numeral 25, said seat being of the same contour as the pane and angularly formed as shown to provide a pane engaging leg and a second leg extending substantially perpendicularly from the surface of the pane. The former leg has a concave formation serving as a reservoir to receive and hold a cementitious compound by means of which the seat is secured to the pane, and the second leg is made thin and suitably formed to be anchored in the concrete of the members 5, 6 and 9, this formation of the second leg being represented in the drawings by a bend but other anchoring means could as well be provided. The seat is applied to the glass pane so as to be substantially centered thereon with the anchoring legs approximately equidistantly spaced from the edges of the pane.

In setting the pane in the grid opening, the anchoring legs are pushed down into the concrete of the members 5, 6 and 9 to bring the top surface of the pane into the plane of the upper extremities of the grid members. The depth of the recesses defining the surfaces 15 and 16 (and therefore the common plane including the rib surfaces 17), and the thickness of the panes 23, are such that when the panes have thus been set in the grid and the concrete structure has hardened, the bottom surfaces of said panes will be spaced above the common plane of the surfaces 15, 16 and 17. Therefore, when the sealing compound 24 is applied, not only will it fill the spaces around the margins of each pane, but it will also flow under the edge portion of the pane to fill the space therebeneath, the anchoring legs of the metallic seat 25 stopping said flow to prevent the sealing compound from smearing the exposed under surface of the pane. The spacing of the seat 25 from the edge of the pane is such that each pane has approximately contact with twice the amount of sealing compound as in heretofore known constructions or, putting it in other words, by this invention substantially twice the amount of surface contact between the pane and the sealing compound is permitted over that heretofore made possible where the sealing compound contacts only the vertical marginal surface of the pane.

In order to protect the top of the concrete members 5 and 9, a sheet of flashing such as 30 is employed, one edge portion thereof being formed with a downwardly extending and inwardly turned V fold as indicated at 31 so that the extreme edge may springingly engage under the flange of the outer branch of the Y side member 18 of the grid and be interlocked therewith, a wedge 32 of soft lead or other suitable material being positioned between the two branches and pressing against said fold to insure this interlocked engagement, the space above said wedge being filled with sealing compound or other suitable filler. The opposite edge portion of the flashing sheet may be suitably joined as by the seam indicated at 33, to the upper edge portion of a vertical sheet of flashing 34 applied to the side of the curb 2. By this construction it is possible to join the flashings 30 and 34 by the seam 33 and then to apply the combined flashings to the curb by simply snapping the V fold 31 into spring locked position with the outer branch of the Y member 18. A second sheet of flashing 35 has one edge portion provided with a similar V fold as indicated at 36 to interlock with the flange of the outer branch of the other Y side member 19, said interlocking being insured against unfastening by a similar wedge 37, the opposite edge portion of said sheet bent downwardly over the surface of the concrete member 9 and the extreme edge upturned as at 38 in the pocket or space between the concrete members 9 and 10. A third sheet of flashing 39, to cover the concrete member 10, is formed similarly to the sheet 35 and an inverted U shaped piece of flashing is dropped over the two upturned edges such as 38 in said pocket, and sealing compound or other suitable filler indicated at 40 packed in said pocket thereover to provide an expansion joint. In other words, though not illustrated for the sake of simplicity in the drawings, it will be understood that the skylight opening 3 with its associated grid framing and glass panes may be wholly or partially duplicated with the concrete portion 10 forming a side thereof, and hence the flashings 35 and 39 are substantially duplicated for such adjacent skylight openings.

The lower glazing is formed as follows. Two panes of glass 45 and 46 are secured in place between two U shaped channel members 47 and 48 with sealing compound filling the interior space 49 between said members and around the marginal edges of the panes, the anchor bolt 22 being threaded into the socket 21 to hold the parts in their assembled position as shown, a helical spring 50 being interposed between the head of the bolt and the under channel member 49 to permit yieldability under changes of temperature as will be readily understood. At the extreme sides of the skylight opening, modified forms of the channels such as 47 may be employed for holding the lower panes, a single box-like member 51 being shown at the left side of Fig. 1 and a fabrication of a plurality of angularly formed members being shown for example at the right hand side of said figure; other variations are possible.

The metallic members for holding the lower panes may be formed as a one-piece grill or they may be individual members, and in the latter case a practical construction is indicated in Figs. 2 and 3 from which it will be observed that the end of each individual member is angularly cut as indicated at 55 and 56 from opposite sides to fit a companion individual member angularly disposed thereto. In other words it is to be understood that the ribs 6 may intersect each other at different angles as desired to form various shaped skylight openings, but from Fig. 2 it

will be obvious that said ribs are disposed at right angles to each other wherefore the end of the lower channel member 48 will have 45° mitre cuts as indicated at 55 and 56, the latter to fit the corresponding mitre cut on the adjacent lower channel member such as 57. The intersection of the mitre cuts is preferably made circular as indicated at 58 to accommodate the shank of the anchor bolt 22, and a plate 59 is provided to cover, and aid in supporting, the meeting ends of the lower adjacent channel members. The upper channel members such as 47 will have their ends similarly mitred.

In Fig. 4 the lower channel such as 48 has a spring clip 60 interposed between it and the head of the anchor bolt 22 to take the place of and perform the function of the helical spring 50 shown in Fig. 3. In Fig. 5 the lower channel member is specially formed as shown at 61 to provide a combination of the parts 48 and 60 illustrated in Fig. 4, the formation 61 serving as a spring cap or spring channel to hold the panes in position under varying temperatures.

Coming now to Figs. 6, 7 and 7*a* it will be seen that the upper glazing is the same as hereinbefore described but that the lower glazing has been modified to provide a hinged section permitting ready access to the space between the upper and lower glasses or panes as well as permitting cleaning of the underside of the upper panes and the upper side of the lower panes. This construction provides the socket 21 embedded in a concrete rib 6 to receive the upper threaded end of a stud 65 having a nut on said threaded end for clamping a saddle bracket 66 to said rib with a strip 67 of yieldable material interposed therebetween as shown, this saddle bracket extending under the full length of the rib 6, or extending a distance thereunder equal to any desired multiple of the spacing of the intersecting ribs such as 68, according to the size of the skylight and/or the weight and size of the hinged section desired. This saddle bracket has a main body portion, of inverted U shape in cross section, the ends of which are outwardly flared to form a stirrup or glazing strip 69 with an upturned edge portion 70 serving as a hook about which the lower sash may turn.

The lower sash may comprise a single glass pane or a multiple thereof, mounted in a frame generally indicated by the numeral 71 one side of which is formed by the channel member 72 and the other three sides of which are formed by angle bars, the channel 72 being provided to fit and rest upon the glazing strip 69 and being capable of pivoting at its lower edge in the stirrup formed by the upturned edge 70 and said glazing strip as will be perfectly clear from Fig. 7. When the sash contains multiple glasses there is provided an intermediate stile member 74 generally of U shape cross section which member is secured at its ends to the sides of the sash, the panes being secured in the sash by sealing compound or any other suitable substance as indicated at 75. It will be understood that the glazing strip 69 with its associated upturned edge 70 will be suitably interrupted (as by the formation of a slot 70*a* therein) in the way of the vertical flanges of the side members of the frame 71 to permit the hinged turning movement of said frame.

The side of the sash opposite its hinge is formed by an angle bar 73 which, when the sash is closed, is adapted to lie adjacent one depending leg of the U bar 76 secured to another rib by a stud in the same manner that the stud 65 secured the saddle bracket 66, it being understood that the other depending leg of said U bar may be adapted to receive thereagainst the free end of another sash 77 similar to the sash 71. To hold the free end of the sash in closed position there is provided a strap clip 78 having a dished central portion adapted to fit the space between the depending legs of the U bar 76 and having outwardly turned flanges such as 79 adapted to fit under the lower edges of said legs as well as the angle bars 73 of the adjacent sashes, said clip being secured in place by a nut 80 threaded on the lower end of the stud. A glazing cap 81 of substantially channel formation is placed under the hinged end as well as the free end of each sash, said cap being held in place by the cap nut 82, and in some cases for appearance a similar intermediate glazing cap 83 may be secured by the bolt 84 tapped into each of the stiles such as 74. In unfastening or fastening a sash, the nut 80 can be backed off its stud slightly to allow the tilting of the strap clip 78 sufficiently to permit its flange 79 to release the angle bar 73. The glazing caps 81 and 83 may be of a size to cover only the area immediately surrounding a stud, or they may be made elongated to span two or more studs.

Coming now to the modifications shown in Figs. 8 to 14 it will be observed that the upper glazing is similar to that previously described but that in the lower glazing the metallic springs have been omitted and in their place strips 90 of rubber or other compressible material are cemented to the under surface of the concrete ribs 6 and that the upper surfaces of the lower panes such as 91 and 92 are pressed up against these rubber strips to form a seal which is yieldable under temperature variations.

There is provided a metallic shield or frame generally identified by the numeral 93 the sides of which comprise a vertical flange 94 and a horizontal flange 95 the extreme edge of the latter being upwardly directed and relatively sharpened as at 96 to provide a minimum of contact with the under surface of the pane. A space is provided between the margins of the pane and each vertical flange 94, which space is filled with sealing compound or the like as indicated at 97, said compound passing under the edge portions of the pane and filling the space created by the raised edge 96 of said shield. Each corner of the shield is provided with a quarter round recess 98 having the bored bottom wall or shoulder 99 for accommodating respectively the head and the shank of a bolt 100 threaded into a socket member 101 secured in the bottom of the concrete ribs by virtue of an enlarged anchor portion or button 102. A helical spring 103 is positioned between the bolt head and the shoulder 99 to hold the shield under tension against the rubber strip 90.

It is obvious that those skilled in the art may vary the details of construction and arrangements of parts without departing from the spirit of this invention and therefore it is not desired to be limited to the exact foregoing description except as may be demanded by the claims.

What is claimed is:

1. In a structure of the class described the combination of a metal grid consisting of pane separators defining pane receiving openings; panes mounted in said openings in spaced relation to said separators; a filler between said panes and said separators; a concrete support for said separators; and rigid means for supporting said

panes in said openings entirely independently of said grid, said means anchored within the concrete support and spacing said panes from a surface thereof.

2. As an article of manufacture, a grid comprising a frame having side members of generally Y-shaped section, and substantially flat grid bars extending between the sides of said frame, the outer branch of each side member having an inwardly directed edge.

3. In combination, a concrete support, a metal grid embedded in said support and comprising metal separators defining grid openings; panes mounted in said openings; and metallic means for supporting said panes in said openings, said means spaced from said separators and anchored in said concrete support.

4. In combination, a grid comprising a frame, a pocket formed in the upper surface of said frame, a lip extending inwardly of said pocket at the upper extremity of the outer side wall of the pocket, and a flashing formed separately of said grid and having an infolded edge adapted to snap over and be springingly interlocked with the lower surface of said lip.

5. In combination, supporting means, a pair of grids carried by said supporting means, a flashing associated with each grid said flashing covering said supporting means and springingly interlocked with its associated grid, a pocket in said supporting means between said grids and into which each flashing extends, and means to secure the end of each flashing in said pocket.

6. In combination, a support, a grid carried by said support, and having an inturned outer edge, and a flashing formed separately of said grid, said flashing covering said support and having an infolded edge adapted to snap over and be springingly interlocked with the lower surface of the grid edge.

7. In a skylight construction the combination with a concrete framework provided with a plurality of openings, light transmitting panes for the openings, said framework being disposed wholly beneath said panes along the joints between adjacent panes, and metal pane-receiving shields separate from and anchored in the concrete about the openings so as to leave the adjacent concrete exposed, of means engaging the panes and embedded in the concrete for spacing the panes from said shields and the concrete so as to leave the concrete exposed along and under the edge portions of the adjacent panes, and means engaging the panes and the shields for covering the exposed concrete.

8. In a structure of the class described, the combination of a pair of panes, a metallic seat attached to each pane, a concrete support in which is embedded said metallic seat, said concrete support supporting adjacent margins of said panes and having its upper surface spaced wholly below the under surfaces of said panes by virtue of said metallic seats, a rigid metal separator embedded in said concrete support and disposed between and spaced from adjacent margins of the panes, and a water-proof sealing filler interposed between the separator and the adjacent margins of the panes and filling the space created by said metallic seats.

9. A skylight structure comprising side members and ribs extending from one side member to another; upper glazing mounted upon said members and said ribs; and lower glazing mounted in rigid frames secured to the under surfaces of said members and said ribs, said securement adapted to permit movement of said frames in a direction away from the upper glazing.

10. A skylight structure comprising side members and ribs extending from one side member to another; upper and lower glazing supported by said structure one of said glazings mounted in a rigid frame; and yielding means to permit relative movement of said frame and its contained glazing in a direction away from the other glazing.

11. A skylight structure comprising side members and ribs extending from one side member to another; upper glazing mounted upon said members and said ribs; and lower glazing secured to the under surfaces of said members and said ribs, said lower glazing consisting of metallic framing elements and panes carried thereby, said elements being of rigid channel-like formation and containing therein a bonding substance between said elements and said panes, said elements having a headed device passing therethrough by which the framed glazing is secured in position, and spring means for varying the tension between said device and said elements.

12. A skylight structure comprising side members and ribs extending from one side member to another; upper glazing mounted upon said members and said ribs; and lower glazing hingedly mounted to the under surfaces of said members and said ribs.

13. A skylight structure comprising side members and ribs extending from one side member to another; upper glazing mounted upon said members and said ribs; and lower glazing secured to the under surfaces of said members and said ribs, said lower glazing consisting of a metallic frame and panes carried thereby, a saddle bracket carried by a rib and having hinged relation with one of the frame elements, and a strap clip associated with another rib for supportingly engaging another of the frame elements to hold the frame in latched position.

14. A skylight structure comprising side members and ribs extending from one side member to another; upper glazing mounted upon said members and said ribs; and lower glazing secured to the under surfaces of said members and said ribs, said lower glazing consisting of a plurality of panes, a metallic shield for each pane, each shield provided with a corner recess adapted to contain only a portion of the securing means, and a bolt serving as the securing means and threadingly engaging a rib, said bolt substantially filling the combined recesses of a plurality of adjoined shields, said bolt provided with spring means for varying the tension between the bolt head and a wall of said recesses.

15. In a skylight construction the combination with a concrete framework provided with a plurality of openings, light transmitting panes for each opening and comprising an upper pane and a lower pane, said framework being disposed wholly beneath said upper panes along the joints between adjacent panes, and metal pane-receiving shields one for each pane and separate from each other and anchored to the concrete about the openings, of means engaging the upper panes and embedded in the concrete for spacing the upper panes from their shields and the concrete so as to leave the concrete exposed along and under the edge portions of the adjacent upper panes, the lower shields yieldably anchored to the concrete framework, and bonding means engaging and covering the exposed surfaces be-

tween each pane and its shield as well as the exposed surfaces between each upper pane and the underlying concrete.

16. In skylight construction the combination of a pane; a metallic shield for said pane; a support for said shield; and a metallic seat for said pane independent of said shield and having a portion anchored within said support.

17. In a skylight construction the combination of upper and lower glazing and means to secure the same to frame members of the skylight, one of said glazings mounted in a rigid frame; and additional means for rendering yieldable said rigid frame and its contained glazing to permit movement thereof in a direction away from the other glazing.

18. In a skylight construction the combination of upper and lower glazing and means to secure the same to frame members of the skylight, one of said glazings mounted in a rigid frame with its securing means passing through said frame; and additional means for rendering yieldable said rigid frame and its contained glazing to permit movement thereof in a direction away from the other glazing.

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