

June 30, 1953

T. H. PICKERING ET AL

2,643,744

SASH CONSTRUCTION

Filed Jan. 15, 1947

4 Sheets-Sheet 1

FIG. 1

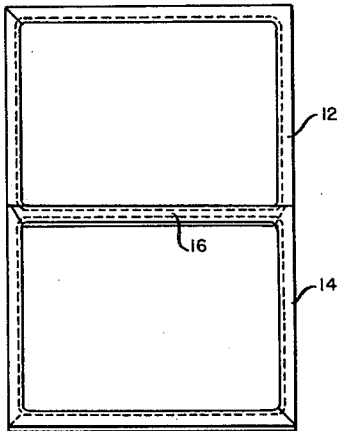


FIG. 2

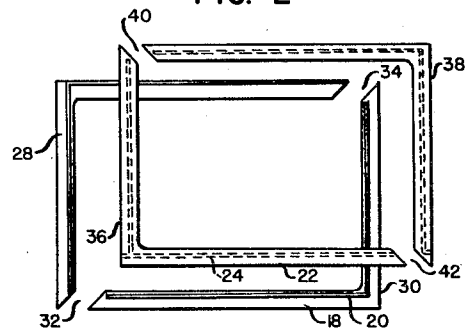


FIG. 3

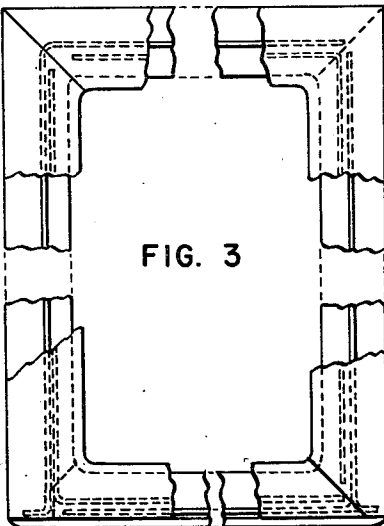


FIG. 4

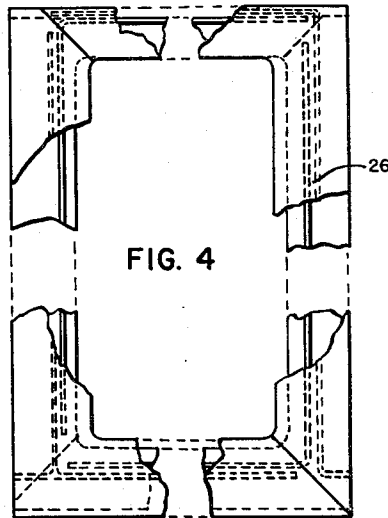
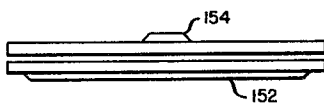


FIG. 5

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4 Sheets-Sheet 3

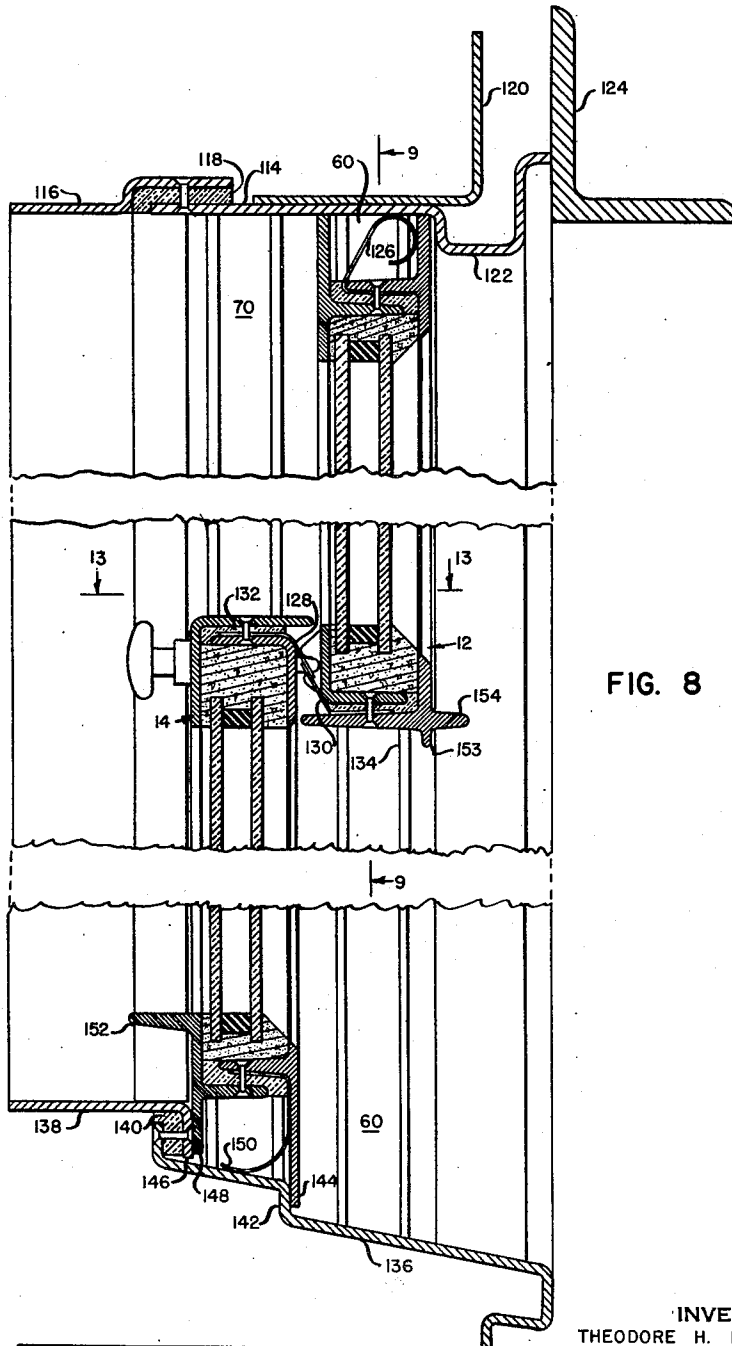


FIG. 8

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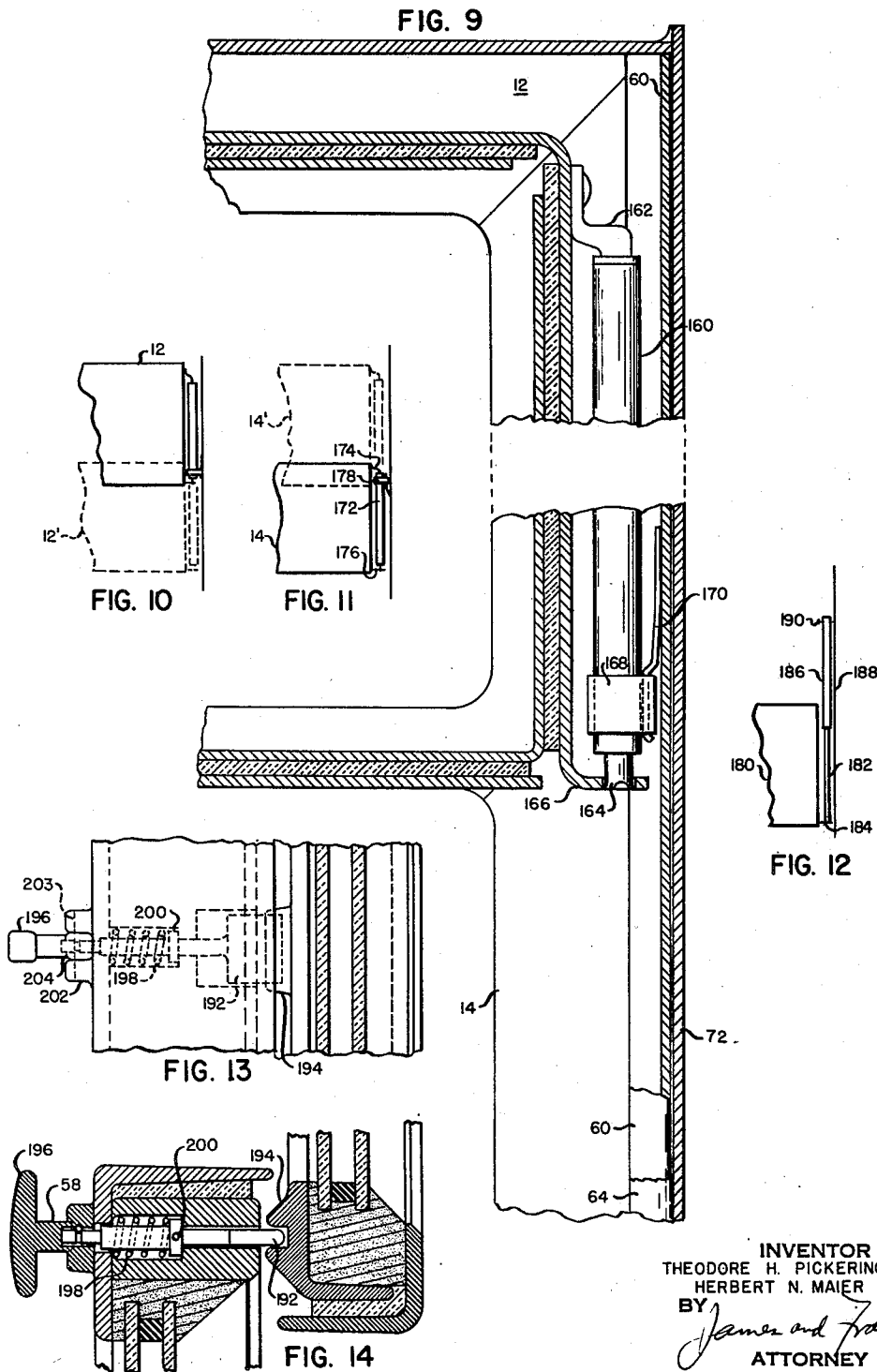
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SASH CONSTRUCTION

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4 Sheets-Sheet 4



UNITED STATES PATENT OFFICE

2,643,744

SASH CONSTRUCTION

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6 Claims. (Cl. 189—76)

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This invention relates to windows, and more particularly to double hung windows having metal sash.

The primary object of the present invention is to generally improve windows, especially windows of the double hung type.

Metal windows have already been used in an effort to overcome the known disadvantages of wood windows. However, metal windows suffer from the disadvantage of "sweating," that is, condensing moisture on the inside. They are also cold to the touch during winter. One object of the present invention is to overcome the foregoing difficulty, and this is done by forming each sash with an outside section and an inside section, said sections being assembled with a layer of heat insulating material therebetween. If the window frame too is made of metal, as is preferably the case, it too is formed of an inside section and an outside section assembled together with heat insulation therebetween. There is accordingly no direct thermal transfer between the metal parts exposed outside the building and the metal parts exposed inside the room.

Still another object of the present invention is to make it possible in a practical way to die cast the window sash, and ancillary objects made possible by die casting, are to provide rounded inside corners for the sash, thereby facilitating cleaning the glass; to provide handle ledges cast integrally with the upper sash and the lower sash; to provide a lock housing and latch for locking the window; and to provide appropriate fittings for cooperation with sash balances. The inside and outside sections of the sash might each be molded in one piece. However, this has the disadvantage of requiring a large die which produces only one piece at a time, and the further disadvantage of making the fit between the inside and outside sections relatively critical, considering the problems of shrinkage and warping of the casting, etc. In accordance with an important feature and object of the present invention, these difficulties are overcome by making the outside section of two pieces, preferably meeting at diagonally opposite corners, while the inside section is made of two pieces preferably meeting at the other two corners. Thus the sections strengthen and rigidify the sash and hold it in square formation. At the same time the parts may be assembled tightly together without critical fit between the inside and outside sections.

Still further objects of the present invention are to provide a sash which is adapted to take any of the modern double-pane or thermal insulating glass; to provide a sash having an edge channel adapted to slide on an internal sash guide; to make the edge channel large enough to further receive a torque type sash balance, and also weather stripping. These objects are ful-

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filled by forming the inside and outside sections each with a face and a web, these sections being assembled with the webs overlapping with a layer of heat insulating material therebetween, and said webs being made of substantial depth. This makes the inside of the sash deep enough to receive thermal insulating glass, and at the same time forms an edge channel between the aforesaid faces and outside the aforesaid webs, which channel is large enough to receive an internal sash guide, a torque type sash balance, and weather stripping.

To accomplish the foregoing objects, and other more specific objects which will hereinafter appear, our invention resides in the window elements and their relation one to another, as are hereinafter more particularly described in the following specification. The specification is accompanied by drawings, in which:

Fig. 1 is a front elevation showing upper and lower sash;

Fig. 2 is explanatory of the method of assembly of the parts of a sash;

Fig. 3 is an elevation of the upper sash at the corners thereof;

Fig. 4 is an elevation of the lower sash at the corners thereof;

Fig. 5 is a schematic view in plan showing the outwardly and inwardly projecting handle ledges of the upper and lower sash;

Fig. 6 is a horizontal section through one side of the window, with the sash in overlapping relation;

Fig. 7 is a similar view showing a modification of the weather stripping;

Fig. 8 is a vertical section through the window;

Fig. 9 is a vertical section taken approximately in the plane of the line 9—9 of Fig. 8;

Figs. 10 and 11 are schematic figures explanatory of the mounting of the sash balances;

Fig. 12 is a schematic figure explanatory of the mounting of a modified sash balance;

Fig. 13 is a horizontal section taken approximately in the plane of the line 13—13 of Fig. 8; and

Fig. 14 is a vertical section through the lock.

Referring to the drawing, and more particularly to Fig. 1, the invention is here described as applied to a window of the double hung type, it comprising an upper sash 12, and a lower sash 14. These sash overlap at the middle or so-called meeting rail 16.

In accordance with the present invention, each sash has an outside section and an inside section, which are assembled with heat insulating material therebetween. Referring to Fig. 2, the outside section has a face 18, and an inwardly projecting web 20, while the inside section has a face 22 and an outwardly projecting web 24. When the inside and outside sections are assem-

bled together, there is a space between the webs, as is indicated at 26 in Fig. 4, and heat insulating material is placed in this space and is so arranged that there is no metal to metal contact between the outside section and the inside section.

To facilitate manufacture of the sash by die casting, each section is cast in several parts. In preferred form the parts are angle pieces, as is best shown in Fig. 2, the outside section being made up of two angle pieces 28 and 30, which meet at corners 32 and 34, while the inside section is made up of two angle pieces 36 and 38, which meet at the intermediate or alternate corners 40 and 42. When the parts are assembled the angle piece 36 holds the pieces 28 and 30 in square formation at the corner 32. The angle piece 38 similarly shapes the corner 34, and the angle pieces 28 and 30 similarly support the corners 40 and 42 respectively. Thus the resulting sash is sturdy and rigid, and accurately retains its square formation.

Referring now to Fig 6 of the drawing, the upper sash 12 comprises an outside section having a face wall 44 and a web 46, while the inside section has a face wall 48 and a web 50. Heat insulation 52 is disposed therebetween. The webs 46 and 50 are relatively wide, thus giving the inside of the sash ample depth to readily receive a double pane or thermal insulating glass 54. This is held in the sash by using metal clips which may be standard glazier's clips for steel sash, such clips being made of spring wire, or may be special clips devised and sold by the manufacturers of the thermal insulating glass. An edge channel is formed between the spaced faces 44 and 48, outside the web 46. This channel is preferably large enough to receive both an internal sash guide 60 and a torque type sash balance 62. Weather stripping 64 is also disposed in the channel.

The lower sash 14 is generally similar to the upper sash 12, except for a reversal in the position of the webs, the web 66 coming inside, instead of outside the web 68. The reason for this will be clear from examination of the section through the meeting rails in Fig. 8, it being desirable to make the weather side or outside closed. It also facilitates mounting of the weather stripping at the meeting rails.

Both sash run on sash guides 60 and 70, said guides being detachably secured to a window frame 72. The said frame is preferably made of metal, and if made of metal is preferably insulated between the outside and the inside of the building. Specifically, the frame comprises an outer section 74, and an inner section 76, the said sections overlapping with insulation 78 therebetween. It will be understood that in all cases the inside and outside sections are suitably secured together, preferably by means of a plurality of rivets. These rivets are indicated at 80 for upper sash 12, at 82 for lower sash 14, and at 84 for the frame 72. The frame further includes anchors 86. For use during assembly, and for the sake of appearance, rather than to act as a sash guide, the frame is preferably provided with an outer bead 88 which may be formed integrally as here shown, and an inner bed 90 which is made separately from the frame and is detachably secured thereto by fastener means, specifically screws 92. These screws are flush or countersunk.

In Fig. 6 the weather stripping consists of a thin band of metal bent to channel shape or U-shape, said band being disposed outside the sash guide. The outward expansion of the weather strip causes it to bear against the inside of the sash channel as is clearly shown at 64. The sash

guide is detachably secured to the frame, as by means of countersunk or flush screws 94. These screws pass through the weather strip 64. However, the weather strip is preferably preliminarily fastened to the sash guide, so that the workmen assembling the window at the building do not have to handle these as separate parts.

A modified form of weather stripping is illustrated in Fig. 7. Referring to that figure, the frame 94 and the lower sash 96 are generally similar to those previously described. The weather stripping, however, has been modified, and instead of using a single U-shaped piece of spring metal as in Fig. 6, there are two L-shaped strips, one being the strip 98 secured to the frame 94, and the other being the strip 100 secured to the sash 96. One side of strip 98 is preliminarily fastened to the sash guide 102. The other side of strip 98 bears against the inside of the edge channel of the sash. Strip 100 has one side secured between the insulation 104 and the web 106. The weather stripping action of these parts, as well as their tendency to take up clearance and prevent rattling in a high wind, will be self-evident. It will also be seen that the weather stripping arrangement of Fig. 7 has an advantage over that shown in Fig. 6, in that there is no metal to metal contact between the outside section and the inside section of either the sash or the frame. Strip 98 contacts the outside section of the frame. Strip 100 contacts the outside section of the sash.

The weather stripping for the upper sash 108 is similar to that already described for the lower sash 96. The webs 110 and 112 are arranged like those for the lower sash, instead of being reversed as shown in Fig. 6. At the lower corners of the upper sash the web is broken so that the two halves may cross to provide the relation shown at the meeting rails in Fig. 8.

Additional features of the window may be described with reference to Fig. 8 of the drawing, this being a vertical section with intermediate parts cut away to localize the view to the head at the top, the meeting rails at the center, and the sill at the bottom. Referring to Fig. 8, it will be seen that the top of the frame, like the sides already described, comprises an outer section 114 and an inner section 116 separated by heat insulation 118. The frame may further include anchors 120, and an outside bead 122. No inside bead need be provided, and none is shown, but one may be added, if desired. The lintel shown at 124 forms a part of the building structure, and may be made of steel, as shown, or of wood or stone. The head is simpler than the jambs because there is no need to provide sash guides. The weather strip is also simple, it comprising a single spring metal member 126, the bottom of which is anchored in the sash, and the top of which bears resiliently against the head when the sash is drawn to its uppermost position shown in the drawing.

The meeting rails are provided with weather strips 128 and 130. The upper part of strip 128 is secured between the outside and inside sections of lower sash 14. The lower part of weather strip 130 is secured between the outside and inside sections of upper sash 12. It will be understood that weather strip 128 is secured outside the insulation 132, and the weather strip 130 is secured inside the insulation 134, thus avoiding metal to metal contact between the outside and the inside sections of the sash.

The sill is made up of an outer section 136 and an inner section 138 separated by insulation 140.

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The outer section 136 is not only sloped for drainage, but is stepped at 142 in alignment with the face 144 of the outer section of the sash. The inner section 138 is turned downwardly at 146 for cooperation with the face 148 of the inside section of the sash. Thus the sash meets the sill with an effective fit or seal, and at the same time the metal to metal contact of the outer section of the sash is with only the outer section of the sill, and similarly the metal to metal contact of the inner section of the sash is with only the inner section of the sill.

In addition to the foregoing, a weather strip 150 is provided, this being anchored against the outer section of the sash and bearing yieldably against the outer section of the sill.

In Fig. 8 the depending lip 153 is cast integrally with the sash and extends for the length of the sash, it acting as a so-called "drip," to localize drippage from the sash. This has been omitted from some of the other figures to simplify the drawing.

To facilitate moving the lower sash up and down a handle is provided in the form of a long ledge 152 cast integrally with the inner section of the sash. The nature of this handle ledge will be apparent from examination of the diagrammatic outline at 152 in Fig. 5, as well as the section shown in Fig. 8. Similarly the upper sash is provided with a handle ledge 154 (Fig. 8), this being cast integrally with the outside section of the upper sash. The handle 154 is made quite short compared to the handle 152, as shown in Fig. 5. However, neither the dimensions nor the shape is in any way critical. What should be emphasized is the convenient and inexpensive manner in which handles are provided when die casting the parts of the sash, instead of attempting to assemble the same from rolled or extruded sections.

The movement of the sash is preferably counterbalanced by means of appropriate sash balances. One advantage of the present construction is that sash balances may be employed which are housed within the edges of the sash. The general idea has already been mentioned in connection with Fig. 6, in which it was explained that sash balance 62 is housed within the edge channel of sash 12.

The particular form of sash balance here employed may be described with reference to Figs. 9, 10 and 11 of the drawing. This sash balance is one known commercially as the "Invisible" sash balance manufactured by Grand Rapids Hardware Company of Grand Rapids, Michigan. This is a sash balance of the constant load torque type, and referring to Fig. 9, it will be seen that the rotatable helical part 160 of the balance is secured at its upper end to the sash 12 by means of a suitable bracket 162 forming a part of the sash balance. The lower end 164 of the sash balance is received in a tab 166 cast integrally with one of the angle pieces of the sash. The ability to form the tab 166 integrally with the sash is, of course, an additional convenience resulting from the use of cast pieces for the sash. The connection between the balance and the frame is obtained by means of a bearing 168 held by a mounting arm 170, these parts being sold as a part of the sash balance. It will be understood that as the upper sash 12 is moved downwardly the movable part of the balance is pulled down through the bearing 168, as is indicated by the change from the solid line position 12 to the dotted line position 12' in Fig. 10.

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The lower sash 14 is provided with a similar sash balance, and the arrangement of this is schematically indicated in Fig. 11, in which it will be seen that sash 14 has a balance, the rotatable portion 172 of which is mounted on the sash at the top by means of a bracket 174, and at the bottom by means of an integrally cast tab 176. Bearing 178 is normally located at the top of the balance, and part 172 is slid upwardly through bearing 178 when the sash is raised from the solid line position 14 to the dotted line position 14'.

It will be understood that other forms of sash balance may be used with the present window. Another example of long slender sash balance of the torque type is the so-called "Unique" balance made by the Unique Window Balance Corporation of New York, New York. This type of balance will also fit in the edge channel of the sash as here described, but the balance is not completely invisible as is the one previously described. The arrangement for the Unique balance is schematically indicated in Fig. 12, in which it will be seen that sash 180 has the movable part 182 of the sash balance connected to it at 184, said part 182 being slidable into and out of a stationary tubular part 186 of the sash balance, the latter being secured to the frame 188 at 190.

The window is locked by means of a lock the general nature of which is seen in Figs. 13 and 14. The lock comprises a bolt portion 192 received in a latch portion 194, the latter being cast integrally with the inside section of the upper sash. The bolt 192 may be controlled by a handle 196 the said handle preferably being elongated in shape in order to clearly show whether it is in a horizontal position, which holds the lock open, or in vertical position, as shown in the drawing, which permits the lock to close. The bolt 192 is urged to locking position by means of a compression spring 198. This bears against a collar 200 pinned on the stem of the bolt 192, the latter preferably being a non-rotatable flat plate, best shown in Fig. 13.

To afford rotation of handle 196 relative to bolt 192, the parts are connected by means of pins which project into a groove on the stem. A bearing portion 202 is cast integrally with the lower sash, and is vertically slotted at the top and bottom to receive the portion 204 of the handle. It will thus be seen that by turning the handle to the vertical position shown the spring is permitted to urge the bolt outward, but by pulling the handle inward and rotating it ninety degrees, the bolt will be withdrawn and held in retracted position. The bearing 202 may be provided with shallow horizontal slots 203 acting as a detent for holding the handle in horizontal position when the window is to remain unlocked.

The pieces of the sash frame may be most economically and accurately cast by die-casting, and are preferably made of a suitable aluminum or other light metal alloy. The heat insulation between the outside and inside sections of the sash may be a synthetic resin or plastic such as "Synthane." The plastic may be molded to proper shape to fit between the sections, as by molding pills of powdered plastic, or by molding sheet plastic to the desired configuration, or by extruding sections of desired shape. The insulation may also be a cork compound pressed to proper shape.

The glazing may consist of a single pane of

glass, or more preferably a double pane such as those known commercially as "Thermopane" and "Twindow," the former being made by Libbey Owens Ford Glass Company of New York City, and the latter being made by Pittsburgh Plate Glass Company of Pittsburgh, Pennsylvania. One advantage of the present sash is that it affords ample depth for the use of such a thermal insulating glass. At the same time, should such a glass be broken and a replacement be unavailable, a temporary repair may be made by setting in an ordinary single pane of glass. The glass is held in position by either standard clips customarily employed with metal sash, or by special clips designed and sold by the manufacturers of "Thermopane" and "Twindow," mentioned above. A suitable mastic is employed to seal the glass in the sash.

The weather stripping may be made of stainless steel, or an alloy such as Phosphor bronze or aluminum bronze. The sash balance may be of some other type than shown, although a torque type balance has the advantage of being received within the edge channel of the sash, so that the frame of the window remains a relatively simple structure. It also provides constant tension or balance for any position of the sash.

The jambs, head and sill of the frame are each uniform in section, and we therefore do not recommend that these parts be die cast. They are preferably made of extruded sections of aluminum or other light metal alloy, although they may also be formed by pressing or rolling heavy gauge sheet stock.

In casting the pieces of the sash it is recommended that the parting face of the die lie parallel to the plane of the glass, and that the parting face correspond to the face of the sash section, the web being formed in the ejector die. In this way any marks caused by the ejector pins will appear inside the sash, and will in no way mar the appearance of the finished sash.

It will be understood that by making angle pieces instead of a single large rectangular section there is considerable economy, because a large number of pieces may be cast at one time in a single die of substantially the same size as would be required to cast a single one-piece section. There is the further advantage in assembly in that the parts may all be fitted tightly together against the insulation strips.

Each sash is completely assembled at the factory, the angle pieces and the insulation strips and the weather strips all being fastened together by a series of small flush rivets distributed around the periphery of the sash. If the sash is to be glazed in advance, as is usually done, the glass is set in place with appropriate clips and mastic. The sash balances are also secured to the sash.

The sash guides are prepared at the factory with suitable countersunk holes for flush screws. Weather strips are preliminarily secured to the sash guides.

The frame is completely assembled at the factory, that is, the head, the jambs and the sill are all welded or secured together at the factory in proper size and shape. There is no need to provide and separately add a sill at the building, as is required with wood frames. Less skilled labor is needed at the building because, unlike wood frames, there is no need to square up the frame while mounting it in the wall. However, the sash guides and the inside bead are only temporarily secured in place, this being a convenient

way to ship the said parts with their necessary screws. They may, however, be shipped separately, if desired, for addition later when adding the sash. The frame has tapped holes for the screws which hold the sash guides and bead.

At the building site the frames are set in place during the erection of the building wall. The precise method of construction will differ, depending on whether the building is of wood construction, or masonry construction, etc. The frame may be sealed to the building structure or masonry by means of conventional caulking.

When the sash is to be set in place the upper sash is assembled with its sash guides, the latter being the full height of the frame and approximately twice the height of the sash. The sash and guides are slid into the frame from the inside until stopped by the outside bead. Some of the screws holding the sash guide are then applied at points outside the sash. The sash is then slid in one direction or another to expose additional holes, so that additional screws may be applied. In this way the sash guide is secured in position, thus mounting the sash.

In similar fashion the lower sash is assembled with its balances and sash guides, and the entire assembly is slid into the frame, following which mounting screws are applied, the sash being moved up or down to expose the holes for the screws. Thereafter the inside bead or snap bead is added to the frame by means of appropriate screws.

It is believed that the construction and method of assembly, as well as the advantages of our improved window, will be apparent from the foregoing detailed description. Since the window is made of aluminum it will not rust, and requires no painting. It may be and preferably is anodized to prevent corrosion. The window will not warp like wood, yet unlike steel is light in weight. The present window should easily last for the life of the building. Steel not only requires painting, but the paint causes sticking or binding of the sash against movement.

The cost of the window is no higher than other metal windows already known, and is only a little higher than the cost of a wood window, and eventually is anticipated to be no higher in cost. In fact, if the cost of maintenance or painting of wood windows over a period of say ten years be taken into consideration, then the cost of the present window is no higher than that of wood even now. The use of aluminum for the sill of the frame is advantageous, because of the particularly rapid deterioration of wood sills.

The present window, although made of metal, is insulated to prevent transfer of heat from the inside to the outside, with consequent chill and drippage of condensed moisture on the inside. This heat insulation also has the practical advantage of not transmitting and consequently wasting heat from inside the building to the outside. Since the sash is adapted to take thermal insulating glass, there is no need for storm sash. The sash has rounded inside corners, which facilitates the work of the housewife in cleaning glass. The face wall or so-called "rail" of the sash is relatively narrow, so that the glass area is large for any particular window-opening area. A similar gain is attained because of the narrowness of the frame.

The lock is small and inconspicuous yet effective, and is proof against opening by means of a knife or the like, for a knife even if slid between the sash, cannot get to the end of the bolt to

move or "jimmy" it back. There are no irregular dust-catching surfaces, and even the top of the lower sash may be wiped off readily, it being smooth and uninterrupted by a lock. The handle ledge on the lower sash is sturdy, long and convenient.

The use of four angle sections for each sash makes it possible to mold more sections in a single die. It also makes it possible to assemble the sections in tightly fit relation without large tolerance and shrinkage allowance and other problems which would arise when using two one-piece rectangular sections. By staggering the meeting points of the outer and inner sections, the parts reinforce one another, resulting in a strong rigid structure. The sash parts may be cast with no sharp edges, as well as rounded inside corners, and with a minimum number of joints, there being only two and even these being inconspicuous in nature.

However, although there are important advantages in die casting the parts of the sash, not all features of the invention are limited to die cast sash. It will therefore be apparent that many changes may be made in the structure described and claimed, without departing from the spirit of the invention, as sought to be defined in the following claims.

We claim:

1. A slidable metal sash for a double hung sash window including a stationary frame, said sash having an outside section including a face and a web intermediate the edges of the face, and an inside section including a face and a web intermediate the edges of the face, said sections being assembled with the webs overlapping with a layer of heat insulating material therebetween in order to interrupt thermal conductivity therebetween, and with the outer vertical edges of the faces of the outside and inside sections in common vertical planes for sliding engagement with the inside of the stationary frame, said planes being approximately perpendicular to the plane of the sash, the sections being die cast sections having ejector pin marks, said marks being located on the inside surfaces of the sections where they are concealed, whereby the outside faces of said sections are unmarred by ejector pin marks, said sections having rounded inside corners to facilitate cleaning the glass of the sash, the outside face of the meeting rail of the upper sash having a handle ledge integral therewith, and the inside face of the lower sash having a handle ledge integral therewith.

2. A metal sash for a window, said sash comprising an outside section including a face and a web intermediate the edges of the face, and an inside section including a face and a web intermediate the edges of the face, said sections being assembled with the webs overlapping with heat insulation therebetween in order to interrupt thermal conductivity therebetween, said outside and inside section each being made of pieces in a common plane meeting end to end at spaced points, each piece including at least a corner and part of the two sides adjacent the corner, the pieces of the inside section meeting at points remote from those at which the pieces of the outside section meet, so that the inside and outside pieces overlap to form a rigid sash.

3. A slidable metal sash for a double hung window, said sash comprising an outside section

including a face and a web, and an inside section including a face and a web, said sections being assembled with the webs overlapping with heat insulation therebetween, said outside and inside sections each being made of two pieces meeting at opposite points, the two pieces of the inside section meeting at points remote from those at which the two pieces of the outside section meet, whereby the sash is held rigidly in square formation.

4. A metal sash for a window, said sash comprising an outside section including a face and a web, and an inside section including a face and a web, said sections being assembled with the webs overlapping, said outside and inside sections each being made of two angle pieces meeting at diagonally opposite corners, the angle pieces of the inside and outside sections meeting at alternate corners such that the sash is held rigidly in square formation.

5. A slidable metal sash for a double hung window, said sash comprising an outside section including a face and a web, and an inside section including a face and a web, said sections being assembled with the webs overlapping with heat insulation therebetween, said outside and inside sections each being made of two angle pieces meeting at diagonally opposite corners, the angle pieces of the inside and outside sections meeting at alternate corners such that the sash is held rigidly in square formation.

6. A slidable metal sash for a double hung window having a stationary frame with an internal sash guide, said sash comprising an outside section including a face and a web, and an inside section including a face and a web, said sections being assembled with the webs overlapping with heat insulation therebetween, said outside and inside sections each being made of two angle pieces meeting at diagonally opposite corners, the angle pieces of the inside and outside sections meeting at alternate corners such that the sash is held rigidly in square formation, an edge channel of substantial dimension being left between the faces and outside the webs of the sash for sliding on the aforesaid internal sash guide of the stationary frame, said channel being sufficiently deep to additionally receive a conventional commercially available torque type sash balance.

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