

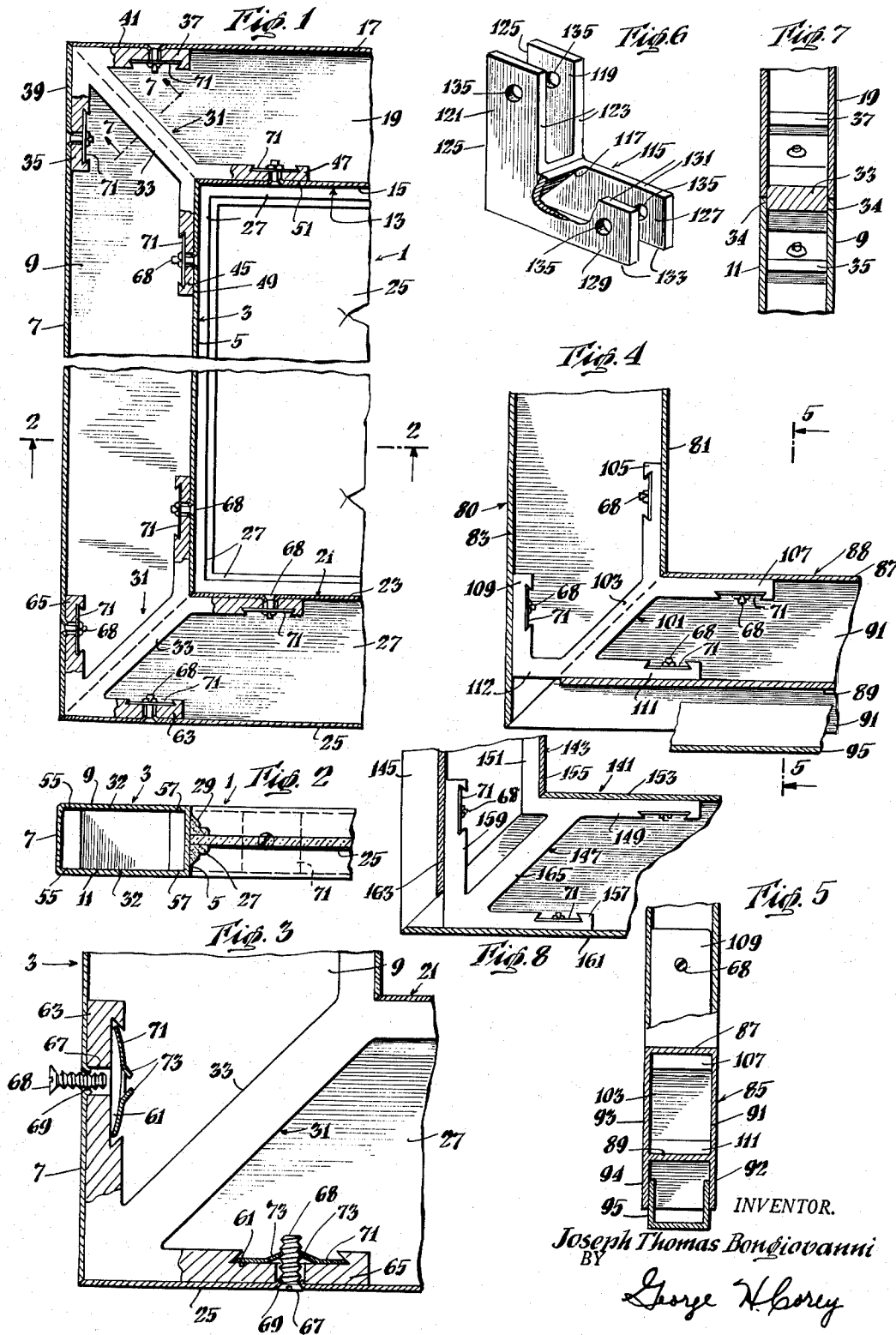
Aug. 9, 1955

J. T. BONGIOVANNI

2,714,944

WINDOW OR DOOR SASH CORNER CONSTRUCTION

Filed Dec. 8, 1949



2,714,944

WINDOW OR DOOR SASH CORNER CONSTRUCTION

Joseph Thomas Bongiovanni, Rocky Point, N. Y.

Application December 8, 1949, Serial No. 131,746

10 Claims. (Cl. 189—36)

This invention relates to window and door sash constructions and the like which utilize framing elements extending along the sides of the sash and joined at the corners formed therebetween, these sash ordinarily providing a supporting frame for a panel, a pane of glass, a screen or the like. The invention especially relates to windows and door sash which utilize tubular framing elements and more particularly to those in which the tubular framing elements are of metal.

Window sash and doors have been constructed heretofore with metal framing elements constituting a frame supporting a panel, a glass pane, a screen or the like, the framing elements being in the form of tubes ordinarily of rectangular cross section. The tubular material is manufactured in lengths from which the framing elements are cut to size for the particular window or door sash and are joined adjacent the corners of the sash. Various means have been proposed for fastening these framing elements of the sash together at the corners with the adjacent framing elements in proper angular relation to each other along the respective adjacent sides of the window or door sash.

One of the difficulties which may be experienced in conventional constructions is that the angularly related framing elements are not rigidly held in relation to each other and, because of the forces brought on the sash in handling or in opening and closing the window or door, movement of the two elements with respect to each other occurs both in the plane of the sash and transversely of this plane with consequent distortion of the sash from its normal shape, ordinarily rectangular, and from its true plane so that the window or door sash does not fit to or does not close properly against the window frame or door frame. In conventional window or door sash constructions which utilize tubular framing elements the joint between the two adjacent elements may be made with a miter. While the framing elements may be machined accurately so that the elements may be abutted along the miter joint to bring these elements into proper angular relation to each other, heretofore satisfactory means have not been provided for holding these elements in this abutting relation which will avoid the undesirable relative movement both in the plane of the sash and transversely thereof and at the same time avoiding conspicuous reinforcing or bracing devices for the corners formed between the two angularly related framing elements.

In the above and following discussion and in the claims where reference is made to "window sash" and "door sash" these terms are intended generically to identify an assembly of fabricated members which when used as a window closure ordinarily is called a "window sash" and when used as a closure for a door opening is called a "door," the word "sash" being intended to be descriptive of both forms of an operable closure. In the description herein and in the claims the term "framing elements" is intended to signify the elements which in conventional window sash and door constructions constitute the elongated

members extending about the window sash or door and which are joined adjacent a corner of the sash or door. The term "framing element" as hereinafter used relates more particularly to an element of a window sash or door as distinguished from a window or door "frame" with which the sash or door may cooperate as a closure for a window or door opening. It will be understood, however, that where the essential construction of the invention may be utilized in a window or door "frame" the terms above defined are intended to apply to such window or door frames. The window and door sash of the invention may be of the sliding type or of the types which are hinged, pivoted or otherwise supported.

It is an object of the invention to provide in a metal window or door sash means for securely and rigidly holding the angularly related framing elements of the sash adjacent a corner thereof.

It is another object of the invention to provide in metal window or door sash means for holding the angularly related framing elements adjacent a corner therebetween which is inconspicuous and does not protrude upon the exterior form or modify the appearance of the window or door sash.

It is a further object of the invention in a window or door sash in which the framing elements are of tubular cross section, and particularly metal tubular elements, to provide means for holding the angularly related framing elements adjacent the corner formed therebetween, which means is disposed within the tubular elements and is not seen.

It is another object of the invention to provide for a window or door sash constructed with tubular framing elements, particularly of metal, a corner bracing member or bracket which is insertable within the adjacent tubular elements so as not to be seen and which may rigidly cooperate with these elements to prevent angular movement thereof as well as movement transversely of the plane of the sash.

It is a still further object of the invention to provide a corner bracing member or bracket insertable within the tubular framing elements, particularly of metal, at the corner formed therebetween, which bracket may be produced by severing an extruded or drawn bar transversely thereof, this bar having a predetermined cross section such that the bracket may fit within the adjacently disposed angularly related framing elements of the window or door sash.

It is a feature of the invention, in a window or door sash construction made from metal or other framing elements having oppositely disposed walls adjacent a corner formed between the angularly related elements of the sash, that a bracing member or bracket is disposed adjacent the corner and cooperates with the respective oppositely disposed walls of the two adjacent framing elements so as to bear thereagainst to hold these framing elements in the predetermined angular relation to each other. In such a window or door sash, and particularly in one in which framing elements are in the form of tubes which are cut to form a miter joint between the two angularly related elements, the bracing member or bracket may be formed with opposed bearing faces associated with each of the framing elements and spaced apart distances corresponding to the spacing between the oppositely disposed walls of the respective framing elements. Where the framing elements are made, for example, from straight tubes of rectangular cross section the bracing member or bracket may be formed with parallel plane faces spaced apart a distance substantially equal to the internal dimension of the tube between the corresponding oppositely disposed parallel surfaces of the tubular element. Preferably also the dimension of the portions

of the bracing member or bracket in the direction parallel to the planes of these faces and perpendicular to the other parallel oppositely disposed surfaces of the tubular element is substantially equal to the internal dimension of the tubular element between these two other parallel walls.

It will be understood from the general description just given that the bracing member or bracket provides portions which are adapted to fit snugly between at least two oppositely disposed walls of the framing elements and preferably snugly between both pairs of such oppositely disposed walls of rectangular tubular elements. These portions of the bracing member or bracket which respectively are associated with the two adjacent angularly related framing elements are connected by a trunk portion from which they project into the respective framing elements, substantially as cantilever members. In consideration of the snug fit of the projecting portions of the bracing member or bracket with the respective framing elements and of the substantial rigidity of the trunk, the framing elements adjacent the corner may be rigidly held and movement thereof in the plane of the sash or transversely thereof which would produce warping may be prevented.

It is another feature of the invention that the cantilever portions or arms of the bracing member or bracket which project from the trunk into the respective framing elements are so proportioned and the bracket is made of such material that a slight flexure of these portions or arms transversely of the plane faces thereof may occur. This slight degree of resilient flexure makes it possible for the respective projecting portions adjacent the ends thereof disposed outwardly from the trunk to move somewhat away from the walls with which respectively the plane faces of these portions make contact. Thus, these end portions may ride upon a burr or other slightly raised portion provided on the wall in a suitable location which may come into register with an aperture or recess in the respective portions or arms of the bracket to locate and position the framing elements and the bracket in proper relation to each other. When the bracket and framing elements are thus brought into the desired position with respect to each other, the burr enters the aperture or recess because the resilience of the projecting portion or arm of the bracket effects return flexure movement of the projecting portion or arm to restore it to its bearing relation against the inner surface of the respective wall of the tubular element.

It is a further feature of the invention that the projecting portions or arms of the bracket are formed with recesses oppositely disposed with respect to the respective faces thereof which bear against the adjacent walls of the tubular framing elements, these recesses being adapted to receive therein and to retain spring member cooperating with a fastener to hold the respective projecting portions tightly against the walls. For example, a spring nut, such as a Tinnerman nut, may be inserted in the recess and may be engaged by a screw passing through the adjacent wall of the framing element and through a hole in the projecting portion or arm of the bracing member or bracket.

As will be more apparent from the drawings and description thereof the device having the features above generally described makes it possible securely and rigidly to hold together the adjacent framing elements in the proper angular relation to each other and in the plane of the window or door sash without utilizing exposed and conspicuous angle brackets or similar conventional bracing elements fastened to the exterior of the framing elements. In the construction according to the invention the bracing member or bracket and the fastening means are concealed within the tubular framing elements.

A modification of the invention relates to window or door sash of the type which utilizes a framing element

along at least one side thereof with which framing element an adjustable element cooperates in a conventional manner to secure the desired fit between opposite sides of a window or door frame opening. In this modification of the invention in order that the appearance of the window or door may not be unduly changed from that which is architecturally desirable and secured when conventionally utilizing framing elements of tubular cross section, one of these elements may be formed as a tubular element of less cross sectional dimension in the plane of the sash than an adjacent framing element with which it cooperates to form the corner. The framing element of less dimension may be provided, however, with skirts at either side thereof parallel to the plane of the sash for receiving therebetween the adjustable element. These skirts may be of such dimension projecting from the tubular element that the width of this element is of similar dimension to the dimension in the plane of the sash to that of the adjacent framing element. Thus, it will be apparent that a miter joint may be made between the two framing elements but the walls with which the bracing member or bracket cooperate may be spaced apart different distances in the two adjacent framing elements. The invention in this modification provides a bracing member or bracket of such form as to receive the cooperation of the parts above generally described but which also provides for the use of a framing element with which an adjustable member may cooperate for fitting to window or door frames of different dimensions in the plane of the sash.

Other features of the invention and advantages thereof will be understood from the description to follow of the drawings in which

Fig. 1 is a section in the plane of a window or door sash showing the construction of the invention and the bracing members or brackets utilized therein;

Fig. 2 is a section on line 2—2 of Fig. 1;

Fig. 3 shows to enlarged scale a proportion of the corner construction and the fastening means utilized in cooperation with the bracket;

Fig. 4 shows a modified embodiment of the invention;

Fig. 5 is a section on line 5—5 of Fig. 4;

Fig. 6 shows in elevation a modified form of the corner bracing bracket of the invention;

Fig. 7 is a section on line 7—7 of Fig. 1;

Fig. 8 shows another embodiment of the invention.

As shown in Fig. 1 a window or door sash 1 is constructed with framing elements 3 having oppositely disposed parallel walls 5 and 7 extending transversely of the plane of the sash, these framing elements in the embodiment shown being of tubular form having also oppositely disposed walls 9 and 11, Fig. 2, extending parallel to the plane of the sash. The upper and lower ends of the framing element 3 are mitered at 45 degrees and abut similarly mitered ends of the tubular framing element 13 of rectangular cross section having walls 15 and 17 extending transversely of the plane of the sash and the wall 19 and a wall parallel thereto which are parallel to the plane of the sash. Similarly at its lower end the framing element 3 is mitered to abut the mitered end of the tubular framing element 21 which is provided with walls 23, 25 extending transversely of the plane of the sash and a wall 27 and a wall parallel thereto which are parallel to the plane of the sash. Within the opening formed by the framing elements 3, 13 and 21 a panel 25 is held by beads or moulding elements 27 at one face of the panel and similar moulding elements 29 at opposite faces thereof, these moulding elements being fastened by suitable means to the respective framing elements 3, 13, 21. As shown in Fig. 2 in the particular embodiment being described the panel 25 is of glass.

Adjacent a corner formed between the framing elements 3 and 13 a bracing member or bracket 31 is disposed. In the particular embodiments of Figs. 1, 2 and 3 the bracket 31 is formed with a trunk or bridge por-

5

6

tion 33 which is disposed between the oppositely disposed walls 5, 7 and 15, 17 of the respective framing elements 3 and 13 and adjacent the miter joint. In this embodiment the trunk 33 is of generally rectangular cross section as shown in Fig. 7 but this cross section may be modified in different brackets to suit different conditions and sizes of the frames and cross sections of the framing elements used. The trunk 33 shown has parallel sides in planes perpendicular to the plane of the sash and parallel edge surfaces which are parallel to the plane of the sash.

At the outer or upper left hand end of the trunk 33 of the bracket shown at the upper left corner in Fig. 1, this trunk is provided with cantilever arms 35, 37 extending therefrom generally parallel to the respective walls 7, 17. These arms are formed with plane faces 39, 41 which respectively are perpendicular to the plane of the sash and bear against the inner surfaces respectively of the walls 7, 17.

Similarly at the inner or lower right hand end of the trunk 33 at this upper left corner, Fig. 1, the bracket 31 is provided with cantilever arms 45, 47 extending therefrom and providing plane faces 49, 51 which are parallel respectively to the plane faces 39, 41 and bear respectively against the inner surfaces of the respective walls 5 and 15 of the tubular framing elements 3 and 13. It will be understood that the dimension in the plane of the sash and perpendicular to the faces 41 and 51 between these two faces is such as preferably to provide a snug fit of these faces to the inner oppositely disposed surfaces of the respective walls 15 and 17 of the framing element 19. Similarly the dimension between the faces 39 and 49 perpendicular to these faces is such as to provide a close fit to the inner surfaces respectively of the walls 7 and 5 of the framing element 9.

As shown in Figs. 2 and 7 the dimension of the trunk 33 transversely of the plane of the sash is such that the edge surfaces 34 thereof fit closely between the walls 9 and 11 of the framing element 3 and between the wall 19 and the front wall of the framing element 13. The bracket 31 is formed so as to provide parallel edge surfaces 55 and 57, Fig. 2, of the arms thereof which may be so spaced as to bear against the walls 9 and 11 and against the wall 19 and the corresponding front wall of the framing element 13 with a snug fit.

It will be apparent from a consideration of the above description taken in connection with Figs. 1 and 2 that the bracket 31 provides means for preventing not only the movement of the framing elements 3 and 13 with respect to each other in the plane of the sash but also for preventing distortion or warping of the frame by movement of either of the framing elements 3 or 13 out of the plane or by twisting of either of these elements about a line parallel to the length thereof. Such rigidity is secured by virtue of the face to face engagement of the several faces and surfaces of the bracket with the inner surface of the walls of the tubular framing elements. The fit between the bracket 31 and the respective tubular framing elements 3, 13 is such that the arms 35, 45 and the arms 37, 47 may be moved into the respective elements 3, 13 by sliding movement of one relative to the other to the position shown in Fig. 1. In this position a very rigid construction is secured adjacent the corner formed between the framing elements 3 and 13 even when not additionally fastened.

Preferably, however, fastening means are provided for securely holding the respective arms 35, 45 and 37, 47 in face to surface contact against the corresponding adjacent oppositely disposed walls 7, 5 and 17, 15 of the respective framing elements 3, 13. When such fastening elements are used not only is relative movement lengthwise of the framing elements with respect to the bracket 31 prevented but the rigidity of the corner is insured even when the tolerance in the dimensions between the finished surfaces of the bracket particularly between the parallel faces and between the parallel edge surfaces

thereof, and between opposite inner surfaces of the tubular members is greater than the desirable tolerance. Thus, unavoidable variations in the manufacture of the bracket and of the tubular framing elements is permissible without losing the substantial advantages of the invention which are secured by the close cooperation of the bracket with the tubular elements to resist angular and torsional movement of the elements and other displacement thereof which occur due to ordinary handling or operation of the window or door sash of the invention.

The preferred form of the fastening means is shown in Figs. 1 and 4 and to enlarged scale in Fig. 3. In this embodiment a recess 61 is formed in each arm of the bracket 31 at the side thereof which is oppositely disposed with respect to the respective faces thereof which are in bearing relation against the walls of the tubular framing elements.

In Fig. 3 the bracket 31 is formed with trunk 33 and arms 63, 65 bearing against walls 7, 25, the bracket 31 in this figure corresponding to the bracket 31 at the lower left hand corner of the sash shown in Fig. 1. The recesses 61 in the arms 63, 65 are of dovetail shape adapted to receive a fastening element which may be entered edgewise in the recess or, if of resilient material, may be sprung therein past the corner of the dovetail.

As shown in Fig. 3 centrally disposed with respect to the recesses 61 the arms 63, 65 are provided with holes 67 through which a screw or similar fastening means may be passed to engage the fastening element inserted in the recess 61. In this embodiment the walls 7, 25 of the framing elements 3, 21 also are provided with holes, which may be made by punching when the walls 7, 25 are of metal to provide burrs 69, or raised portions of annular form otherwise may be produced which register with and enter into the holes 67. Through the apertures in the walls 7, 25 screws 68 such as machine screws may be passed, these screws passing through the holes 67 to engage the cooperating fastening means held within the recesses 61.

Preferably this cooperating fastening means provides for resiliently pressing the bracket arm and wall together as the screw is being tightened. In the particular embodiment shown in the drawings the fastening means 71 in the recess 61 is a Tinnerman nut of conventional form which is made of spring steel or other resilient material from which are punched lips 73 which are adapted to engage the threads of the machine screw 68. It will be apparent that as the screw 68 is screwed into the lips 73 that it draws the flanks of the Tinnerman nut 71 toward the bottom of the recess 61 and spreads the edges thereof under the dovetailed edges of the recess until the nut becomes tight against the bottom of the recess, thus securely holding each of the arms 63, 65 against the respective walls 7, 25. As shown in Fig. 1 each of the arms at each end of the trunk 33 of the bracket 31 may be provided with the recesses 61 and with Tinnerman nuts therein engaged by corresponding screws 68 for holding each of the arms securely against the respective walls of the tubular elements against which they bear.

Although the fastening device described and shown in the drawings is preferred, other fastening means may be utilized within the scope of the invention which are effective to securely hold the arm of the bracket in face to face bearing relation against the corresponding wall of the tubular framing element to secure rigidity as above described and which are adapted to be disposed within the tubular framing elements so as not to be seen.

The burr or annular raised portion 69 formed in the wall of the tubular element which is entered into the hole 67 serves to position the tubular element lengthwise thereof with respect to the corresponding arm of the bracket. In order that the burr or annular raised portion 69 may enter into the hole 67 while at the same time the faces of the arms may bear against the walls

of the elements, the cantilever arms 63, 65, and correspondingly the other cantilever arms of the brackets in Figs. 1 and 2 as above described, are of such thickness transversely of the walls 7, 25 with which they cooperate and the brackets are of such material as to provide for slight flexure in the direction transversely of these walls respectively. Thus, when the arms 63, 65 are entered into the tubular member the ends thereof may move slightly from face to face contact with the adjacent walls so that the end portions thereof may ride over the respective burrs until these burrs come into register with the holes 67. Thereupon, because of the resiliency of the material of which the bracket 31 is made and because of the form of these arms and the relation thereof to the trunk 33, these arms will return to the face to face engagement with the respective adjacent walls. The height of the burrs or annular raised portions need not be great so that great force to flex the arms and ride them over the burrs is not necessary. The burrs, however, entering the holes 67 may serve properly to position the tubular framing elements lengthwise thereof in relation to the bracket and also may serve to prevent accidental displacement of the bracket and tubular elements during assembly of the window or door sash or in the event that a fastening element such as a screw 68 becomes loosened or lost. Such loosening and loss of the fastening, however, is prevented or greatly minimized by the use of the spring type of fastening means such as a Tinnerman nut.

In Figs. 4 and 5 is shown an embodiment of the invention in which a vertical framing element 80 of tubular form corresponding to the framing element 3 of Figs. 1 and 2 and having oppositely disposed walls 81 and 83 is mitered and abuts the horizontal framing element 85 of which a portion is of tubular form providing an upper wall 87 and a lower wall 89. As shown in Figs. 4 and 5 the walls 91 and 93 of the framing element 85 are extended downwardly from the tubular portion thereof to form skirts 92, 94 which embrace an inverted channel element 95 which is adjustable with respect to the skirts 92, 94 and to the framing element 85 in order to vary and determine the vertical dimension of the window or door sash. The adjustable channel 95 may be held in position by any suitable means which forms no part of the invention.

In order that the appearance of the sash shall be substantially that of the conventional sash with respect to the visible width of the faces of the framing elements 80 and 85, the dimension of the tubular part of the framing element 85 between the walls 87, 89 is reduced with respect to the dimension between the walls 81 and 83 of the framing element 80, the overall width between the wall 87 and the bottom edge of the depending wall or skirt 91 being similar to the overall width of the framing element 80 between the walls 81 and 83. As will be noted in Fig. 4 the mitered joint between the framing element 80 and the framing element 85, therefore, may be the usual joint at 45 degrees.

In the embodiment of Figs. 4 and 5 a bracket 101 is formed with a trunk 103 which may be of the rectangular cross section as is shown in Fig. 7 for the trunk 33. At the upper right hand end of the trunk 103 the bracket 101 is provided with arms 105, 107 respectively bearing against the walls 81 and 87 in the same manner as described for the arms 45, 47, Fig. 1. The arms 105, 107 likewise snugly fit between the respective vertical walls of the tubular framing elements 80 and 85 which are parallel to the plane of the sash to function in the same manner as described in connection with the bracket 31 in Figs. 1, 2 and 3. In the embodiments of Figs. 4 and 5 also the arms 105, 107 are held against the walls 81, 87 by screws 68 and resilient fasteners or Tinnerman nuts 71 engaged by the screws 68. In this embodiment, however, the annular burrs or raised portions shown and described in connection with Figs. 1, 2 and 3 are omitted.

At the lower left hand end of the trunk 103 this trunk is connected to the horizontally extending arm 111 of a pair of angularly related arms 109, 111 which respectively bear against the walls 83 and 89. Because the framing element 85 is cut at 45 degrees to form the miter joint, the wall 89 does not extend to meet the wall 83. The arm 111, however, is of such length as to provide adequate bearing upon the wall 89 of the framing element 85 and to be fastened thereto by a screw 68 passing through a hole 67 therein and through the wall 89 and engaging a spring fastener or Tinnerman nut 71. In line with the arm 111 the bracket 101 is formed with a connecting portion extending toward the left of the trunk 103 and connected to the lower end of the arm 109 of this bracket which extends vertically in face to face engagement with the wall 83. The arm 109 is fastened to the wall 83 by means of a screw 68 passing through the wall 83 and through a hole 67 in the arm 109 and engaging a spring fastener or Tinnerman nut 71. As shown in Fig. 5 the trunk 103 as well as the arms 109, 111 like the arms 105, 107 may extend transversely of the plane of the sash to engage and fit snugly against the vertical walls of the framing elements 80, 85 in the same manner as described in connection with Figs. 1, 2 and 3. Moreover, this trunk may be made of sufficient cross section in the plane of the sash to secure the requisite rigidity thereof while at the same time carrying at its ends the cantilever arms 105, 107, 109, 111 so that slight flexure of these arms may be secured if desired for entering the bracket into the tubular framing element without losing the requisite rigidity of these arms which is effective to prevent distortion of the sash when the arms are fastened to the walls of the tubular members by means of the screws 68 and their cooperating spring nuts 71.

In Fig. 6 is shown in perspective a modified form of the corner bracket 115 of the invention. In this embodiment the trunk 117 shown in part in dotted outline in Fig. 6 extends diagonally so as to be positioned adjacent the mitered joint between cooperating tubular elements in the same manner as described in connection with Figs. 1 to 5. In the embodiment of Fig. 6, however, the bracket is provided with arms adapted to engage the faces of the walls of the tubular elements which are parallel with the plane of the sash rather than those which are perpendicular to the plane of the sash as is the case in the embodiments of Figs. 1 to 5. As shown in Fig. 6 the bracket 115 is formed with two vertical arms 119 and 121 which have their exterior faces spaced so that they may respectively engage the walls 9 and 11 of the element 3 when this bracket is used, for example, at the lower corner of Fig. 1. The width of these arms in the plane parallel to the plane of the sash between the edges 123 and 125 thereof is such that these edges may fit snugly against the walls 5 and 7 of the tubular element 3.

Similarly the bracket 115 is provided with horizontally extending arms 127 and 129 which respectively are adapted to bear against the wall 27 and the wall parallel thereto which are parallel to the plane of the sash in the framing element 21. The vertical width of the arms 127, 129 between the edges 131, 133 thereof is such that these edges fit snugly against the walls 23 and 25 respectively of the framing element 21. As shown in Fig. 6 the cantilever arms 119, 121, 127, 129 each are provided with a hole 135 through which a fastener, such as a screw 68, may be passed to hold the respective arms against the adjacent walls in the same manner as described in connection with Figs. 1 to 5 inclusive. In the embodiment of Fig. 6 also, if desired, the length of the arms 119, 121, 127, 129 and the thickness thereof may be such as to provide for slight flexure transversely of the plane of the sash in order to ride over the burrs or other means corresponding to the annular raised portion 69, Fig. 3, for the purpose of holding the tubular fram-

ing elements in the desired position with respect to the bracket inserted therein when these burrs engage the holes 135. In the embodiment of Fig. 6 the snug fit of the arms of the bracket to all of the walls adjacent thereto and the rigid connection of these arms together by means of the trunk which also fits between the oppositely disposed walls may be utilized to secure the advantages of the invention in holding the adjacent angularly related framing elements in the desired position one with respect to the other in the plane of the sash and also so as to prevent distortion and movement of these elements out of the plane when the window or door sash is handled or operated.

In Fig 8 is shown a modification of the bracket and corner construction of the invention which provides for joining in a miter joint adjacent angularly related framing elements having tubular portions of different width in the plane of the sash, as in the embodiment of Fig. 4. In the embodiment of Fig. 8 the tubular element 141 has a vertical width substantially equal to the horizontal width of the tubular element 143 including the skirts of which one, 145, is shown in Fig. 8 corresponding to the skirt 91 of the tubular element 85 in Fig. 4. These skirts may be adapted to cooperate with a member, not shown, similar to the channel member 95, Figs. 4 and 5, to provide for adjustment of the width of the sash within a given opening.

In the embodiment of Fig. 8 the bracket 147 is provided with arms 149, 151 bearing against the respective walls 153, 155 of the tubular elements 141 and 143. Similarly the bracket 147 is provided with arms 157, 159 which bear against the respective opposite walls 161, 163 of the tubular elements 141, 143. The dimensions between the bearing faces of the arms 149, 157 and between the bearing faces of the arms 151, 159 are such that these parallel arms fit snugly between and in bearing relation to the walls of the respective tubular elements 141, 143. These arms respectively may be fastened to these walls, for example, by screws 63 and Tinnerman nuts 71 as shown and described in connection with Figs. 1 to 4 inclusive.

In the embodiment of Fig. 8 the trunk 165 of the bracket 147 extends generally parallel to the miter joint between opposite walls of the framing elements 141, 143. This trunk may be of generally rectangular section and may bear edgewise upon the vertical walls which are parallel to the plane of the sash in the same manner as described in connection with Figs. 1 and 3. In this embodiment, however, the trunk 165 is not coincident with the miter joint so as to extend along and cover the miter joint but is somewhat removed from and extends parallel to this miter joint. The trunk 165 is connected at one end thereof to and adjacent the juncture of the arms 157, 159. This trunk is joined to the arm 149 at a point removed from the juncture of this arm and the arm 151.

In the embodiments of Figs. 1, 3 and 4 the trunk extending along the miter joint covers this joint and eliminates the "light line," that is, the light which may be noticed passing through the joint unless the miter edges of the framing elements are cut with great accuracy to fit tightly together. Where the trunk covers the miter joint, as in Figs. 1, 3 and 4, extreme accuracy in the cutting and fitting of the tubular elements is not required in order to provide a joint of good appearance and serviceability. In some cases, however, as shown in Fig. 8 it is desirable to connect the trunk 165 adjacent the juncture of the outwardly disposed arms 157, 159 in order that the fastening or screw 63 which holds the arm 157 against the wall 161 shall be as close to the miter as is feasible while allowing for entering the bracket into the tubular element 141 with a snug sliding fit, especially if the arm 157 is required to flex slightly to ride over a burr or other positioning protruberance formed in the wall 161 as described in connection with

Fig. 3. Similarly the fastening holding the arm 159 against the wall 163 of the element 143 may be brought as close as is practicable to the corner of the bracket and to the miter joint by connecting the trunk 165 to the arms 157, 159 in the manner shown in Fig. 8.

In this embodiment the arms 149, 151 may be of suitable length to provide the requisite flexure thereof with respect to their connection to the trunk 165 while maintaining sufficient rigidity to hold these arms respectively against the walls 153, 155. In this embodiment as in the other embodiments described the trunk functions to hold the arms in snug bearing relation to the oppositely disposed walls 153, 161 and 155, 163 as well as between the respective walls of the framing elements 141, 143 which are parallel to the plane of the sash.

It will be further understood that the trunk of the bracket of the invention which thus connects the arms and holds them in proper position bearing upon the respective walls may be positioned at either side of or coincident with the miter joint to suit different conditions, the arms in each case being made of suitable length for securely fastening the bracket to the respective walls while also providing for entering the arms into the tubular elements with a snug fit.

It will be observed also in the several figures of the drawings that the corners of the arms which are adjacent the bearing faces thereof are rounded for the purpose of more easily entering the arms into the respective tubular elements and of riding over the burrs or other means corresponding to the annular raised portions 69 which are used for positioning the brackets with respect to the tubular elements. Within the scope of the invention the burrs or other protruberances may be carried by the arms of the brackets and may enter into corresponding holes in the walls of the tubular framing elements.

It will be understood from a consideration of Figs. 1, 3, 4 and 5 showing several forms of the bracket that this bracket may be produced by cutting at right angles to its length a bar which has been extruded or drawn with a cross section in one or the other of the forms shown in these figures or similar cross sections. Bars of such unusual cross section may be extruded without difficulty when made of aluminum alloys and the brackets thus produced will have the requisite rigidity while also providing for the slight flexure of the arms thereof as above described. In some window and door constructions, however, utilizing tubular or other framing elements having oppositely disposed parallel walls adapted to cooperate with the bracket as above described, the bracket may be made of steel or other materials by forging, die casting or other methods of manufacture.

The invention is applicable to various forms of window sash and doors and similar closures, particularly where tubular framing elements are utilized. It will be understood, however, that the invention is not limited to the preferred construction in which all of the faces and edge surfaces of the bracket are snugly fitted against the adjacent walls of the tubular framing elements and that substantial improvement may be secured by virtue of the connecting trunk portion in the rigidity of the corner and of the sash and in ease of assembly and in other ways when only opposite faces, e. g., the parallel faces of the arms, bear snugly against the corresponding walls of the framing elements. All such variations and modifications of the forms hereinabove disclosed are intended to be within the scope of the invention and to be covered by the claims appended hereto.

I claim:

1. In a frame construction for a window or door the combination with a pair of elongated tubular framing elements disposed in angular relation to each other and extending along respective adjacent sides of said frame from a corner of said frame, each of said framing elements having oppositely disposed walls providing inner

opposed surfaces extending generally parallel to the length of said element, of a bracket cooperating with said framing elements adjacent said corner for connecting the said elements together in said angular relation to each other, said bracket having a trunk portion disposed between oppositely disposed walls of said framing elements adjacent the joint between said framing elements at said corner of the frame and having cantilever arms extending from said trunk portion respectively along and providing outwardly disposed faces respectively adjacent said inner opposed surfaces of said elements, said arms respectively being provided with cavities in said faces thereof open toward the respective adjacent inner wall surfaces, the respective adjacent walls of said framing elements being provided with protrusions from said inner wall surfaces projecting into the respective cavities in the respective arms of said bracket to position said bracket and said framing elements with respect to each other with said trunk disposed adjacent said joint between said angularly related framing elements and with said arms disposed within said tubular elements, said arms of said bracket being capable of sufficient resilient flexure transversely of said faces thereof so that the extremities of said arms of said bracket may move transversely of the respective faces to pass by said protrusions so that said arms may slide over said protrusions upon engaging said bracket arms between said inner opposed surfaces of said walls of said framing elements until said protrusions project into said cavities of said arms.

2. In a window or door construction the combination as defined in claim 1 in which said arms of said bracket are provided with holes extending therethrough transversely of the respective adjacent walls of said elements, fasteners carried by the respective walls and extending through said holes for fastening the arms to the respective adjacent walls of said elements, and spring elements respectively cooperating with said fasteners and said arms to bias the respective arms into engagement with the adjacent walls of said framing elements.

3. In a window or door sash construction the combination as defined in claim 2, said fastener being a machine screw and said spring element being a Tinnerman nut.

4. In a frame construction for a window or door the combination as defined in claim 1 in which said inner opposed surfaces of each framing element are planar and are parallel to each other in planes perpendicular to the plane of said frame, the space between said inner surfaces in one framing element being different from the space between said inner surfaces of the other framing element, said bracket on the two arms thereof that are adjacent the opposed inner surfaces of the respective framing elements providing planar faces parallel to each other and to said adjacent inner surfaces, said faces being spaced apart distances corresponding to the respective spaces between said inner surfaces in the two framing elements.

5. In a frame construction for a window or door the combination as defined in claim 4 in which the framing element of less space between the inner opposed surfaces thereof comprises a wall extending therefrom generally parallel to the plane of the frame outwardly of the frame with respect to said element sufficiently to make the apparent width of the two adjacent framing elements similar, said framing elements being formed to provide a mitered joint therebetween at said corner, said trunk of said bracket being disposed adjacent said mitered joint and being connected to one of said arms at a point spaced from the juncture of said arm with the adjacent arm of said bracket that is in angular relation thereto.

6. A corner bracket for a frame for a window or door constructed with a pair of elongated tubular framing elements disposed in angular relation to each other and extending along respective adjacent sides of said frame

from a corner of said frame, each of said framing elements having oppositely disposed walls providing inner opposed surfaces extending generally parallel to the length of said element, said bracket having a trunk portion adapted to be disposed between oppositely disposed walls of said framing elements adjacent the joint between said framing elements at said corner of said frame and having a pair of cantilever arms for each framing element, the arms of each pair being connected to said trunk and extending therefrom in parallel relation to each other and providing thereon outwardly disposed faces spaced apart so as to be adjacent the respective inner opposed surfaces of the respective framing elements when assembled therewith, said pairs of arms extending in angular relation to each other corresponding to said angular relation of said framing elements of said frame, said arms respectively being provided with cavities open at said outwardly disposed faces for engagement with protrusions provided at said inner opposed surfaces of the respective framing elements, said arms of said bracket being capable of sufficient resilient flexure transversely of said outwardly disposed spaced faces thereof so that the extremities of said arms respectively may move transversely of said faces to pass by said protrusions and so that said arms may slide thereover until said protrusions enter said cavities upon complete insertion of said arms in said tubular elements.

7. A bracket as defined in claim 6 in which said arms of each pair are in spaced relation relative to each other transversely of the plane of the frame when assembled therewith and bear upon the inner surfaces of opposite walls of the respective framing elements which are parallel to said plane.

8. A bracket as defined in claim 6 in which said arms of each pair are in spaced relation to each other in the direction parallel to the plane of the frame when assembled therewith and bear upon the inner surfaces of opposite walls of the respective framing elements which are transverse to said plane.

9. A corner bracket for a frame for a window or door constructed with tubular framing elements extending along the respective sides of the frame in angular relation to each other adjacent a corner of the frame, each of said framing elements having oppositely disposed walls extending parallel to the length of said element and providing inner opposed surfaces parallel to said length thereof in planes transversely of the plane of the frame and at right angles to the corresponding inner surfaces in the adjacent angular related element of said frame, said bracket having a trunk portion adapted to be disposed adjacent said corner of said frame and extending at an angle to both said framing elements between the opposite walls thereof, said bracket having at each end of said trunk two cantilever arms extending from said trunk in angular relation to each other and providing outwardly disposed plane faces at right angles to each other, said plane faces extending from said trunk so as to be disposed adjacent the respective inner surfaces of the walls of said framing elements when said cantilever arms are disposed within the respective framing elements, at least one of said arms for each framing element in a portion thereof spaced therealong from said trunk at the face thereof adjacent the adjacent wall of said framing element being formed with a cavity for engagement with means carried by said adjacent wall of said framing element for securing against relative movement of said bracket and said framing elements lengthwise of said elements when assembled therewith, said arms of said bracket having said cavities therein being capable of sufficient resilient flexure transversely of said plane faces thereof so that the extremities of said arms may move transversely of said faces to pass by said cavity engaging means of the respective adjacent walls to bring said cavities into register with said cavity engaging means for engagement therewith and concomitantly reverse re-

13

silent movement of said arms toward the respective adjacent walls of said framing elements upon complete insertion of said arms in said elements.

10. A bracket as defined in claim 9, said arms adjacent the outer extremities thereof being provided with holes extending therethrough perpendicular to respective plane faces thereof and having at the opposite side of said arms from said plane faces recesses for receiving spring elements cooperating with fastening elements extending from the respective walls and through said holes in said arms to clamp said arms and the respective walls together.

References Cited in the file of this patent

UNITED STATES PATENTS

124,759 Quinn ----- Mar. 19, 1872

923,810
1,352,335
1,694,667
1,749,648
1,908,270
2,086,503
2,213,924
2,587,471

721,819
749,358

14

Budd ----- June 8, 1909
Wirth ----- Sept. 7, 1920
Peck et al. ----- Dec. 11, 1928
Ray ----- Mar. 4, 1930
Shaffer ----- May 9, 1933
King ----- July 6, 1937
Tinnerman ----- Sept. 3, 1940
Hess ----- Feb. 26, 1952

FOREIGN PATENTS

France ----- Dec. 23, 1931
France ----- May 2, 1933