

No. 700,621.

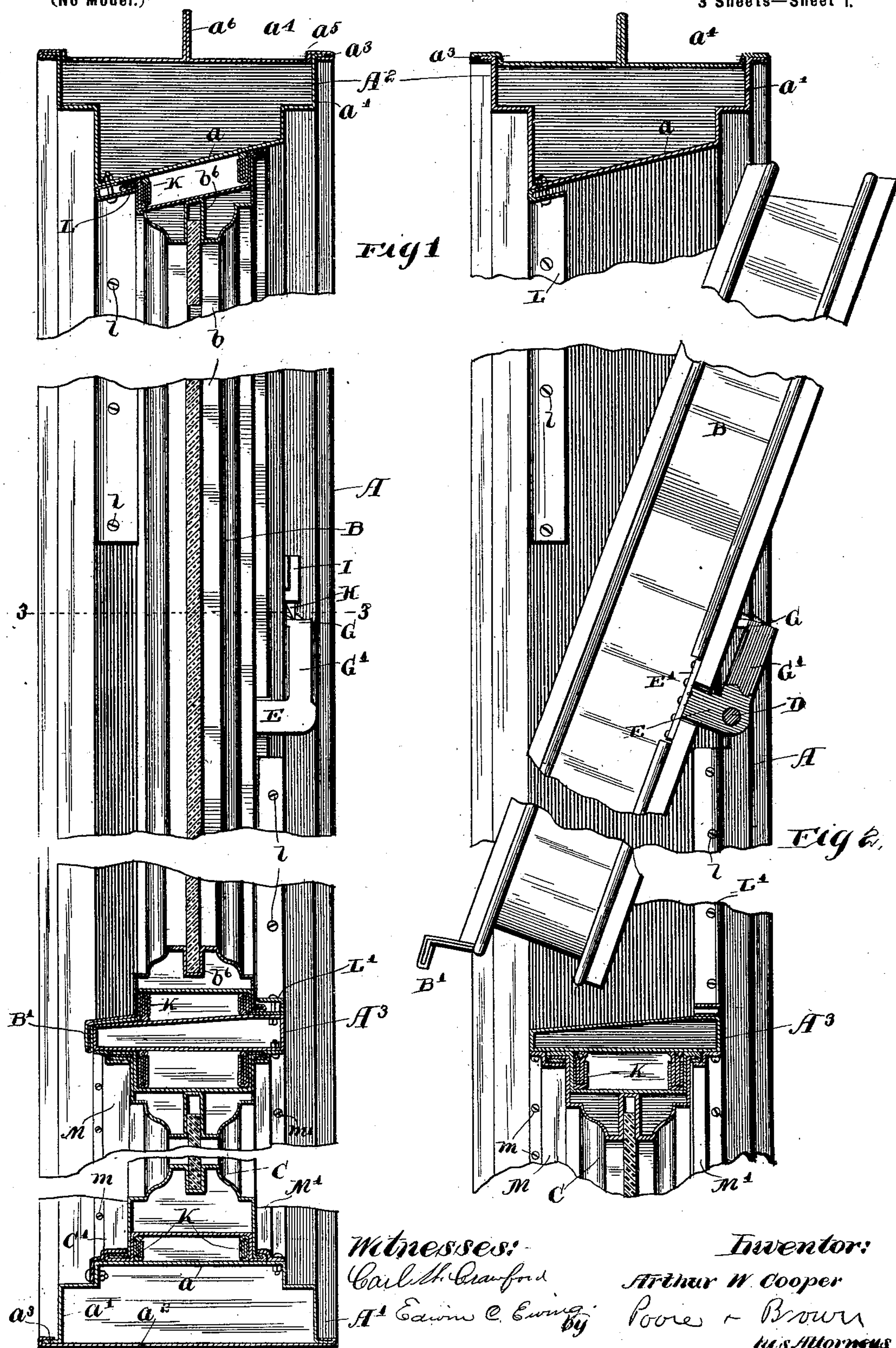
Patented May 20, 1902.

A. W. COOPER.
METAL WINDOW.

(Application filed Feb. 8, 1902.)

(No Model.)

3 Sheets—Sheet 1.



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3 Sheets—Sheet 2.

Fig 3

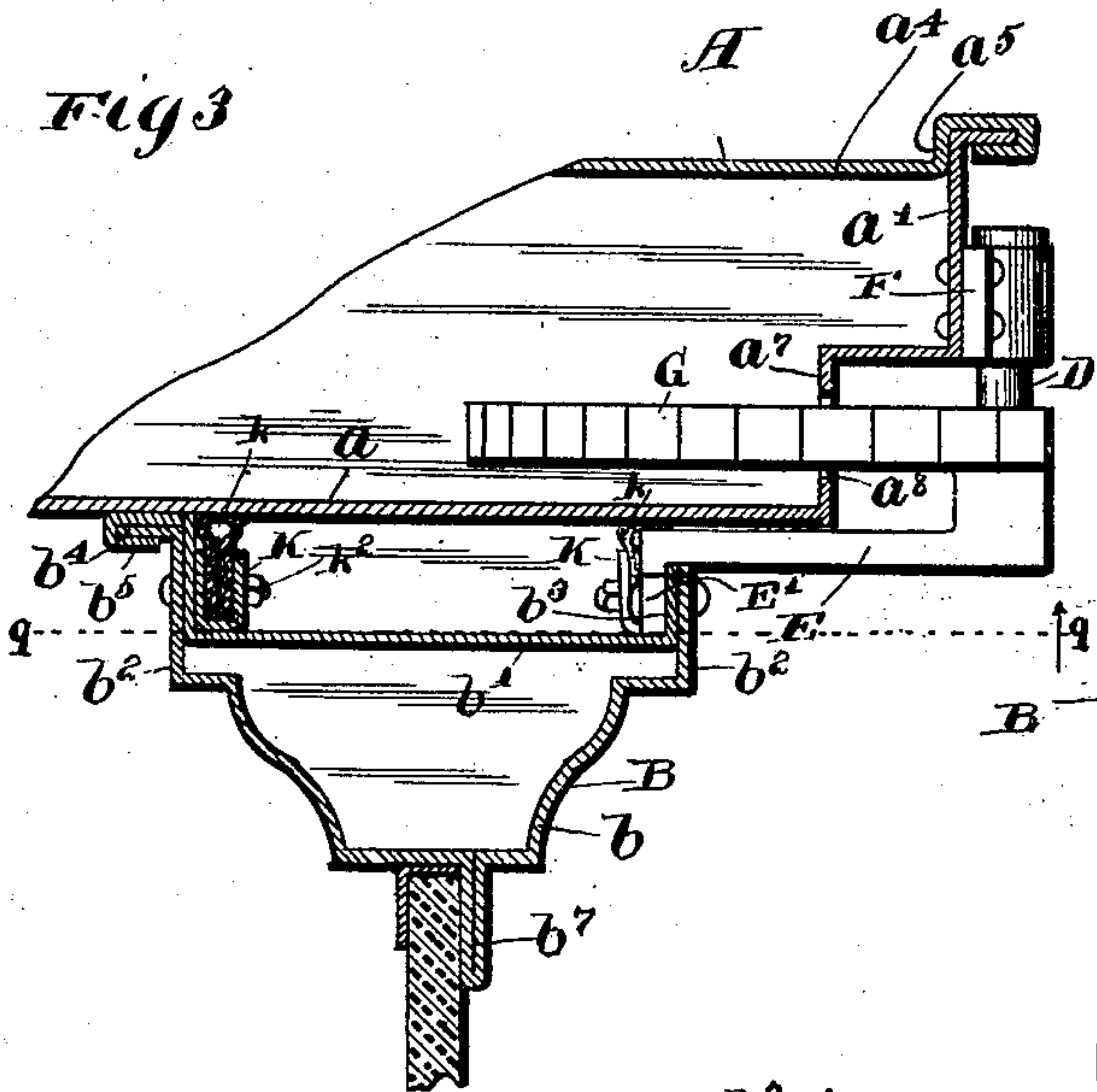


Fig 4

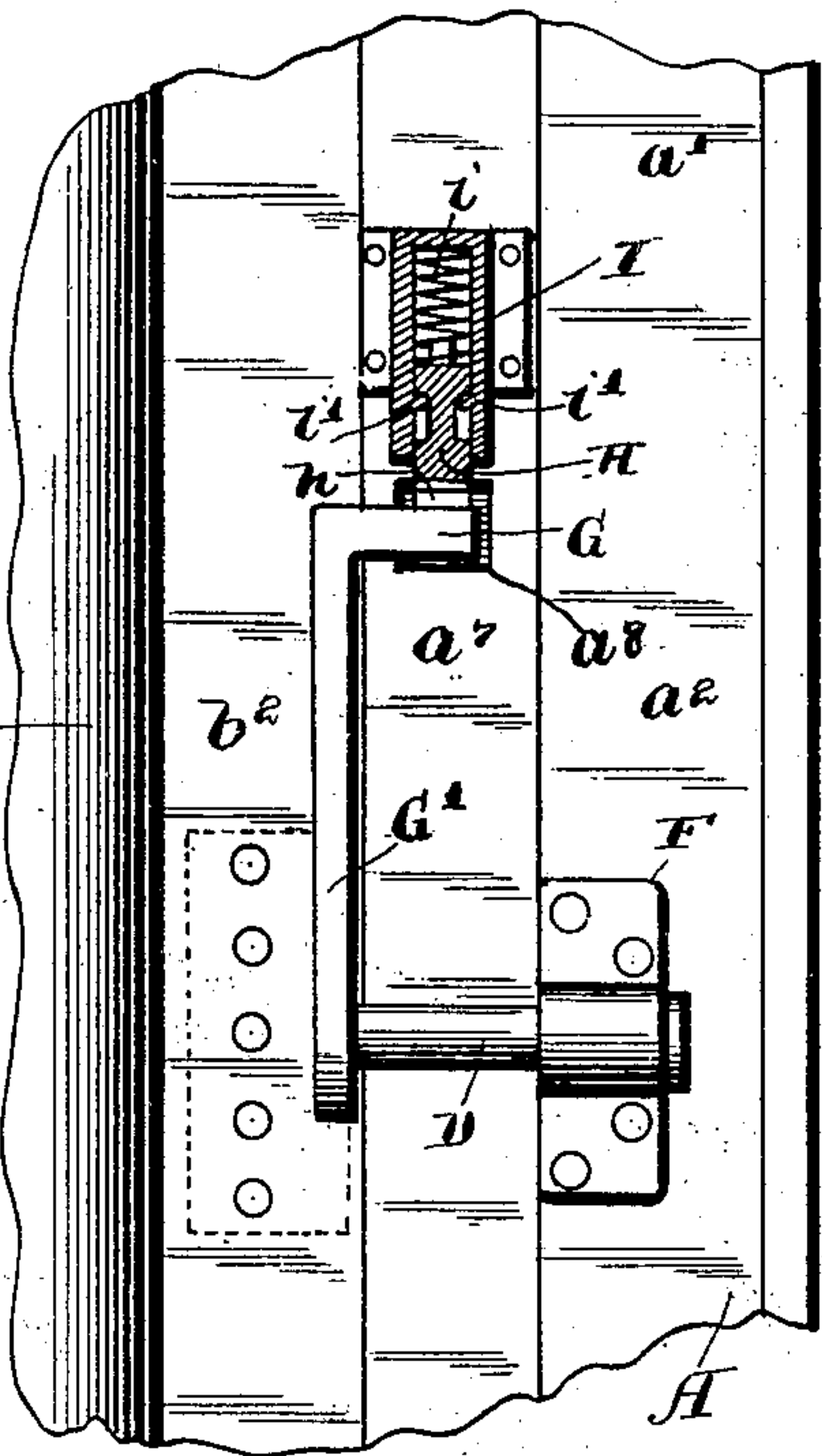
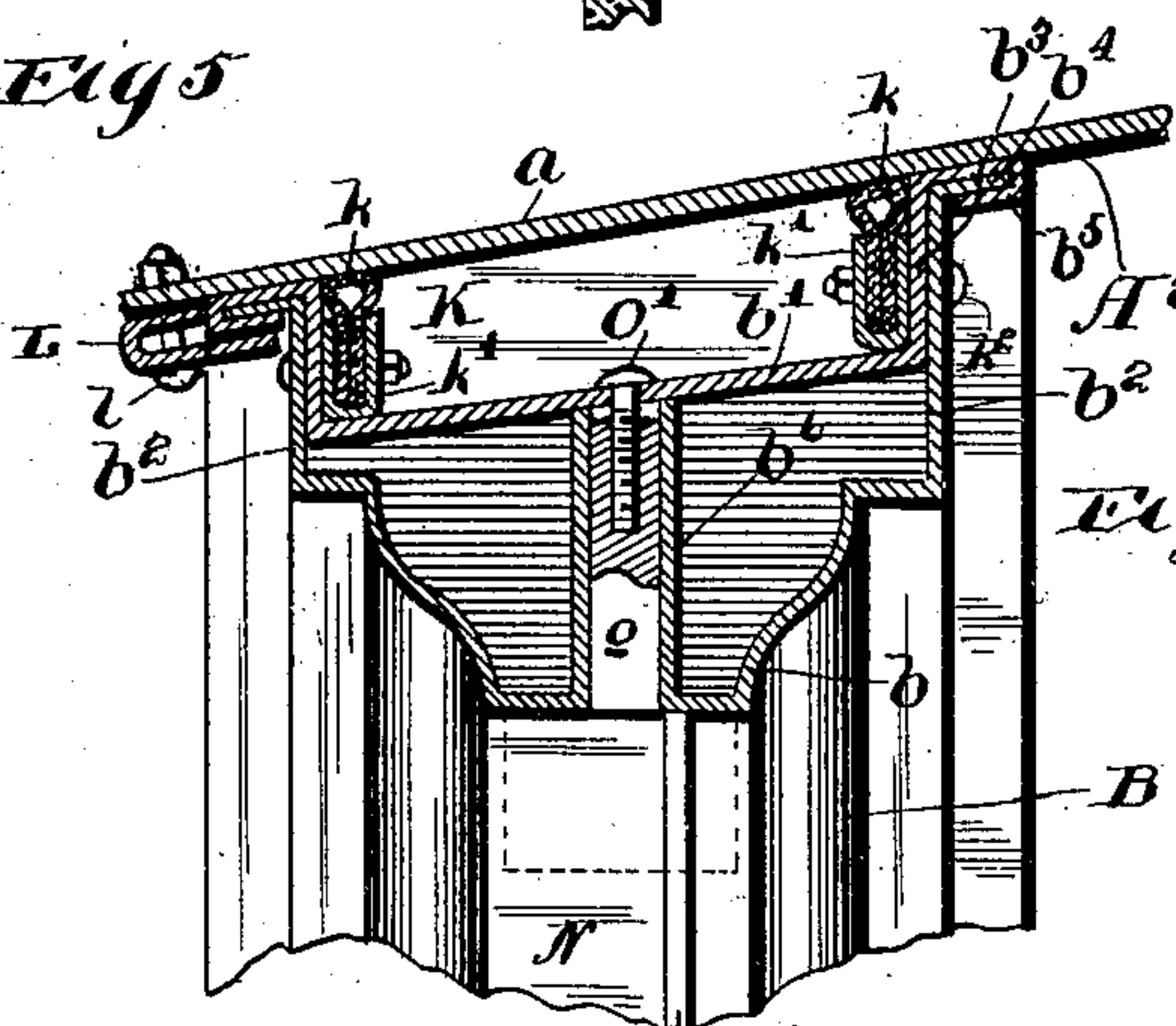


Fig 5



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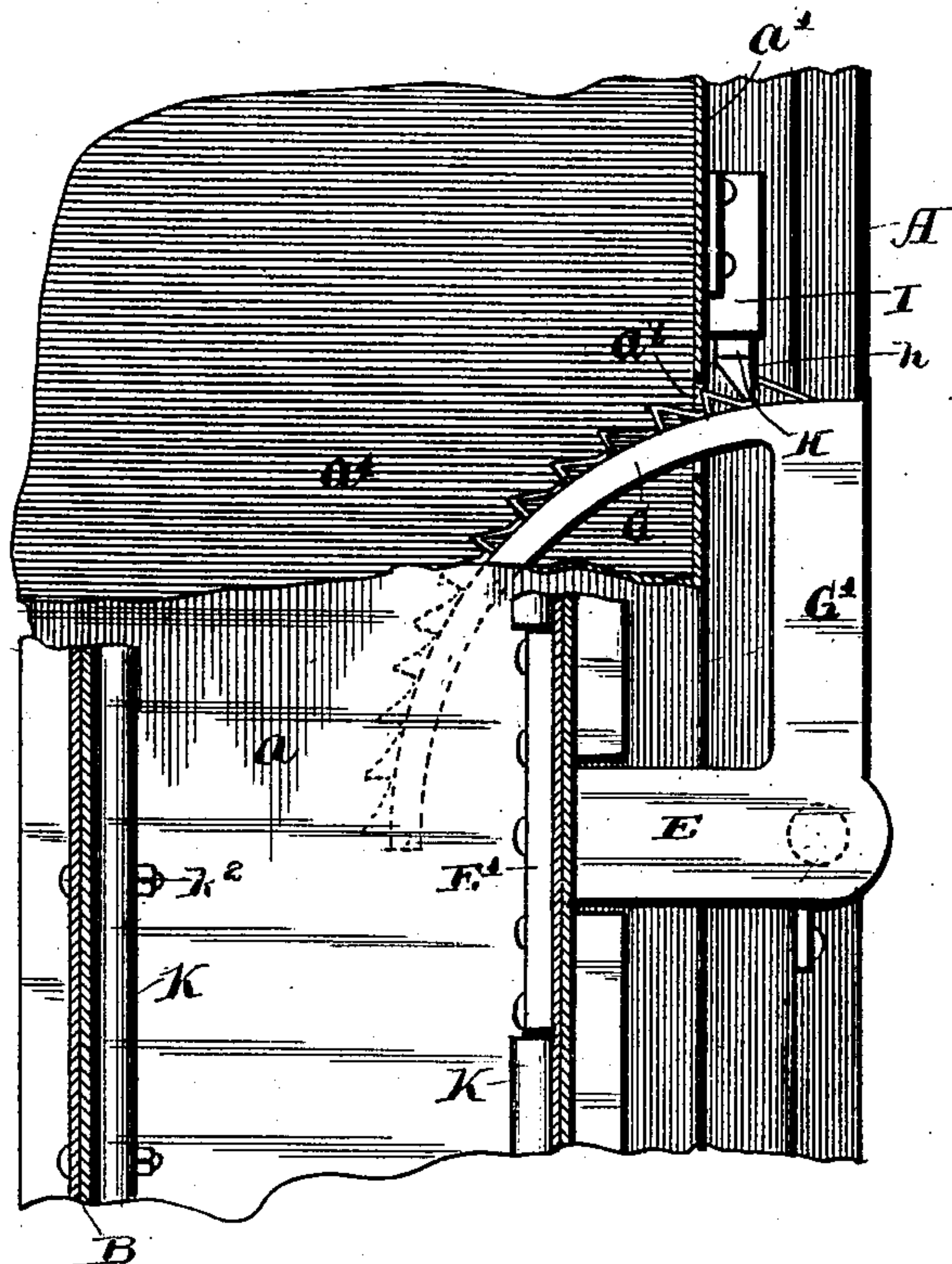


Fig 9

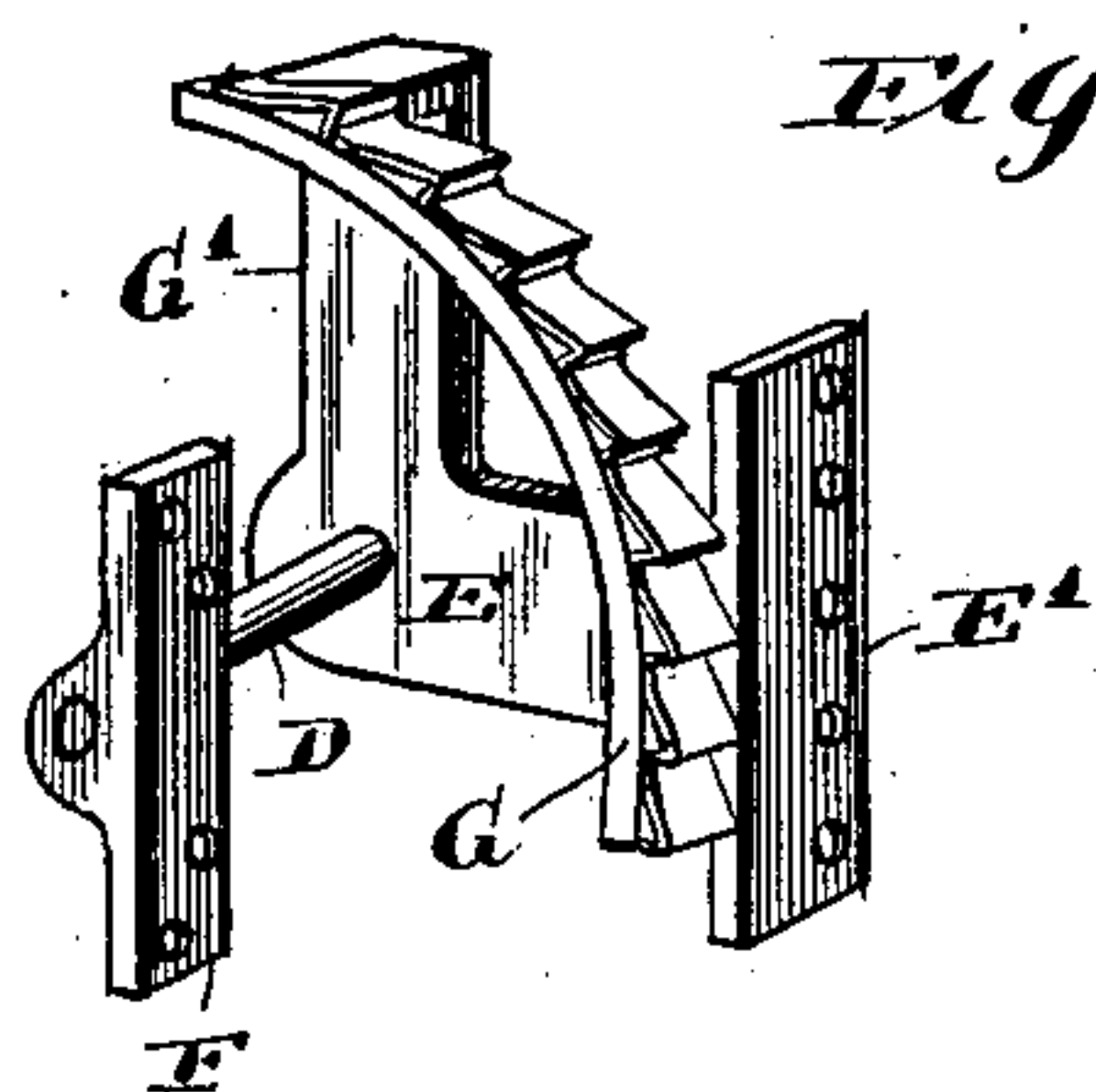


Fig 10

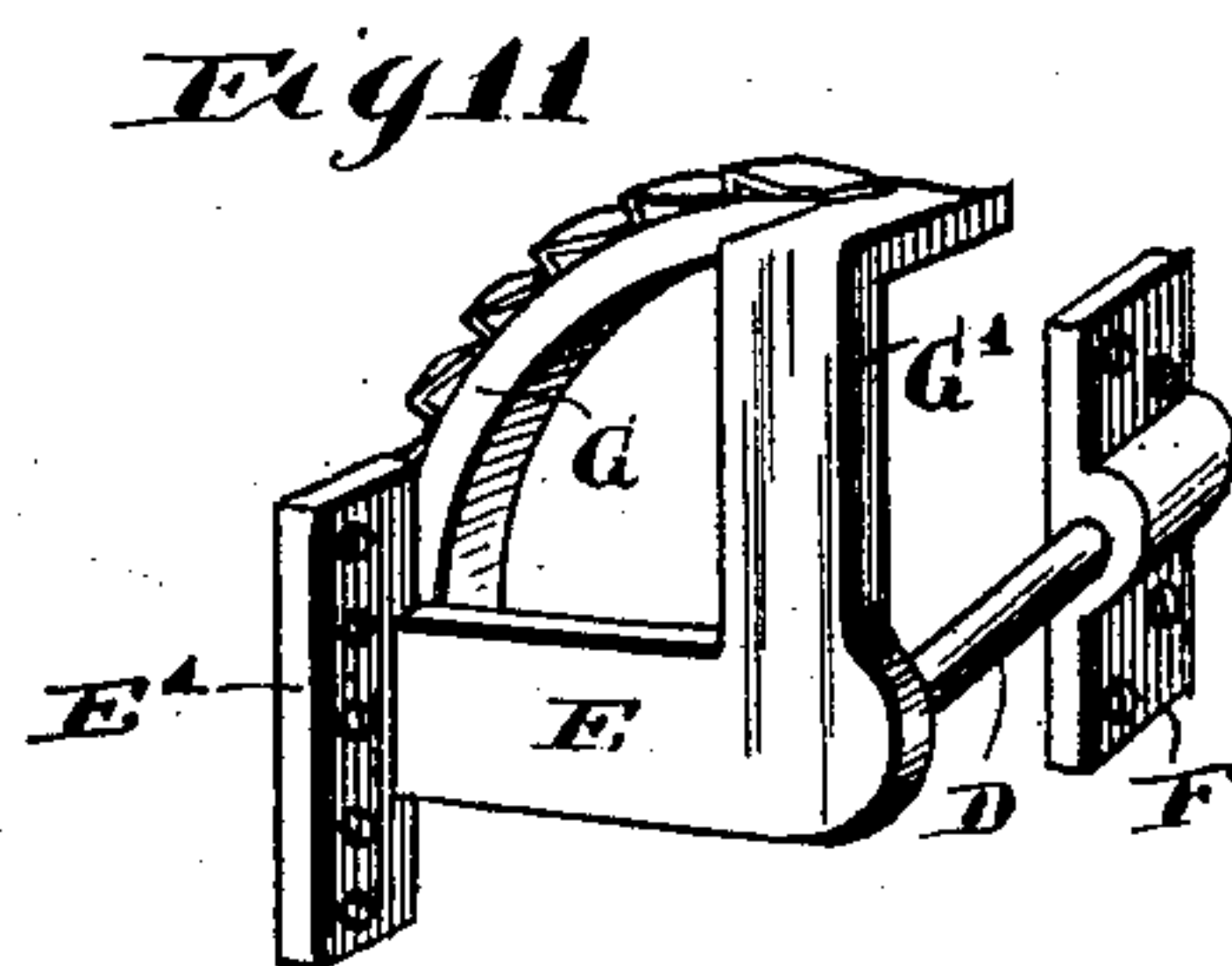


Fig 11

Witnesses:

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Inventor:

Arthur W. Cooper

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UNITED STATES PATENT OFFICE.

ARTHUR W. COOPER, OF CHICAGO, ILLINOIS.

METAL WINDOW.

SPECIFICATION forming part of Letters Patent No. 700,621, dated May 20, 1902.

Application filed February 8, 1902. Serial No. 93,133. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR W. COOPER, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful
5 Improvements in Metal Windows; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon,
10 which form a part of this specification.

This invention relates to improvements in fireproof windows, and more especially to improvements in the construction of sheet-metal window frames and sash, in means for sup-
15 porting and securing the sash in the frame, and in devices for making tight or weather-proof joints between the sash and frame.

The invention consists in the matters hereinafter described, and pointed out in the ap-
20 pended claims.

As shown in the accompanying drawings, Figure 1 is a view in central vertical section of a window frame and sash embodying my invention. Fig. 2 is a sectional view of the
25 upper part of the window-frame shown in Fig. 1, with the pivoted sash therein shown in side elevation. Fig. 3 is a plan section taken on line 3 3 of Fig. 1. Fig. 4 is a detail face view of the pivotal connection between the
30 sash and frame, showing the parts illustrated in Fig. 3. Fig. 5 is a vertical section through the upper sash, illustrating the construction of a mullion and means for securing the same in the sash. Fig. 6 is a perspective view of
35 one of the mullion-securing devices shown in Fig. 5. Fig. 7 is a horizontal cross-section taken through the mullion and glass on line 7 7 of Fig. 5. Fig. 8 is a detail section of one corner of the sash-frame, taken on a plane
40 parallel to the side faces of the sash. Fig. 9 is a detail section taken on line 9 9 of Fig. 3, showing the pivotal support for the sash. Figs. 10 and 11 are perspective views of the bracket and toothed segment shown in Figs.
45 3, 4, and 9.

As shown in said drawings, A A designate the vertical side parts or bars of the frame, A' the lower cross-bar or sill of the frame, and A² the upper cross-bar of the frame.

50 A³ indicates an intermediate cross-bar of the frame, located between the upper and

lower ends thereof and separating the upper from the lower sash.

B indicates the upper, and C the lower, sash. Said upper sash B is pivotally sup- 55 ported in the frame; but the lower sash C is rigidly but removably secured therein.

D indicates one of the pivots by which the upper sash is supported in the frame, said pivots being located inside the plane of the 60 sash. Each pivot D is attached to the sash by means of a bracket E, the pivot being connected with the frame by means of a bearing-plate F, attached to the frame and provided with a bearing-aperture to receive the outer 65 end of the pivot, which latter is made of considerable length and extends outwardly from the bracket to the bearing-plate, which is attached to the vertical side face of the frame at some distance outwardly from the sash. 70

G designates a notched or toothed segment which is rigidly secured to the sash at one side thereof and is arranged concentrically with the pivot D. Said notched or toothed segment constitutes, with a spring-pressed 75 holding catch or detent H, which is mounted to slide in a case I, a device for holding the upper sash in its open position. The pivotal axes of the sash being located inside of the plane of the sash, the weight of the latter 80 tends to keep it closed, and it is held in its open position against the action of gravity by the toothed segment G and the detent H, which engages the same.

Now referring to the features of construc- 85 tion illustrated in the frame, the same consists of the vertical side members A and the bottom and top cross-pieces A' A². Said frame is made of sheet metal and is of hollow or tubular construction. Each of said frame 90 members consists of an inner sheet-metal part bent into channeled or trough form and having integral flat inner walls *a* and side walls *a'* and an exterior sheet-metal wall, which in the case of the bottom horizontal 95 frame member is in the drawings lettered *a*² and in the case of the side and top members is lettered *a*⁴. Said wall *a*² of the lower horizontal frame member is flat and projects beyond the side walls *a'* *a'*, which latter are pro- 100 vided with outwardly-extending marginal flanges *a*³, which are engaged by U-shaped

flanges on the margins of the outer wall a^2 , which are bent over and around the flanges a^3 . In the case of the vertical side members A and the top cross member A^2 the inner and side walls a a' are made with flanges a^3 in the same manner as before described; but the outer wall a^4 is arranged in its part between the side walls a' slightly inside of the plane of the outer margins of the said side walls and is provided with outwardly-bent parts a^5 a^5 , forming shoulders which rest against the inner faces of the said side walls, its marginal part outside of said shoulders a^5 being bent around the outwardly-extending flanges a^3 in the same manner as in the case of the bottom frame member. The shoulders a^5 serve to facilitate the joining of the parts by holding the flanges a^3 firmly in engagement with the inwardly-bent margins of the said wall a^4 . Said wall a^4 of the side and top frame members is, moreover, at its central part provided with an outwardly-extending vertical flange a^6 , formed by folding together the central portion of the metal of the outer wall, said vertical flange being adapted to be built into the joints between the brickwork of the wall, in which the window-frame is placed. Said flange a^6 constitutes a means by which the frame is held firmly in position in the wall. The side walls a' of the frame members are, moreover, at the inner side of the frame and preferably also at the outer side thereof shaped to provide an offset part or shoulder a^7 . The inner flat wall a of the top cross-piece A^2 is shown as made oblique, the same being inclined downwardly and outwardly from the inner toward the outer face of the frame, so that it will fit the correspondingly-inclined upper margin of the upper sash B. This construction enables said sash to swing into its closed position with its upper margin in contact with the top member of the frame, as is common in like structures.

Now referring to the construction of the sashes or sash-frames, the same is alike for both the upper and lower sash B and C, and a description of one of said sash will serve for both. The horizontal and vertical members of the sash-frame are hollow or tubular and consist each of two sheet-metal members—namely, an inner trough-shaped member b and outer trough-shaped member b' . The side walls b^2 of the inner member b are parallel with each other and are provided at their margins with outwardly-bent flanges b^4 . The trough-shaped outer part b' is provided with side walls b^3 , which are parallel with and fit closely within the side walls b^2 and terminate in outwardly-extending flanges b^5 , which extend outwardly over the flanges b^4 and are bent inwardly at their margins over said flanges b^4 , so as to rigidly attach or secure said outer members b' to the inner members b . The frame members, consisting of inner and outer members b b' , attached or connected as described, constitute a hollow sash-frame, which is provided at its marginal sur-

faces or outer edges with a wide recess or groove extending around the same and which is nearly as wide as the thickness of the sash. In the case of the upper and lower horizontal frame-bars of the sash, Figs. 1, 2, and 5, the inner member b is bent to form a U-shaped part b^6 , which extends into the hollow interior of the bar and which forms a groove to receive the edges of the glass. In the case of the upright sash-frame members, Fig. 3, the inner sheet-metal member b is provided with inwardly-extending flanges b^7 , formed by bending the same, as clearly shown in Fig. 7. Said flanges b^7 serve to form bearing-surfaces for the glass, as common in metal sash.

The horizontal and vertical members of the sash-frame are connected at the corners of the same by means of overlapping parts on the inner trough-shaped portion b , secured together by soldering, rivets, or bolts, as clearly seen in Fig. 8. The making of the sash-frame of inner and outer trough-shaped parts b b' , joined as described, has the important advantage that in constructing the sash the inner parts b may be joined at their ends to form a rectangular frame in the manner described and shown in Fig. 8, and after the joining or riveting of said ends has been accomplished the outer part b' may then be applied and secured to the inner part by bending the margins of the outer part over the flanges b^4 of the inner part, said outer part b' being either made continuous where it extends around the corner or joined at the corner, as may be found convenient. In Fig. 8 a joint is shown in the outer part b' at the corner of the sash formed by overlapping and soldering the parts in a familiar manner, the soldering being easily accomplished after parts are assembled.

The construction of the sash described, whereby the same consists of inner and outer parts b b' , shaped to form a recess or groove extending around the outer edges of the sash, also constitutes part of a device for forming a tight joint between the sash and the surrounding parts of the window-frame. Said device consists of weather-strips K K, located within the said recesses adjacent to the side walls thereof, so that the outer margins of said strips, which are made of soft, yielding, or flexible material, project somewhat beyond the outer edges of the sash and are adapted to engage the inner face of the said frame. In the particular construction shown the said weather-strips K are made as follows: Each strip consists of a folded strip k of rubber, felt, or other suitable flexible material or fabric, and a strip k' of sheet metal bent into U form around the folded margin of said strip k , the central part of the flexible strip k being bent into U form and extending far enough from the edges of the metal strip k' to form a yielding edge. The compound weather-strip made as described may be secured to the sash in contact with the projecting flanges formed by the side walls b^2 and b^3 of the inner and

outer sheet-metal parts b and b' in any desired manner—as, for instance, by means of bolts or rivets k^2 , Fig. 5. The weather-strips made as described may be applied to one or both sides of the marginal recess in the sash. In the particular construction shown they are applied one on each side of the marginal recess, with the result of affording greater security against the entrance of dust or storm-driven water. The weather-strips will be applied in a like manner to both the upper and the lower or stationary sashes A and B.

In the case of the upper or swinging sash B stops L L' are applied to the frame outside and inside of the sash above and below the pivots thereof. Said stops, as herein shown, consist of U-shaped pieces of metal secured to the inner face of the frame and having their free edges directed inwardly and arranged to stand at some distance from the adjacent part of the frame, so as to form a groove to receive the opposite lateral sash formed by the interlocked parts b^4 and b^5 . The edges of the said stops are preferably arranged to come in contact with the sash when the same is closed, being arranged to overlap the said flanges and to strike the vertical side faces of the sash. The said stops L L', formed by means of a U-shaped piece of metal, as described, are shown as secured to the sash by means of small bolts l , having heads slotted for the application of a screw-driver at the outer faces of the stops and engaging nuts seamed by soldering on the inner faces of the sheet-metal frame. The nuts being thus secured to the frame, which is perforated for the passage of the bolts, the latter may be removed and replaced at any time, the nuts being held in place to receive them and being immovable, so that the bolts may be readily inserted and removed by a screw-driver.

At the outer margin of the lower cross-bar of the upper sash B the same is provided with an L-shaped flange B' , arranged to extend outwardly over the top face and downwardly over the outer face of the frame cross-bar A^3 . Said flange is conveniently formed of the same metal which constitutes the parts b b' of the said lower part of the sash, both of said parts being extended outwardly to form said flange B' and the outer margins of said parts which form the flange B' being joined by bending the margin of the extension of the part b over the extension of the part b' , so as to make an interlocked joint.

For securing the lower sash C in the frame a sheet-metal stop is herein shown and located in the outer face of the frame, consisting of a metal strip M, which is secured, preferably, by bolts m to the inner face of the frame and extends entirely around the same, said strip being inwardly bent or offset to form a groove or recess in the outwardly-extending horizontal flange on the sash and having its free edge adapted to bear against the side edges of the sash in the same manner as in the case of the stops L L'. An inner stop

M' is provided on the lower sash, which also extends entirely around the same and is secured to the sash, preferably, by means of bolts m' . The bolts m and m' have at the outer faces of the strips M M' heads which are slotted for engagement with a screw-driver, and said bolts engage nuts which are secured by soldering to the inner face of the sheet metal constituting the frame, so that said nuts will remain in place and the bolts may be easily inserted and removed. The outer stop for the lower horizontal bar of the lower sash, which is secured to the lower cross-bar of the frame, has the form of an inclined strip, which is secured by bolts to the outer face of the said frame cross-bar and extends upwardly and inwardly, so that its inner edge is in contact with the outer face of the lower cross-bar of the sash. Said strip C' serves to prevent entrance of water between the bottom edge of the sash and the sill of the frame.

Now referring to the device for holding the upper or swinging sash B in its open position, the notched or toothed segment G, hereinbefore referred to, is attached to one of the brackets E, by which the pivots D are supported from the sash-frame by means of an arm E', which rises from said bracket and is connected with one end of the segment, Figs. 3, 4, 9, 10, and 11. Referring to the details of these parts, the said segment G, the bracket E and arm E' are preferably cast integral with each other, so that these several parts constitute a single casting. The bracket E is shown as attached to the sash by means of an integral base-plate E' on the bracket, which is secured against the inner face of the side wall of the lateral recess in the sash, the weather-strip being cut away or omitted at the point where said base-plate E' is located, as clearly shown in Fig. 2. The bracket E is shown as extending through the inner lateral flange at the side of the recess in the sash, said flange being cut away at its outer edge and the bracket being arranged to extend through the notch in the sash, as clearly seen in Figs. 2, 3, and 9. The segment G is not located in the same plane with the bracket E, but is offset outwardly therefrom with respect to the side frame of the sash, so as to bring the said segment outside of the wall a of the frame, Fig. 3, and opposite the side wall a' of said frame, which latter is provided with opening a^8 for the passage of the segment. Said segment being attached at its outer end only to the arm G', its inner end is free and is adapted to pass through the opening a^8 , so that it is partially within the hollow interior of the tubular frame when the sash is in its closed position, as shown in Figs. 3 and 9. The holding detent or bolt H is shown as arranged vertically above the segment G, which has its teeth formed upon its upper surface. The casing I, in which the bolt slides, is of tubular form and secured to the vertical wall a' of the frame above the opening a^8 therein. A

coiled spring *i* is shown as located in the casing I in such manner as to act upon the bolt H in a manner to throw the same toward the segment G. To provide means for releasing the segment and permitting the window to be closed in case of fire within the building, I provide the holding detent or bolt H with a separable or detachable holding end *h*, connected by solder with the body of the bolt and which upon the solder being melted will become detached, and thereby release the segment and permit the sash to close. To limit the outward movement of the bolt, stops *i' i'* are arranged on the casing I, so that when the holding end of the bolt becomes detached the body thereof will not be thrown outwardly from the frame in position to engage the segment. As a further means for insuring the disconnection of the segment from the bolt in case of fire within the building I also make the teeth of the notched segment separable or in the form of a separate piece secured by solder to the curved outer face of the segment. As a preferable construction in said teeth, I make the same by bending or forming the same of sheet metal, as clearly seen in Fig. 9, said teeth being separately secured by solder to the segment. As a result of this construction if the teeth outside of the bolt are subjected to heat from a fire within the building they will become detached and release the sash, even when the teeth on the outer part of the segment remain unaffected by the heat.

As an improved means of securing to a hollow sheet-metal frame the mullion or dividing-strip between the panes of glass within the frame, I provide a construction (shown in Figs. 5, 6, and 7) as follows:

N, Figs. 6 and 7, indicates the mullion-strip, which is made of sheet metal and of cruciform shape in cross-section and so shaped as to form a central web *n*, which is arranged transversely with respect to the bars of the sash-frame, and two wings *n' n'*, arranged in the same plane with the flanges *b'* on the side bars of the sash. The margins of the glass fit at their edges against the cross-piece *n*, with the side faces thereof in contact with the flanges *n' n'*. The sheet metal forming the mullion is bent so as to make the same of hollow form, as shown in Fig. 7, the folds constituting the parts *n n' n'* being slightly separated from each other. The mullion N, made as described, is arranged to extend between and abut at its ends against the inner faces of the opposite frame-bars of the sash, as clearly shown in Fig. 5. For securing the ends of the mullion to said frame-bars devices are provided consisting of connecting-pieces O, one of which is shown detached in Fig. 6. Each of said connecting-pieces embraces a flat-sided rectangular bar or stem *o* and a rigidly-attached part *o'*, made of thin or sheet metal and of cruciform shape in cross-section, corresponding with the shape of the mullion N. The wings of said part *o'* are,

however, made so thin as to enter the narrow spaces in the wings of the hollow sheet-metal mullion N, so that when the connecting-piece O is secured to the opposite ends of the sash-frame, with the part *o'* extending inwardly therefrom and engaged with the ends of the mullion, said mullion must be held by the connecting-piece rigidly in place. The stem *o* of the connecting-piece is provided with front and rear flat sides and is made of proper width to enter within the groove formed in the frame by the U-shaped or channeled part *b'* for the reception of the edges of the glass. Provision is made for securing the said part O in place in said groove, consisting of a screw O', inserted through the wall *b'* of the sash-frame and extending endwise into the said stem *o*. In the case of the upper cross-bar of the sash the U-shaped part *b'* is extended inwardly or upwardly into contact with the wall *b'*, Figs. 1 and 5, so as to make the glass-receiving groove so deep that the glass may be inserted by thrusting its upper edge upwardly into the said groove until its lower edge is free to pass over the lower frame-bar and is above the groove in the latter and then permitting the glass to slide downwardly until its lower edge rests on the bottom of the groove in said lower sash. By reason of this construction in the upper sash-bar the stem of the upper connector is made long enough to reach at its upper end into contact with the top of the U-shaped part *b'*, and the screw O' is inserted through holes formed in the wall *b'* and the said part *b'*, so that when the screw is tightened it draws the upper end of the connector-stem firmly into contact with the horizontal top of the said U-shaped part and also draws the latter into contact with the wall *b'*, so that all three parts referred to are firmly clamped together, and the stem is connected with and rigidly held in position by both the said U-shaped part *b'* of the inner part *b* of the frame-bar and by the outer wall *b'* thereof. In the case of the lower bar of the sash the stem of the connector is made long enough to reach to the wall *b'*, and the U-shaped part *b'* is provided with an opening through which the said stem passes, the end of the stem being in this case arranged in abutting relation to the wall *b'* and being attached thereto by the screw O', which passes through the wall *b'* only and enters the end of the stem. In this case the connector is held rigidly in place by the engagement of its stem with the aperture in the part *b'* and by the rigid attachment of the outer end of said stem to the wall *b'*. In the case of the connectors at both the top and bottom of the sash the heads of the screws O' are located at the outer face of the outer wall or part *b'* of the hollow sash so that the said connectors may be inserted, and secured by the screws after the sash is completed.

An important feature of my invention is embraced in the construction in the hollow sheet-metal frame members, embracing a

trough-shaped inner part and an outer part or wall, the side margins of which are joined to the side margins of the outer trough-shaped part by the folding together or interlocking of the margins of said parts in such manner that the folded or interlocked margins will form laterally-extending flanges at the outer face of the frame member. By this construction in the frame, the flanges formed by the interfolded margins of the inner and outer members form flat exterior surfaces on the frame adapted to bear against the masonry wall surrounding said frame, it being obvious that the outwardly-extending flanges on the frame formed by the interfolded margins of the two parts constituting the frame rest flat against the masonry of the wall, both in the case of the lower cross horizontal member and of the upright and upper horizontal members of the frame.

Another important feature of my invention is embraced in the construction described in the hollow sheet-metal sash, wherein the sash-frame bars are composed each of two trough-shaped parts, the outer of which fits within the inner one and which parts are joined at their edges by the interlocked margins of said side walls. This construction has the advantage of enabling the inner trough-shaped parts to be joined at the corners of the sash by rivets and the like before the outer trough-shaped parts are inserted in place and secured at its margins to the outer part.

Another feature of importance is embraced in the construction by which the seam at the margins of the inner and outer trough-shaped parts is arranged to extend outward from the side faces of the bar, so as to form flanges at its side margin. The flanges so arranged form flat surfaces at the edges of the sash-bar, adapted for contact with the inner faces of the window-frame and affording bearing-surfaces on the sash by which the same is sustained in place within the frame.

I claim as my invention—

1. A hollow or tubular sheet-metal window-frame member embracing a trough-shaped inner part and an outer part or wall, said inner and outer parts being joined at their edges by the bending of the margins of one part over the margins of the other part, so as to form flanges which extend outwardly from the side faces of the frame.

2. A hollow or tubular sheet-metal window-frame member embracing a trough-shaped inner part having outwardly-bent margins, and an outer part or wall, the side edges of which are bent around and interlocked with the said outwardly-bent margins of the inner part so as to form flanges which extend outwardly from the side faces of the frame.

3. A hollow or tubular sheet-metal window-frame member embracing a trough-shaped inner part having outwardly-bent margins, and an outer part or wall the side margins of which

are bent around the outwardly-bent side margins of the inner part, said outer part or wall being bent near its side margins to provide shoulders which are parallel with and fit against the inner faces of the side walls of the trough-shaped member.

4. A tubular sheet-metal sash-frame bar consisting of an inner trough-shaped member, and an outer trough-shaped member the side walls of which are parallel with and adapted to fit between the side walls of the inner member; the margins of the inner and outer members being bent outwardly and folded together so as to form laterally-projecting flanges in the outer margin of the bar.

5. A tubular sheet-metal sash-frame bar consisting of an inner trough-shaped part, the margins of which are bent outwardly, and an outer trough-shaped member the side walls of which are parallel with and fit between the side walls of the inner member, the said side walls of the outer member being bent outwardly and folded around the outwardly-bent margins of the inner member to secure said members together.

6. The combination with a window-frame, of a sheet-metal sash, consisting of an inner trough-shaped part and an outer trough-shaped part, the side walls of which are parallel with and fit within the side walls of the inner part; the margins of said inner and outer parts being bent outwardly and joined by folding the margin of one part over the margin of the other part so as to form outwardly-projecting flanges on the sash, and stops on the frame, consisting of metal strips, the inner margins of which are separated by a space from the frame so as to constitute a groove to receive the flanges on the sash.

7. The combination with a tubular sheet-metal sash provided with a marginal recess or groove, the side walls of which are formed by the outer parts of the side walls of the sash-frame, of a weather-strip secured against one of the side walls of the groove and having a flexible edge which projects beyond the edge of the sash.

8. The combination with a tubular sheet-metal sash consisting of two trough-shaped members fitted one within the other and forming a marginal groove, of a weather-strip secured to the side walls of said groove and having a flexible edge which projects beyond the margin of the sash.

9. The combination with a tubular sheet-metal sash, consisting of two trough-shaped parts, fitted one within the other with their side walls in contact and secured together by the folding or interlocking of their side margins, of a weather-strip secured to the side wall of said groove, and having a flexible edge which projects beyond the margin of the sash.

10. The combination with a tubular sheet-metal sash provided with a marginal recess or groove, of a weather-strip consisting of a folded strip of flexible material, and a folded metal strip embracing the edges of the flexi-

ble strip, said weather-strip being secured to one of the side walls of the groove with the fold of the flexible strip projecting beyond the margin of the sash.

5 11. The combination with a tubular sheet-metal sash consisting of two trough-shaped parts inserted one within the other with their side walls in contact with each other, and forming a marginal groove in the sash, and
10 two weather-strips secured one to each side wall of the said groove and provided with flexible edges which project beyond the margin of the sash.

12. The combination with a frame having
15 flat inner faces and sash-stops thereon, of a sash having a tubular sheet-metal frame provided with a marginal groove, the side walls of which are formed by the outer parts of the side walls of the tubular sash-frame, and a
20 weather-strip secured to one of the side walls of the groove and having a flexible edge adapted for contact with the inner face of the frame when the sash is in place therein.

13. The combination with a frame and a
25 pivoted sash, of holding means for holding the sash in its open position, comprising a toothed bar and a detent adapted to engage the said bar, said holding means including parts which are held in operative relation by
30 solder or fusible metal and which, upon the solder becoming fused by heat, become disconnected and release the sash.

14. The combination with a pivoted sash, of holding means for holding the sash in its
35 open position, embracing a toothed segment attached to the sash concentrically with the pivotal axis thereof and a spring-pressed detent; said holding means embracing parts which are held in operative relation by solder
40 or fusible metal.

15. The combination with a pivoted sash, of a notched segment on the sash and a spring-pressed detent adapted to engage the said segment; the said detent consisting of two
45 parts which are joined by solder or fusible metal.

16. The combination, with a pivoted sash, of a notched segment, the teeth of which are secured thereto by solder or fusible metal,
50 and a spring-pressed detent consisting of two parts joined by solder or fusible metal.

17. The combination, with a pivoted sash, of a holding device embracing a toothed segment which is rigidly attached to the sash and
55 is located in a plane outside of the margin of said sash, and a detent adapted to engage the said segment, said holding devices embracing parts which are held in operative relation by solder or fusible metal.

18. The combination with a tubular sheet-metal frame, of a sash pivoted to the frame and a holding device for the frame embracing a toothed segment attached to one end to the sash and located in a plane outside of
65 the margin of the sash, said frame being provided with an aperture through which the

segment enters the same, and a spring-pressed detent on the frame adapted to engage said notched segment, said holding means embracing parts which are held in operative relation by solder or fusible metal. 70

19. The combination with a sash, of means for pivotally supporting the same, embracing a bracket attached to the sash and a pivot-rod attached to said bracket, and means for holding the sash in its open position, embracing a
75 toothed segment attached to the said bracket concentrically with the said pivot-rod, and a spring-pressed detent adapted for engagement with the said segment. 80

20. The combination with a sash, of means for pivotally supporting the sash and holding it open, embracing a bracket, a pivot-rod attached thereto, a toothed segment and a segment-supporting arm; said bracket, segment
85 and supporting-arm being formed of a single casting.

21. The combination with a pivoted sash, of a toothed holding-segment, a spring-pressed detent having the form of a bolt, one end of
90 which is adapted to engage the segment and a casing in which the detent slides, the end portion of the bolt which engages the teeth of the segment being attached to the body part thereof by a soldered joint. 95

22. The combination with a pivoted sash, of a toothed holding-segment, the teeth of which are made separated from each other and are separately attached to the segment by solder, and a spring-pressed detent adapted
100 to engage the said segment; the end portion of said detent which engages the teeth of the segment being attached to the body part thereof by solder.

23. The combination with a sheet-metal
105 sash-frame, provided with a marginal groove, of a bracket and a pivot-rod attached to said bracket; said bracket being provided with an integral attaching-plate which is secured within the groove in the sash-frame by attachment
110 to one of the side walls of the said groove.

24. The combination with a tubular sheet-metal sash-frame, consisting of two trough-shaped parts, fitted one within the other with their side walls in contact and forming a marginal groove in said sash-frame, of a pivot-rod and a bracket for connecting the pivot-rod with the sash-frame, said bracket having an integral attaching-plate which is secured to the sash-frame within said groove by attachment to the side walls of the said trough-shaped parts; said side walls being notched for the passage of the bracket. 115

25. The combination with a metal sash-frame, of a hollow sheet-metal mullion, and
125 connectors adapted to enter the ends of the mullion and having stems which enter and are secured to the sash-frame.

26. The combination with a hollow sheet-metal sash-frame provided with grooves to receive the edge of the glass, of a sheet-metal
130 mullion and connectors adapted to engage

the ends of the mullion and having flat-sided stems adapted to fit within the grooves in the sash-frame.

27. The combination with a hollow sheet-metal sash-frame, consisting of inner and outer trough-shaped parts, one of which fits within the other, said frame having U-shaped parts which form glass-receiving grooves, of a sheet-metal mullion, and connectors adapted to engage the ends of the mullion and provided with flat-sided stems adapted to fit within the glass-receiving grooves, and screws inserted through the outer trough-shaped parts of the frame and engaging said stems.

28. The combination with a metal sash-frame, of a hollow sheet-metal mullion having flattened central and lateral parts, and connectors having flat wings adapted to enter the ends of the mullion, and stems which enter and are attached to the sash-frame.

29. The combination with a hollow or tubular sheet-metal sash-frame, the upper cross-bar of the frame having a U-shaped part to receive the edge of the glass which extends outwardly into contact with the outer wall of said cross-bar, and the lower cross-bar of the frame having a U-shaped part which is separated by a space from the outer wall of the cross-bar, a sheet-metal mullion, a connection for the upper end of the mullion having a flat side or stem which abuts against the inner wall of the U-shaped part of the sash cross-bar and is secured to the said cross-bar by a screw passing through the outer wall of said cross-bar and through said U-shaped part and a connector for the lower end of the mullion provided with a flat-sided stem which passes through an aperture in said U-shaped part and abuts at its end against the outer wall of the said lower cross-bar and is secured to the said cross-bar by a screw which passes through the said outer wall thereof.

30. A pivoted, tubular sheet-metal sash-frame, consisting of inner and outer trough-shaped members inserted one within the other and joined at their edges; the lower cross-bar of the sash-frame being provided with an outwardly and downwardly extending flange formed by extensions of the marginal parts of both members, which are joined by folding at the outer edge of said flange.

31. The combination with a window-frame,

of a sheet-metal sash consisting of inner and outer parts the side margins of which are bent outwardly and folded together to form marginal flanges at both sides of the sash, and stops extending around the frame at the inner and outer faces of the sash, said stops consisting of metal strips secured to the sash at their outer margins and separated by a space at their inner margins from the frame so as to form grooves to receive the outwardly and inwardly extending flanges in the sash, the stops at the inner side of the sash being detachably secured to the frame.

32. The combination with a window-frame, of a sheet-metal sash consisting of inner and outer parts, the side margins of which are bent outwardly and folded together to form marginal flanges at both sides of the sash, and stops extending around the outer face of the sash, said stops consisting of metal strips secured to the frame at their outer edges and separated by a space from the frame at their inner edges so as to form a groove to receive the flange on the sash; the stop at the bottom or sill member of the frame having its inner edge adapted to bear against the outer face of the lower cross-bar of the sash to prevent the entrance of water between the sash and sill.

33. The combination with a sheet-metal window-frame, and a sash having an outwardly-extending marginal flange, of stops on the frame consisting of metal strips bent into U form and secured to the frame with their edges directed toward the sash.

34. The combination with a tubular sheet-metal frame, of a sash-stop, and means for securing said stop to the frame consisting of nuts soldered to the inner face of the frame, and screw-bolts inserted through the stop and engaging the said nuts, said screw-bolts having heads which bear against the outer faces of the stop.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 6th day of February, A. D. 1902.

ARTHUR W. COOPER.

Witnesses:

C. CLARENCE POOLE,
WILLIAM L. HALL.