No. 890,726. PATENTED JUNE 16, 1908.

C. D. TABOR.

WINDOW.

APPLICATION FILED FEB. 12, 1904.

7 SHEETS—SHEET 1.

Fig. 1.

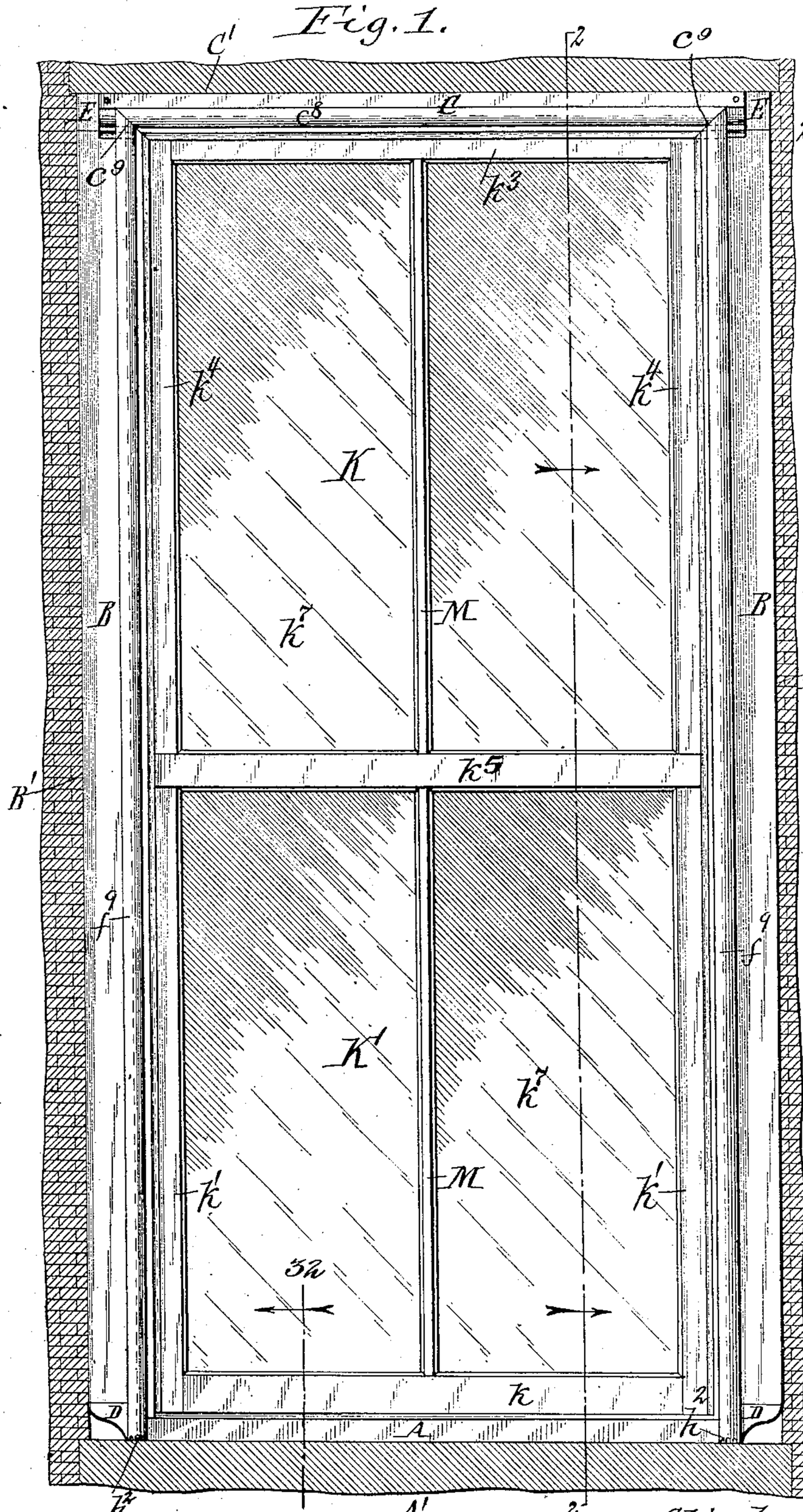
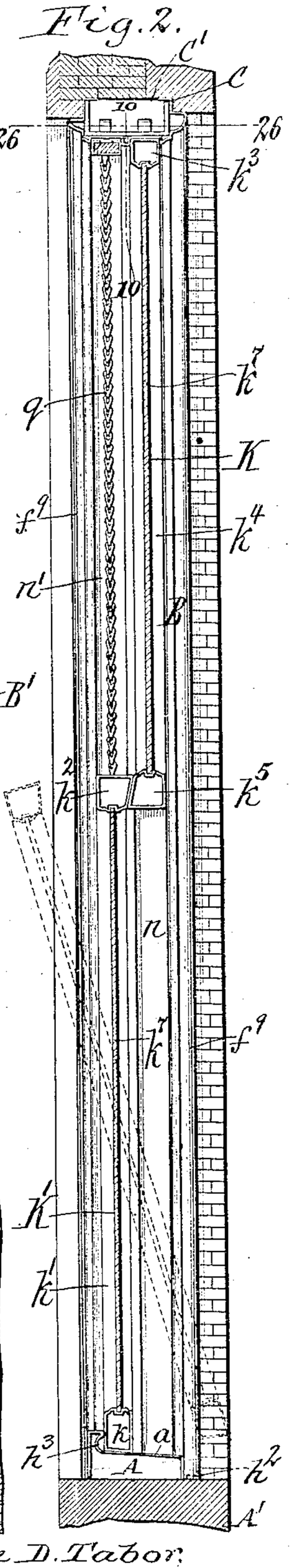


Fig. 2.



Witnesses.
Louis W. Gratz.
Robert Waitkenecht.

Inventor.
Clinton D. Tabor.
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Attorneys.

No. 890,726. PATENTED JUNE 16, 1908.

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7 SHEETS—SHEET 2.

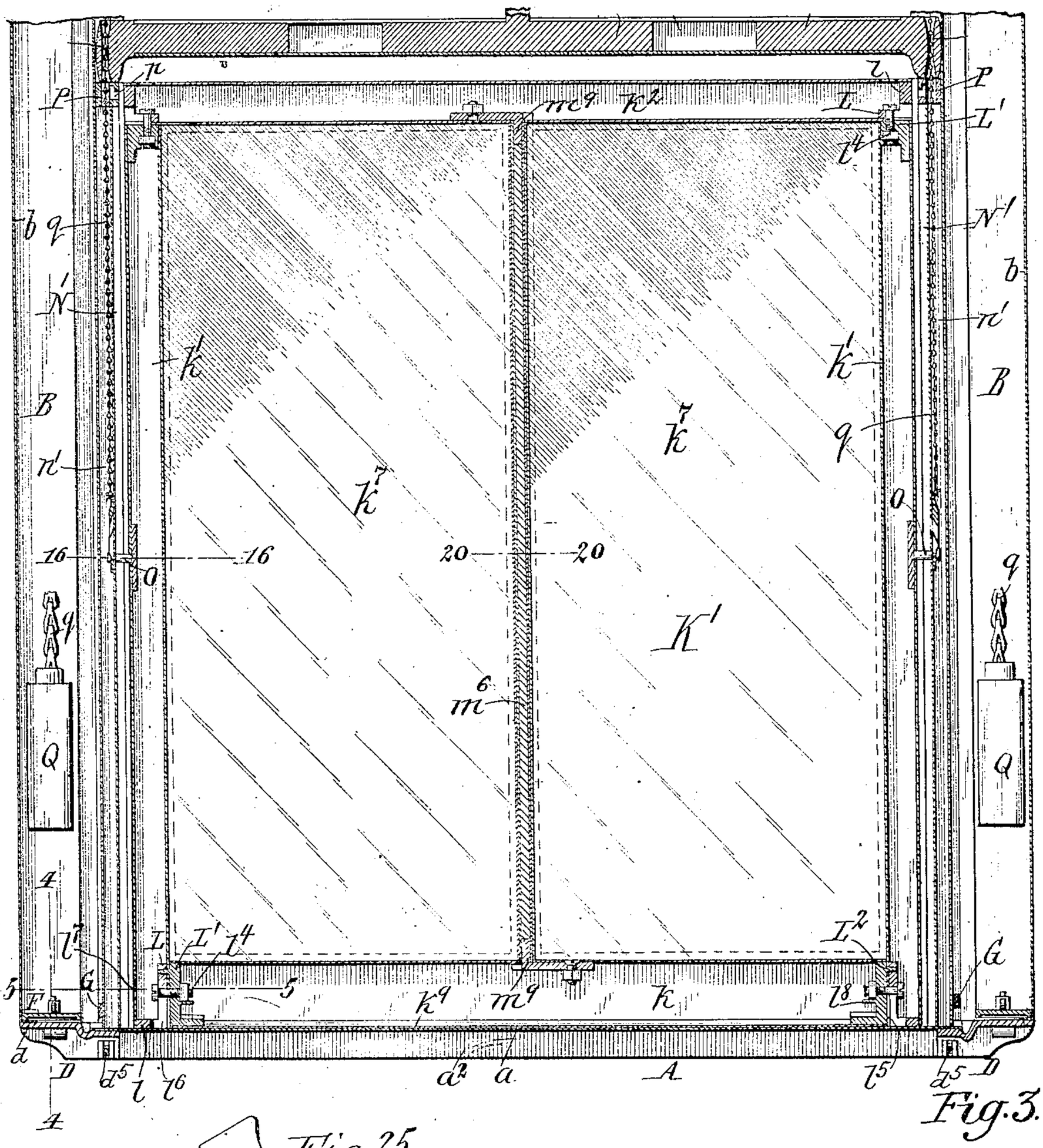


Fig. 3.

Fig. 25.

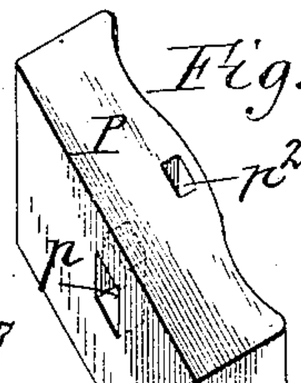
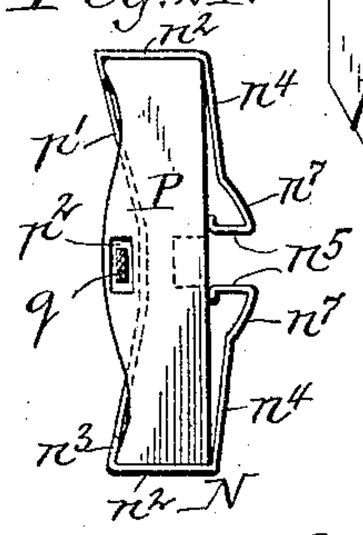


Fig. 24.



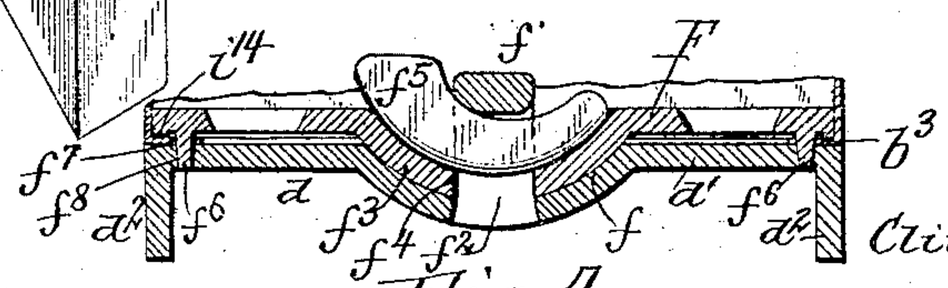


Fig. 4.

Witnesses,
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No. 890,726. PATENTED JUNE 16, 1908.

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7 SHEETS—SHEET 3.

Fig. 5.

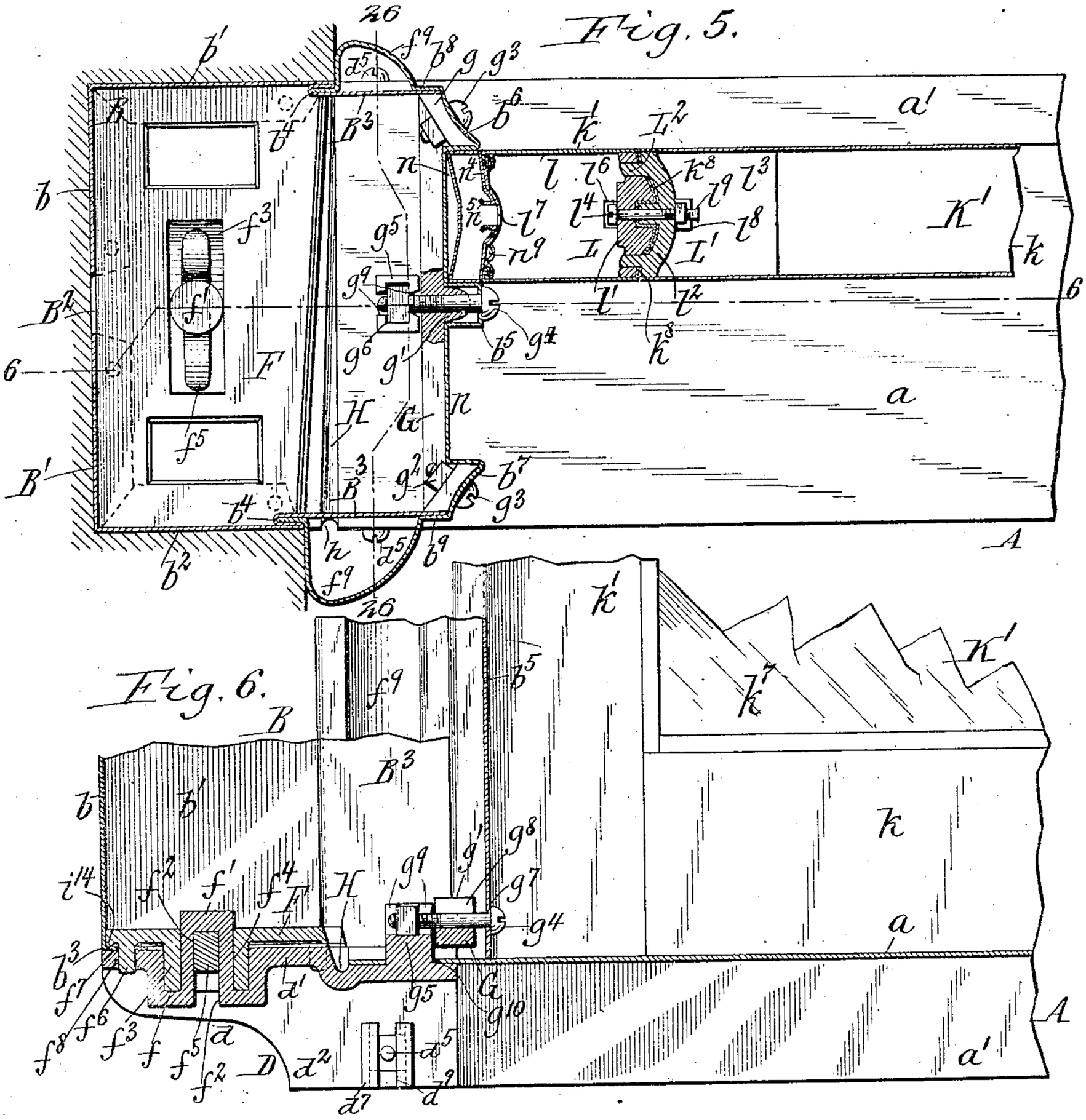

Fig. 6.

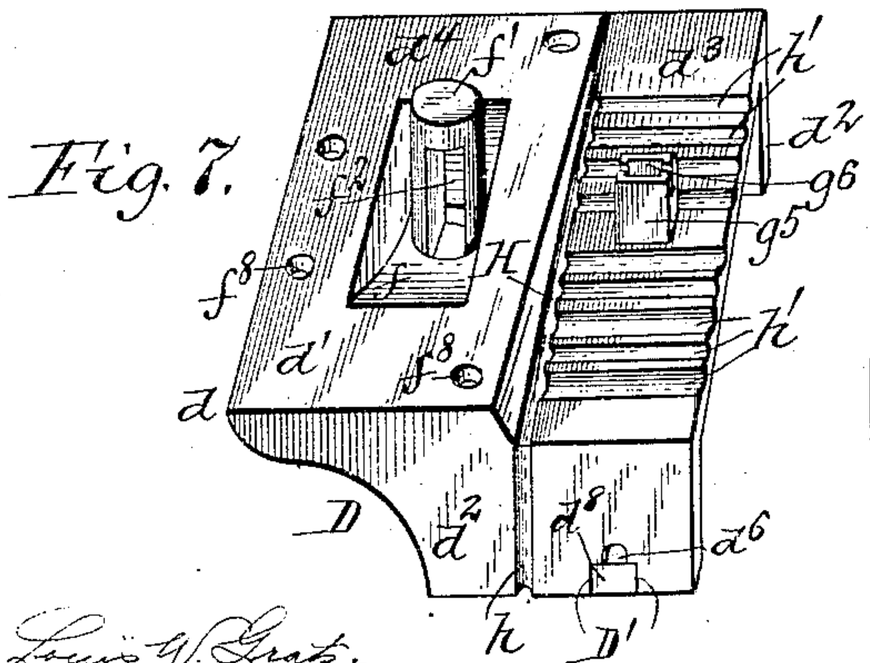

Fig. 7.

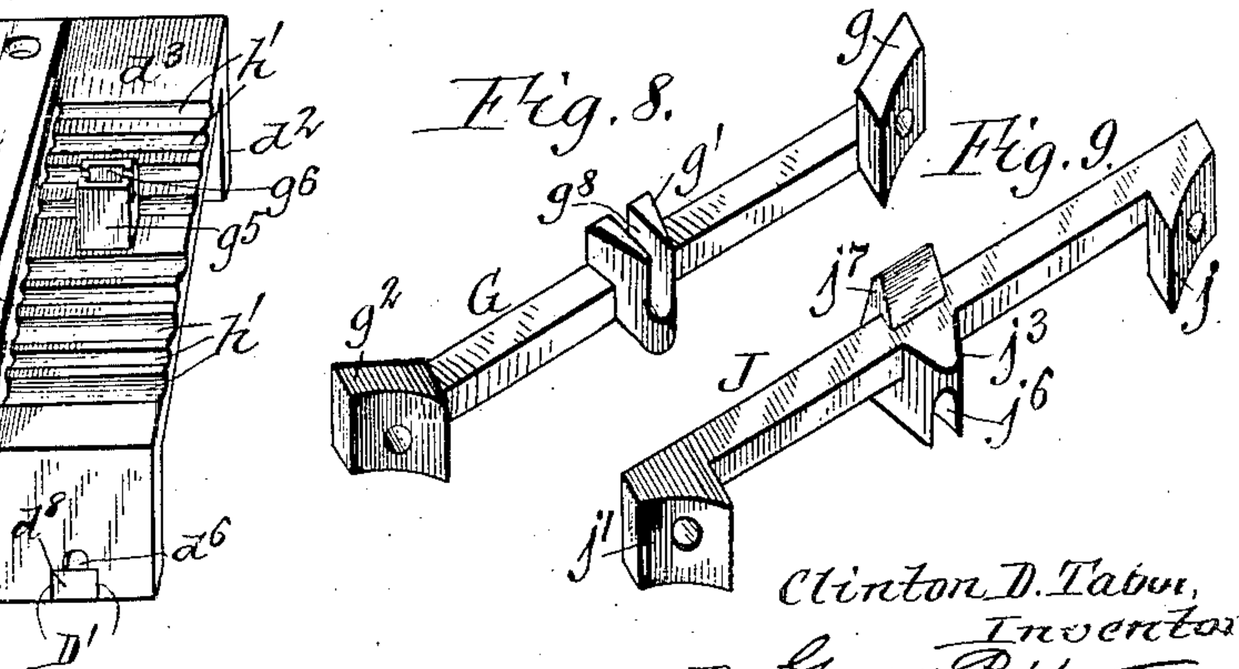

Fig. 8.

Fig. 9.

Louis W. Gratz
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No. 890,726. PATENTED JUNE 16, 1908.

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WINDOW.

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7 SHEETS—SHEET 4.

Fig. 11.

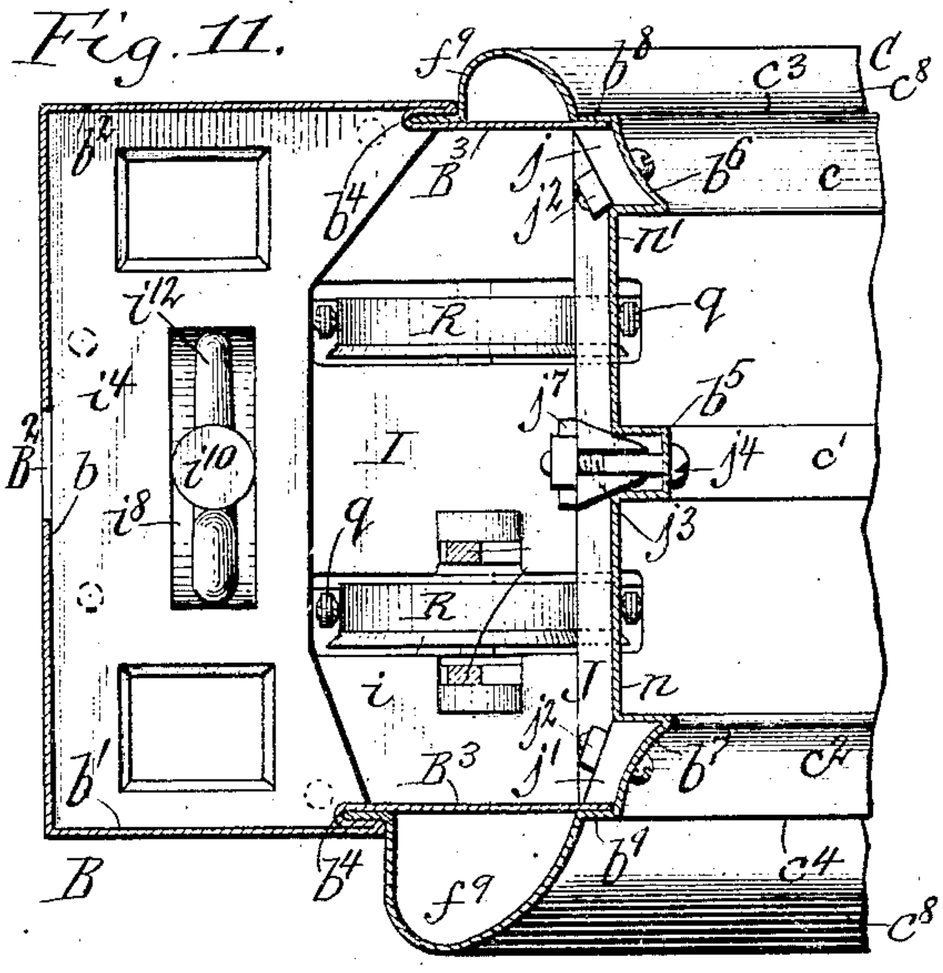


Fig. 12.

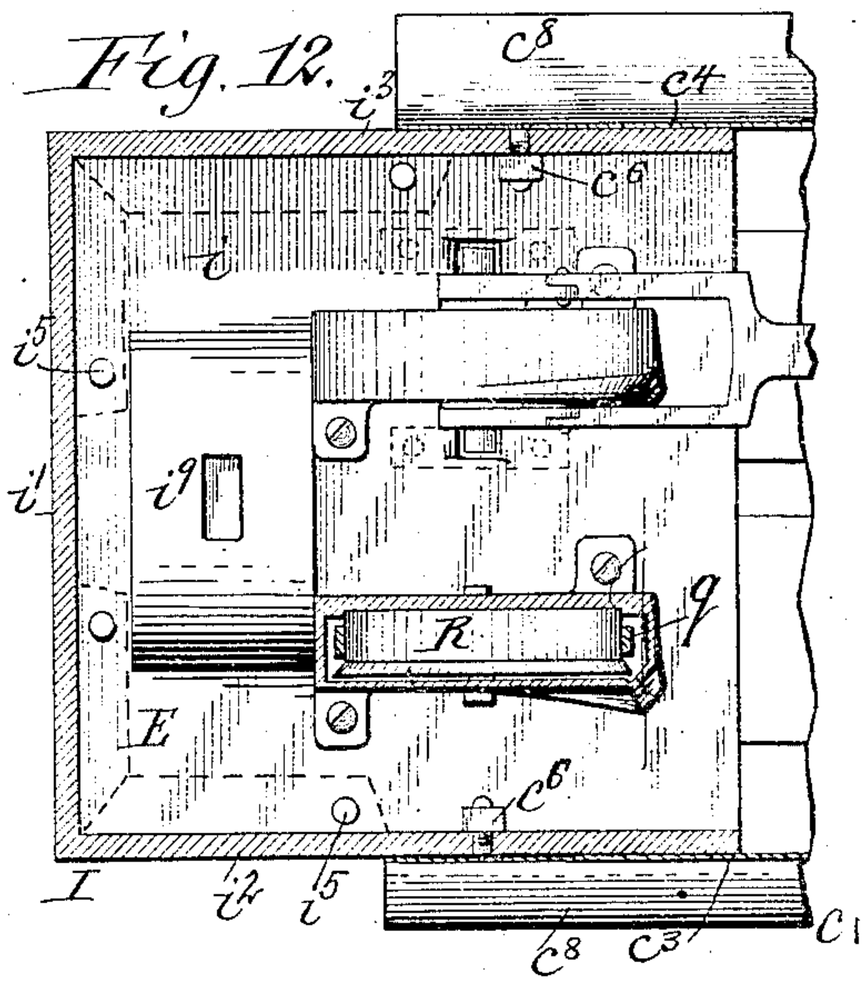
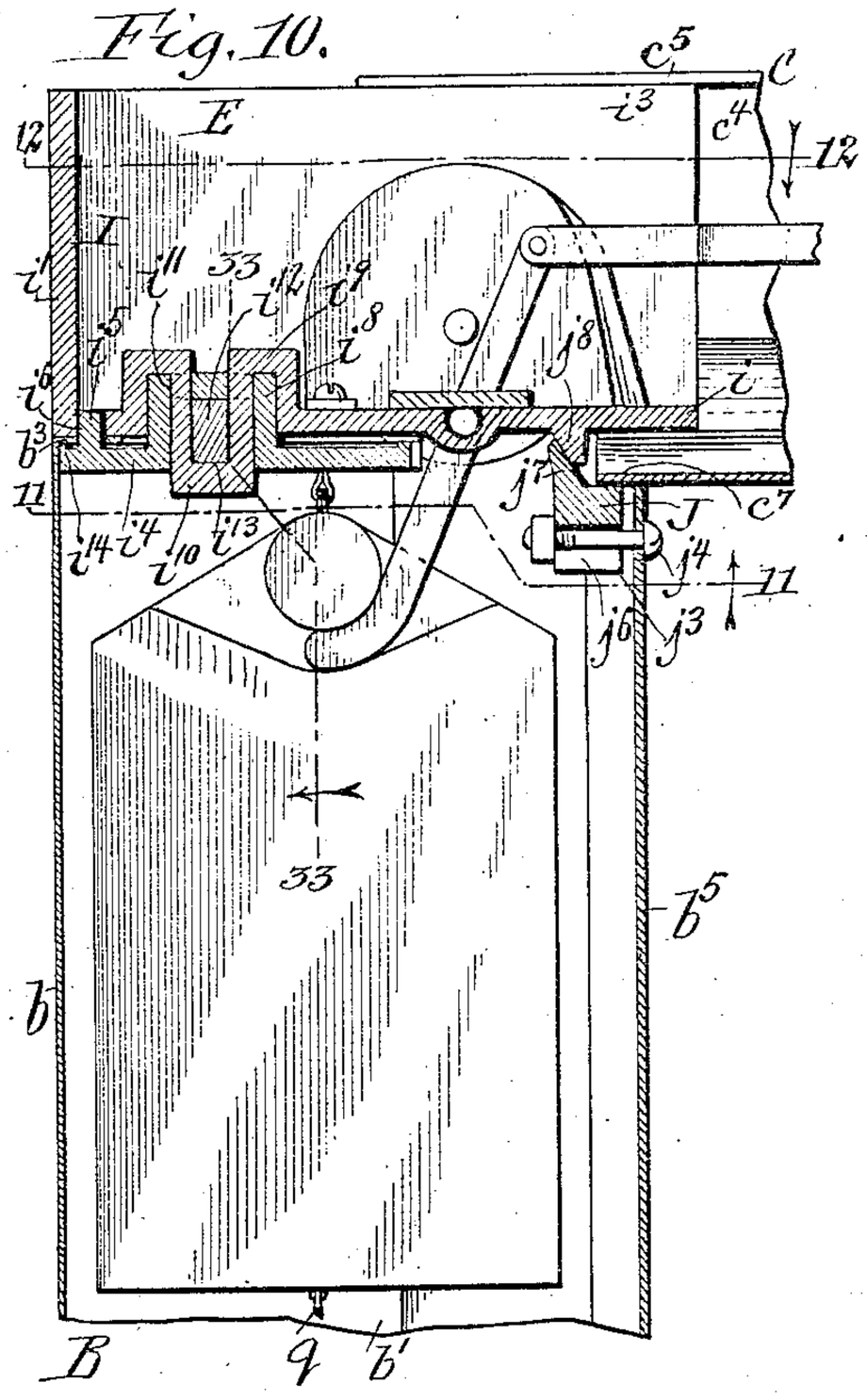


Fig. 10.



Witnesses.
Louis W. Gratz
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No. 890,726. PATENTED JUNE 16, 1908.

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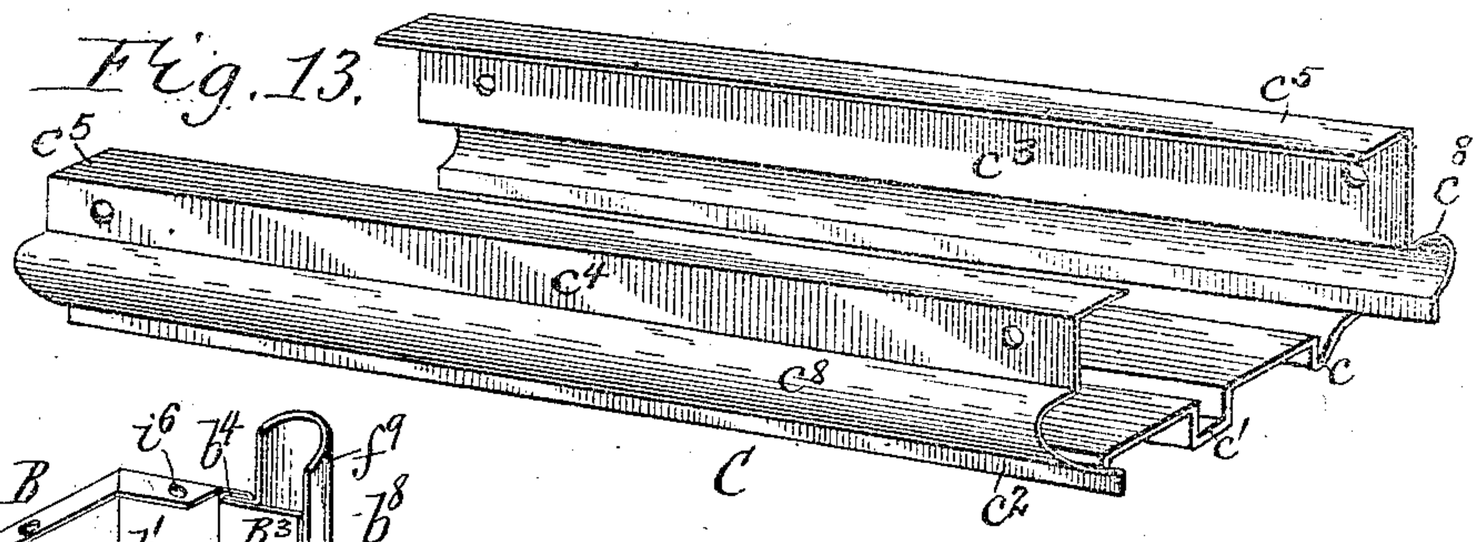
WINDOW.

APPLICATION FILED FEB. 12, 1904.

7 SHEETS—SHEET 5.

Fig. 13.



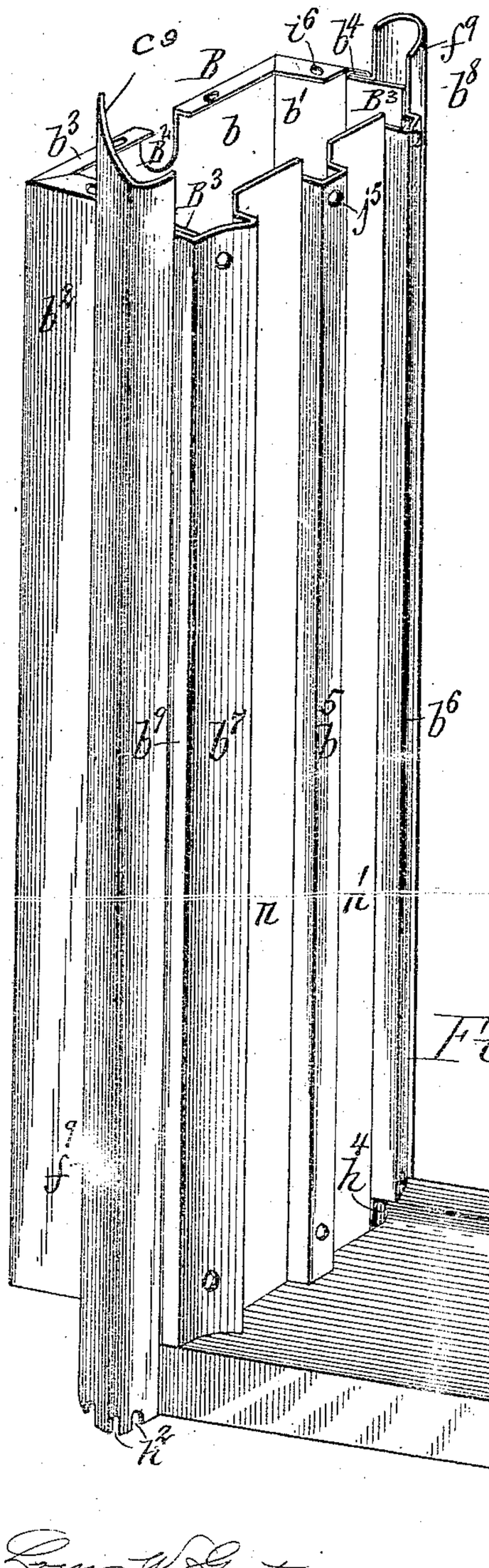


Fig. 14.

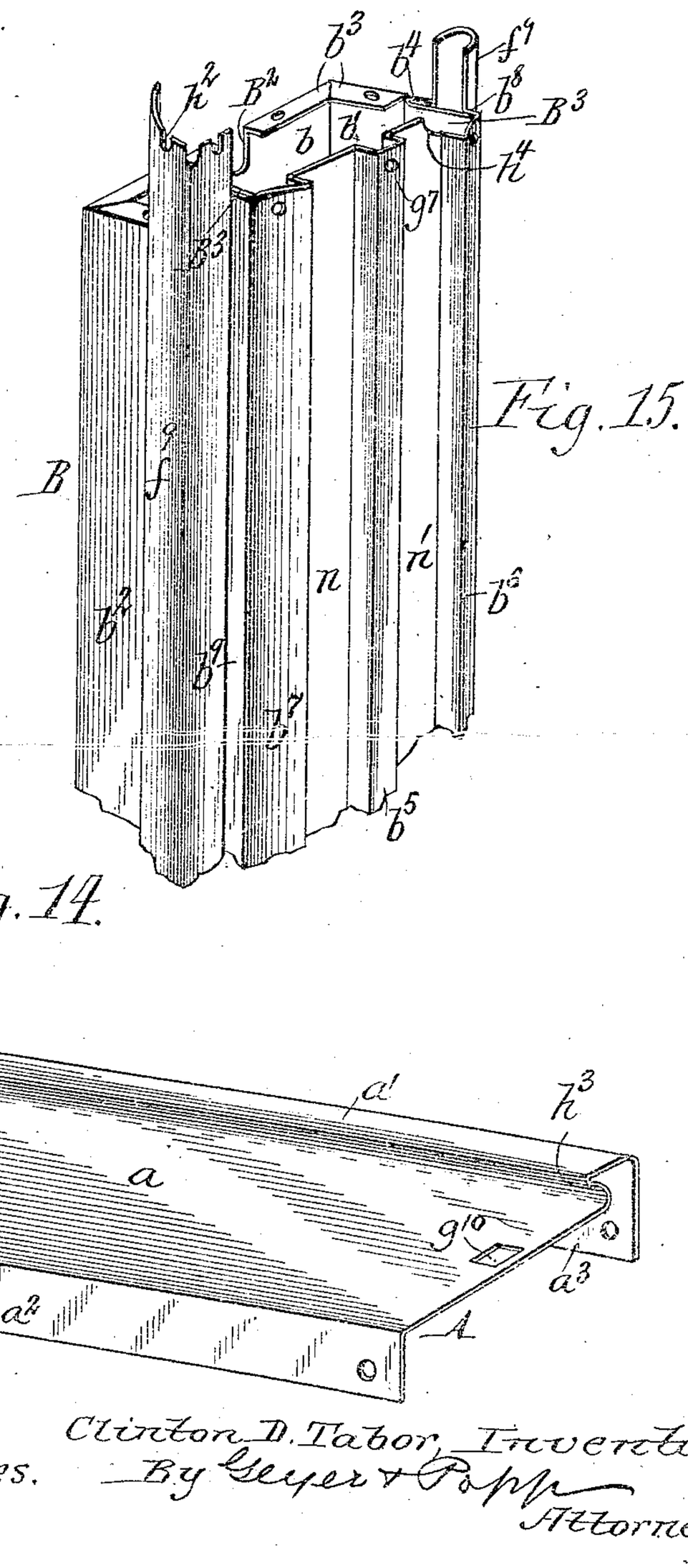


Fig. 15.

Witnesses.
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No. 890,726. PATENTED JUNE 16, 1908.

C. D. TABOR.

WINDOW.

APPLICATION FILED FEB. 12, 1904.

7 SHEETS—SHEET 6.

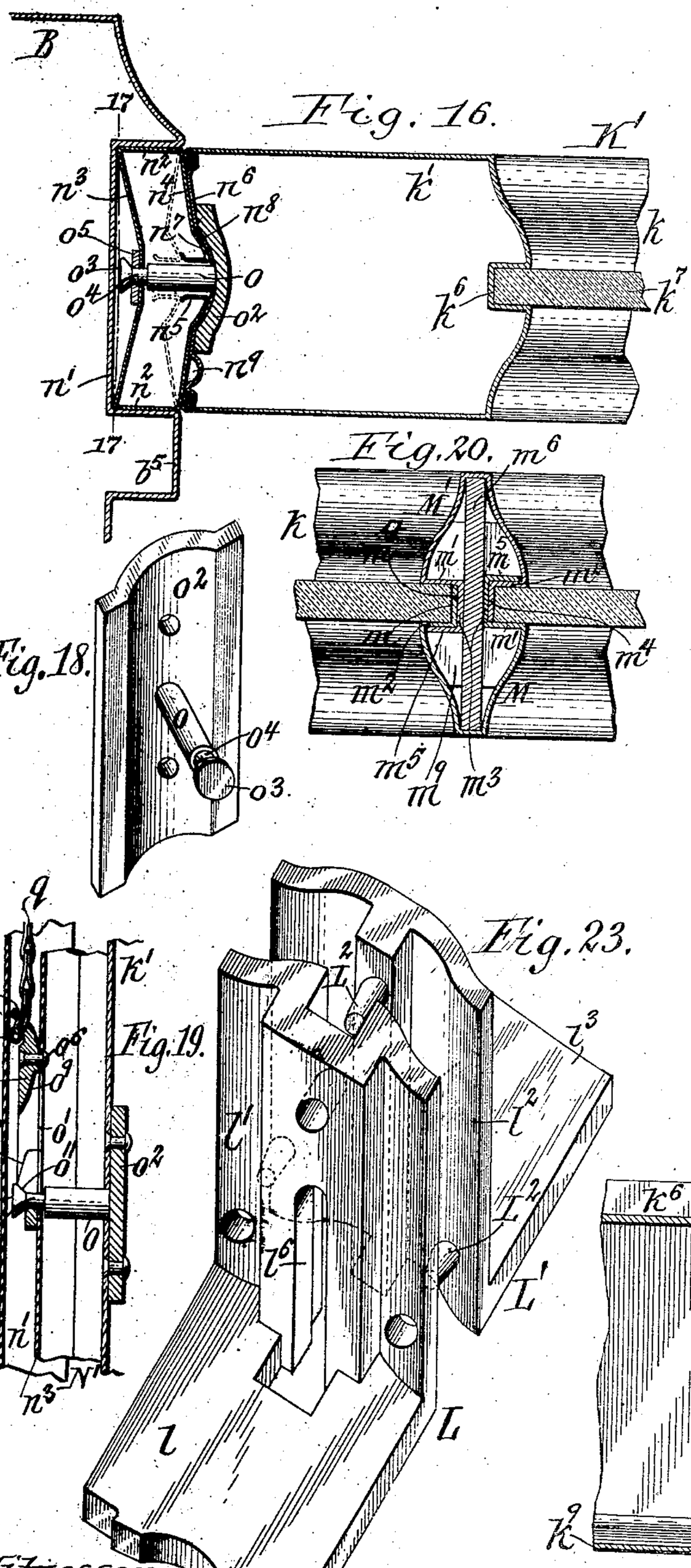

Fig. 16.

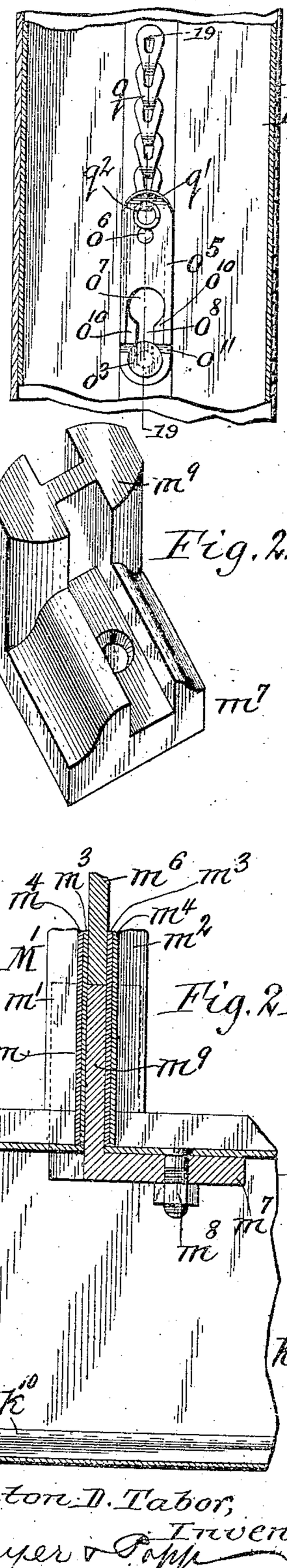

Fig. 17.

Fig. 20.

Fig. 18.

Fig. 22.

Fig. 19.

Fig. 23.

Fig. 21.

Witnesses:
Louis W. Gratz
Robert Weitknecht.

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Attorneys

No. 890,726. PATENTED JUNE 16, 1908.

C. D. TABOR.

WINDOW.

APPLICATION FILED FEB. 12, 1904.

7 SHEETS—SHEET 7.

Fig. 27.

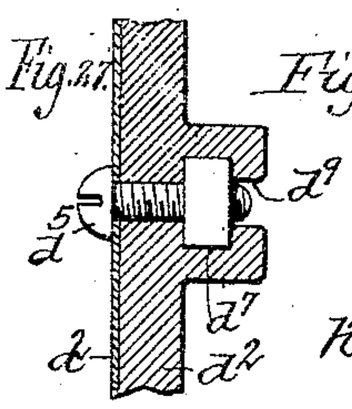
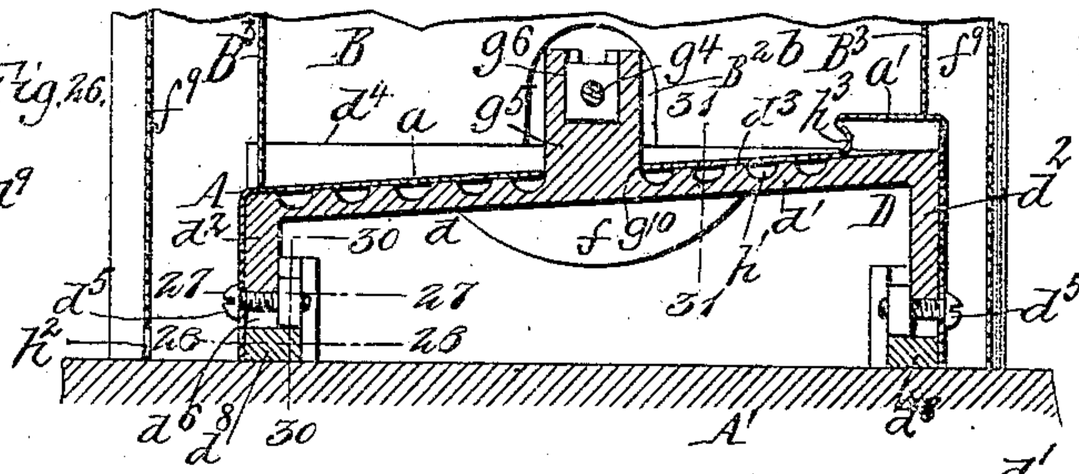


Fig. 26.



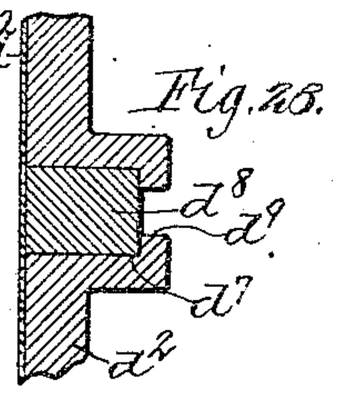


Fig. 29.

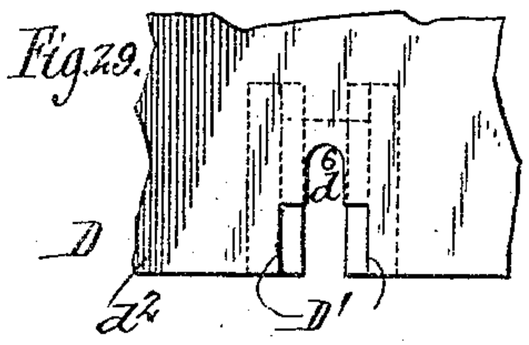


Fig. 30.

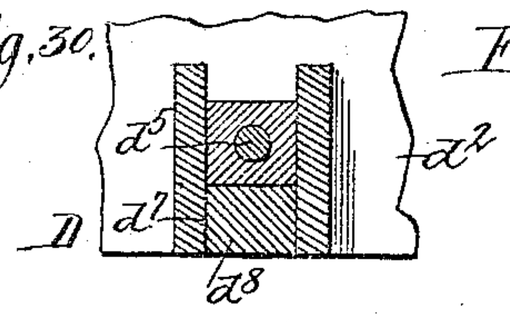


Fig. 31.

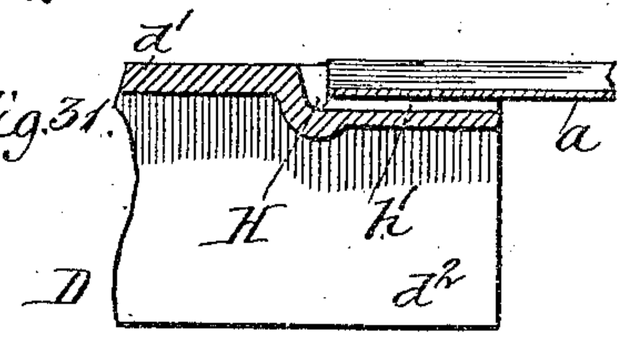


Fig. 32.

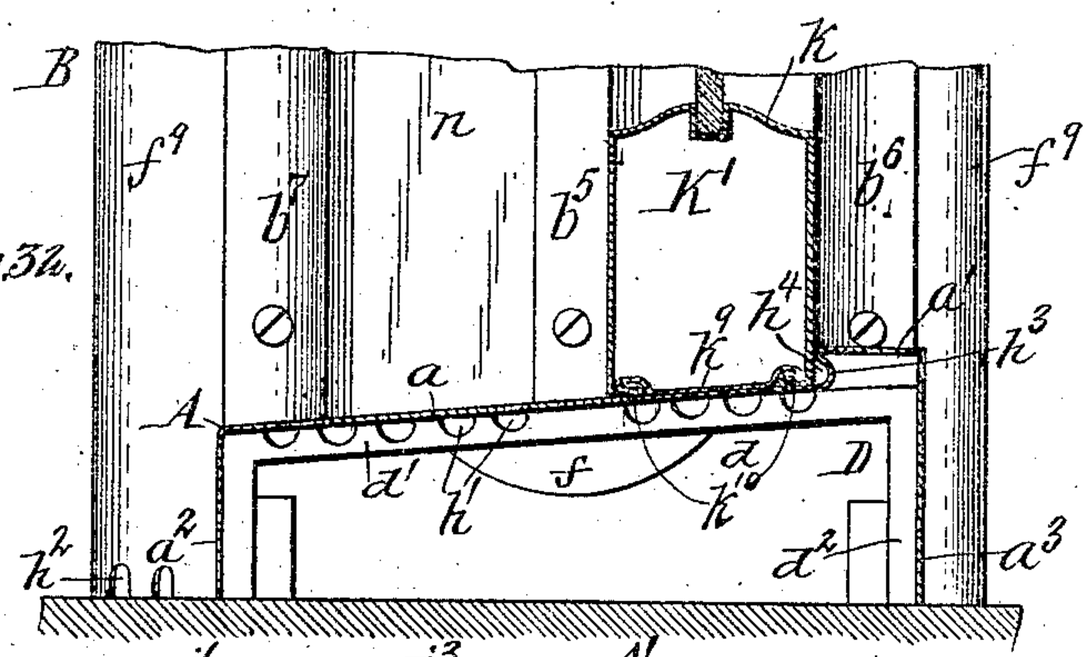


Fig. 33.

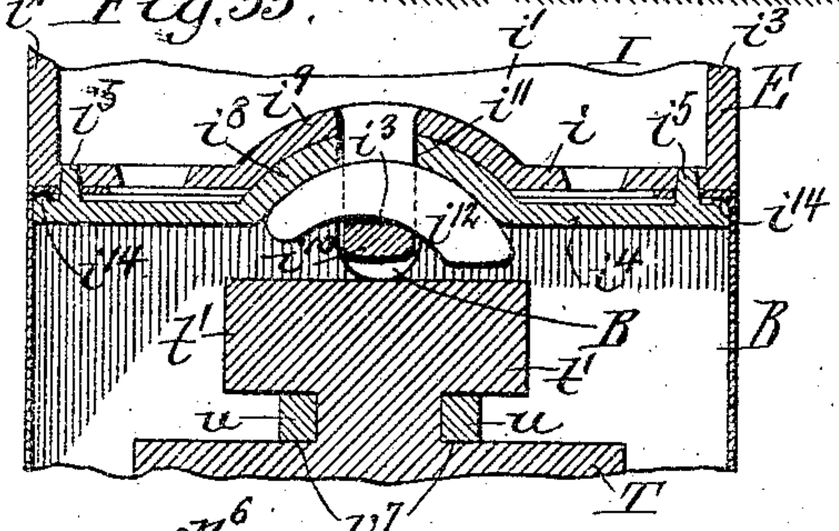


Fig. 34.

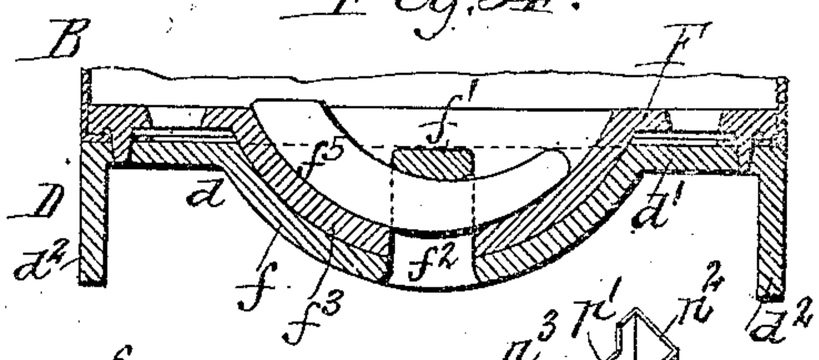


Fig. 35.

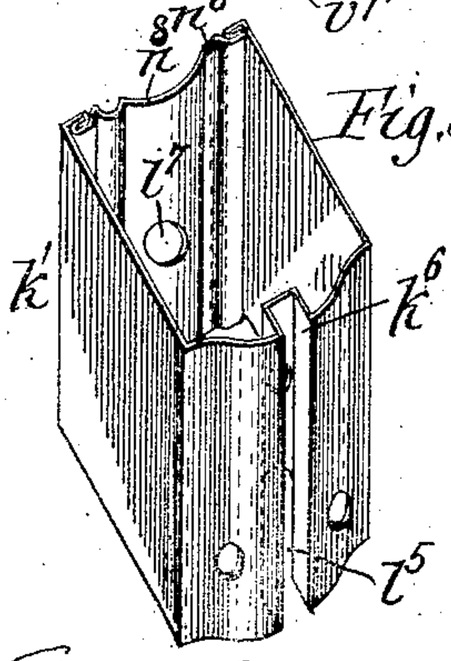


Fig. 36.

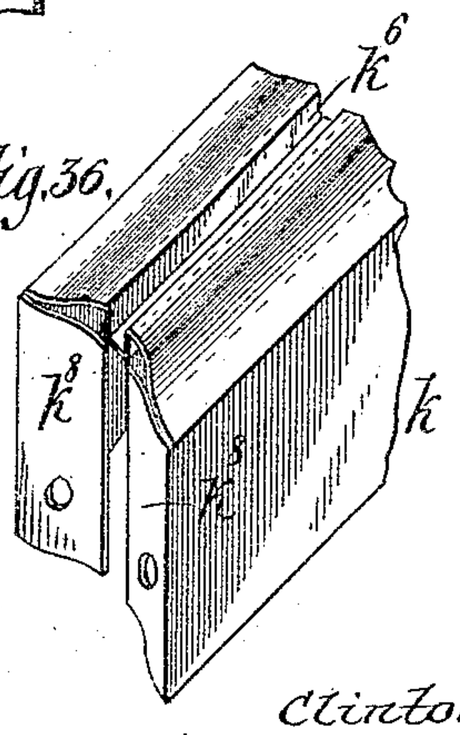
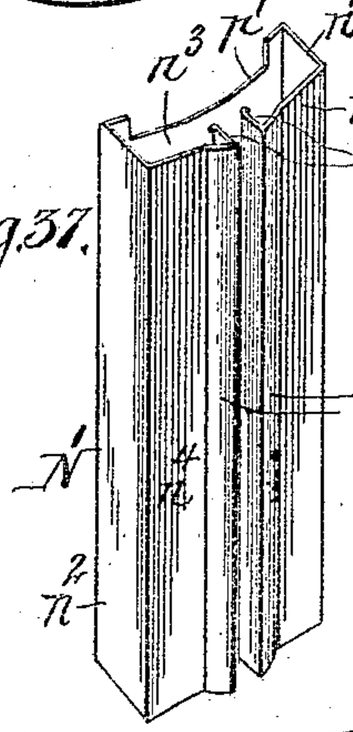


Fig. 37.



Witnesses.
Louis W. Gratz.
Robert Weitknecht

Clinton D. Tabor, Inventor
By Geyer & Popp
Attorneys.

UNITED STATES PATENT OFFICE.

CLINTON D. TABOR, OF JERSEY CITY NEW JERSEY, ASSIGNOR TO TABOR SASH COMPANY, OF NEWARK, NEW JERSEY.

WINDOW.

No. 890,726. Specification of Letters Patent. Patented June 16, 1908.

Application filed February 12, 1904. Serial No. 193,314.

To all whom it may concern:

Be it known that I, CLINTON D. TABOR, a citizen of the United States, residing at Jersey City, in the county of Hudson and State of New Jersey, have invented new and useful Improvements in Windows, of which the following is a specification.

This invention relates more particularly to a metal or fire proof window.

The objects of this invention are to produce a metal frame and sash which is so constructed that the parts can be easily assembled for installation or dismembered for repairing; to improve the means for reversing the sash so that either side can be cleaned from the interior of the building; and to improve the construction of the window in other respects.

In the accompanying drawings consisting of 7 sheets: Figure 1 is a sectional elevation of my improved window viewed from the outside. Fig. 2 is a vertical section of the same in line 2—2, Fig. 1. Fig. 3 is a vertical section, on an enlarged scale, of the inner or lower sash and the adjacent part of the frame taken in the plane of the glass. Fig. 4 is a fragmentary vertical section, on an enlarged scale, taken in line 4—4, Fig. 3, showing the means for connecting the back of the frame side jambs with the frame corner pieces. Fig. 5 is a horizontal section, on an enlarged scale, in line 5—5, Fig. 3. Fig. 6 is a vertical section in line 6—6, Fig. 5. Fig. 7 is a perspective view of a corner piece for connecting the lower end of a frame jamb with the sill. Figs. 8 and 9 are detached perspective views of the bars for stiffening and connecting up the faces of the frame jambs. Fig. 10 is a fragmentary vertical section, on an enlarged scale, in line 10—10, Fig. 2, showing the joint between one frame jamb and the head and adjacent parts. Fig. 11 is a horizontal section in line 11—11, Fig. 10, looking upward. Fig. 12 is a similar section in line 12—12, Fig. 10, looking downward. Fig. 13 is a perspective view of the frame head. Fig. 14 is a similar view of one frame jamb and the sill, showing the manner in which the same are assembled. Fig. 15 is a fragmentary perspective view of a jamb in an inverted position, showing the formation of its lower portion. Fig. 16 is a fragmentary horizontal section, on an enlarged scale, in line 16—16, Fig. 3, showing the means of pivotally connecting the sash and hangers. Fig. 17 is a fragmentary vertical section in line 17—17, Fig. 16. Fig. 18 is a perspective view of one of the sash pivots. Fig. 19 is a vertical section in line 19—19, Fig. 17. Fig. 20 is a fragmentary horizontal section in line 20—20, Fig. 3, showing the construction of the mullions of the sash. Fig. 21 is a fragmentary vertical section, on an enlarged scale, showing the means of connecting the end of a mullion with a transom or rail of the sash. Fig. 22 is a perspective view of one of the mullion coupling pieces. Fig. 23 is a perspective view of the fittings for coupling the end of a sash stile and rail. Fig. 24 is a detached top view of one of the sash hangers showing the means for locking the same in its operative position. Fig. 25 is a perspective view of a hanger locking block. Fig. 26 is a fragmentary vertical section in line 26—26, Fig. 5, showing part of the means for connecting the frame sill and a lower corner piece. Figs. 27 and 28 are horizontal sections of the same in lines 27—27 and 28—28, Fig. 26, respectively. Fig. 29 is a fragmentary front view of a lower corner piece. Fig. 30 is a vertical section in line 30—30, Fig. 26. Fig. 31 is a fragmentary vertical section in line 31—31, Fig. 26. Fig. 32 is a cross section of the frame sill and adjacent parts, on an enlarged scale, taken in line 32—32, Fig. 1. Fig. 33 is a fragmentary transverse section in line 33—33, Fig. 10. Fig. 34 is a fragmentary vertical section, showing a modified construction of the means for fastening the two parts of a frame corner fitting. Figs. 35 and 36 are fragmentary perspective views of the coöperating parts of two adjacent bars or members of a sash. Fig. 37 is a fragmentary perspective view of one of the hanger bars on which the sash is pivoted.

Similar letters of reference indicate corresponding parts throughout the several views.

The frame of the window which is constructed wholly of metal consists essentially of a horizontal bottom or sill A, two vertical side jambs or stiles B, B, a horizontal top jamb or head C, two lower corner fittings D, D connecting opposite ends of the sill with the lower ends of the jambs and two upper corner fittings E, E connecting the opposite ends of the head with the upper ends of the jambs. The wall containing the opening for

receiving the frame is preferably constructed of masonry and provided with a stone stool or sub-sill A^1 upon which the metallic frame sill rests, a recess B^1 in each of its vertical sides for receiving the jambs and a recess C^1 in its top for receiving the head of the frame, as shown in Figs. 1, 2, and 5.

The sill of the frame is hollow and constructed of a sheet of metal which is bent to form a horizontal top or plate *a* sloping or inclining transversely toward the outer side of the window, an elevated head or rib a^1 arranged lengthwise on the inner side of the top and forming a rabbet on the sill and downwardly-projecting side walls or flanges a^2, a^3 arranged on the outer edge of the top and the inner edge of the rib, respectively, and resting on the sub-sill A^1. Each of the side jambs or stiles is also hollow and constructed of sheet metal in the form of a box which comprises essentially a back or rear section and a face or front section. The back section is bent out of a single sheet of metal to form a vertical rear wall *b*, inner and outer side walls b^1, b^2 and inwardly-turned flanges b^3 on the upper and lower edges of the walls, as shown in Figs. 6, 10, 14 and 15. Each of the side walls of the jamb back is doubled or folded inwardly upon itself about midway of its width so as to form a vertical channel or groove b^4 in its outer sides which open toward the sash. The front section of each jamb is bent to form a front wall or face plate having an intermediate or check stop b^5, an inner stop b^6, an outer stop b^7 on the face of the plate and rearwardly projecting side walls or flanges b^8, b^9 arranged on the inner and outer edges of the face plate.

The head of the frame is bent out of a sheet of metal so as to form a horizontal bottom or plate having inner, intermediate and outer stops *c*, c^1, c^2, inner and outer flanges or side walls c^3, c^4 projecting upwardly from opposite longitudinal edges of the plate, and inwardly-turned flanges c^5 arranged on the upper edges of the side walls.

Each of the lower corner fittings is constructed and applied to the lower end of a side jamb and the adjacent end of the frame sill as follows: *d* represents the hollow cast iron corner piece or base of the lower corner fitting which consists essentially of a top plate d^1 and side walls, feet or flanges d^2 arranged at the inner and outer edges of the plate. This base fits snugly into one of the lower corners of the window opening in the wall with its feet resting on the bottom of said opening. The front part d^3 of the base is inclined outwardly while the rear part d^4 thereof is horizontal. The metallic sill of the frame fits at its opposite ends over the bases *d*, its top plate *a* resting on the inclined front parts d^3 thereof and the end portions of its flanges a^2, a^3 lying against the outer side of the feet thereof. The sill may be secured to the base *d* in any suitable manner but I prefer a fastening which permits of readily detaching the sill from the base. Such a fastening is shown in the drawings, Figs. 6, 7 and 26–30, and is constructed as follows: d^5 are fastening bolts passing through the feet d^2 and the adjacent parts of the sill flanges. Each of those bolts has its body arranged in a downwardly-opening recess d^6 in the lower edge of the foot of a base and its head bears against the outer side of the sill flange while its nut is arranged in a downwardly-opening pocket d^7 on the inner side of the foot. The lower part of the recess d^6 is enlarged, as shown at D^1, Fig. 29, to permit of introducing the nut into the pocket from the outside and then raising the nut to the top of the pocket in its operative position while the base is resting on the sub-sill. After the nut has been thus raised in the pocket the same is held in this position by a retaining block d^8 which is inserted through the enlargement D^1 into the lower part of the socket and thus support the nut on its elevated operative position. The sides of the pocket and the retaining block are flat and engage with the corresponding sides of the nut, thereby preventing the same from turning. When the retaining blocks are in place their front ends are flush with the outer side of the feet and when the frame sills embrace the corner bases their flanges confine the retaining blocks in the recess and pockets, whereby the nuts are reliably held in the proper position for receiving the bolts which fasten the sill flanges to the base. This means of supporting the nuts on the feet of the corner bases avoids tapping of the latter and permits of readily assembling these parts of the window or dismembering of the same if necessary to make repairs of damage by fire or otherwise without requiring the corner bases to be removed for this purpose. In order to provide the necessary clearance in the pocket for the rear end of the bolt, the back of the pocket is provided with a recess or opening d^9 which opens downwardly so as to permit of producing the same in the casting of the base without requiring coring.

F represents clamping plates which form part of the lower corner fittings and whereby the lower ends of the frame jambs are secured to the base of these fittings. Each of the jambs rests with its lower internal flanges b^3 on the adjacent lower base *d* and the adjacent clamping plate F bears against the upper side of these flanges, as shown in Figs. 3, 4, 5 and 6. The base and clamping plate may be securely fastened against opposite sides of the lower flanges b^3 by any suitable means, but I prefer for this purpose the fastening device which is shown in the drawings and which is constructed as follows: *f* represents a concave socket or depression formed in the top of the base *d* and f^1 a coupling pin or stud

rising from the bottom of this socket and having a perforation or recess f^2 which opens downwardly through the bottom of the socket. f^3 is a concave-convex deflection or swell arranged on the underside of the clamping plate and engaging its convex side with the concave side of the socket in the base. This swell has a central opening f^4 for receiving the stud of the base. f^5 represents a wedge which is driven into the recess of the stud above the clamping plate, for tightly drawing the base and plate against opposite sides of the lower jamb-flanges b^3. The wedge is curved downwardly and engages its convex side with the concave side of said swell while its concave side engages with the outer or free end of the stud. This construction of wedge fastening permits of conveniently striking the wedge at either end in a direction lengthwise of the jamb for tightening or loosening the same, thereby enabling the side jamb to be connected with or disconnected from the corner fitting by the use of an ordinary hammer and avoiding the use of special tools for this purpose. In order to further secure the side jamb against displacement relatively to the corner fitting the clamping plate is provided on its underside with pins or dowels f^6 which pass through coinciding openings f^7, f^8 in the lower jamb flanges b^3 and in the top of the base, as shown in Figs. 4 and 6.

In fitting the front section of each jamb to its companion rear section the side flanges b^8, b^9, of the front section engage their edges with the grooves b^4 in the side walls of the rear section and the outer edges of the side walls engage with the corners of the front section at the junction of the inner and outer stops and the inner and outer sides thereof, as shown in Figs. 5, 11, 14 and 15. By this means the two sections of the jamb are firmly interlocked and produce a rigid structure.

The outer sides of the jamb face plates are ben tto form vertical moldings or beads f^9 between its face plate and the rear edges of its sides. The lower ends of these moldings extend below the face plate and along the vertical flanges of the frame sill to the sub-sill A^1 and cover the heads of the bolts d^5 which connect the frame sill and lower corner bases, as shown in Figs. 5 and 26, thereby producing a neat and finished appearance.

The lower part of the front section of the jamb is held in place by detachably connecting the same with the base of the adjacent lower corner fitting in the following manner: G represents lower coupling bars arranged transversely in rear of the lower ends of the jamb face plates and provided with lugs g, g^1, g^2 which fit into the concave side of the inner, intermediate and outer stops, respectively. The inner and outer lugs g, g^2 are secured to their respective stops by bolts g^3. The middle part of the face plate and the coupling bar are secured by a bolt g^4 to a lug g^5 which rises from the base d adjacent to the inner side of the coupling bar. The nut of the bolt g^4 is seated in an upwardly-opening pocket g^6 in the lug g^5 and the body of this bolt passes through an opening g^7 in the intermediate stop of the face plate, a slot or recess g^8 in the intermediate lug of the coupling bar, and recesses g^9 formed in the inner and outer walls of the socket which contains the nut, as shown in Figs. 5, 6 and 26. The sides of the intermediate lug g^1 are beveled so that this lug tapers outwardly, whereby the hollow rear side of the middle stop on engaging the same is centered relatively to the coupling bar. The top plate of the frame sill is provided with an opening g^{10} to permit the lug g^5 of the base to pass upwardly through the same, as shown in Fig. 6. In addition to forming a part of the device for fastening the lower end of the jamb face plate section to the lower corner base the coupling bar serves to stiffen the face plate.

For the purpose of ventilating the inner side of the hollow frame and carrying away any moisture which may be present the following means are provided: H represents a main inclined gutter, groove or channel formed transversely in the top of the base d at the inner end of its inclined part and communicating at its lower or discharge end with a vertical groove or channel h formed on the outer side of the outer foot or wall of the base. A transverse row of longitudinal channels or grooves h^1 is also formed in the top of the inclined part of the base which communicate at their inner ends with the transverse channel, as shown in Figs. 7 and 31. The end portion of the frame sill covers the longitudinal channels of the base but not the transverse channel, thereby placing the interior of the sill and the jamb in communication. The vertical channel h of the base is arranged within the adjacent outer molding f^9 of the face plate section and the lower end of the latter is provided with a plurality of openings or notches b^2 whereby communication is established between the interior of the hollow window frame and the external atmosphere. By this means the molding of the jamb serves as a conduit through which the interior of the frame is placed in communication with the exterior atmosphere, thereby ventilating the frame and carrying off any moisture which may form in the frame due to sweating which otherwise would produce undue rusting of the parts. Furthermore, by forming the longitudinal grooves or channel in that part of the base on which the frame sill rests, this surface is corrugated and causes the parts to come in contact only at intervals which prevents any rust formed between the same from uniting so firm that they cannot be easily separated.

This is important when it becomes necessary to dismember the frame for making repairs after the building has been on fire.

On its outer side the rib *a* of the frame sill is curved to form a longitudinal concave channel or groove h^3 which communicates at its ends with the interior of the jambs by means of openings h^4 in the adjacent lower parts of the face plates formed by cutting away the edge of the face plates, as shown in Figs. 26, 32 and 14. Any water which may drive inwardly through the joint between the top plate of the sill and the bottom rail of the lower sash during a rain storm enters the longitudinal channel h^3 and is carried by the latter through the openings h^4 into the jambs. Thence the water runs downwardly in the channels H, *h* of the corner base and through the openings h^2 of the outer molding to the outside of the building. Water is thus prevented from entering the building under the sash even though the latter be closed only loosely upon the sill.

The upper ends of the side jambs are detachably connected with the opposing ends of the frame head by upper corner fittings which are constructed substantially like the lower corner fittings but operate reversely to the lower corner fittings. Each of the upper corner fittings is constructed as follows: I represents the hollow cast iron cap or corner piece of an upper corner fitting which fits into one of the upper corners of the window opening and which consists of a bottom plate *i*, a back wall i^1 and inner and outer side walls i^2, i^3. The adjacent end of the frame head embraces the front part of the cap and is secured thereto in any suitable manner. As shown in Figs. 1, 10, 11, 12, and 13, the bottom plate of the frame head stops short of the sides and is fitted against the underside of the front part of the upper corner cap while the sides of the head are secured to the sides of the cap by bolts c^6. The ends of the bottom of the head are square and extend over the upper edges of the jamb face plate, as shown at c^7, Fig. 10; for producing a joint between these parts. The sides of the head are provided with horizontal molding or beading c^8 which corresponds to the molding on the sides of the jamb face plate or front section and form a miter joint therewith. As shown in Figs. 1, 12, 13, and 14, the molding on the sides of the head extends straight to the end of the sides but the molding on the jamb sides extends above the upper end of the latter and is provided with a bevel c^9 see Figs. 1 and 14 which fits the molding c^8 of the head sides. This manner of forming a miter joint between these parts avoids the necessity of an absolutely perfect fit between the parts and prevents any slight inaccurary in workmanship from producing an opening in this joint. The internal flanges b^3 at the upper end of the back section of the jamb bear against the underside of the cap plate and are secured thereto by a clamping plate i^4 bearing against the underside of the flanges b^3 and having upwardly-projecting pins or dowels i^5 which pass through corresponding openings i^6, i^7 in said flanges and the bottom plate of the cap, as shown in Figs. 10 and 12 and 33. i^8 is an upward deflection or swell on the clamping plate i^4 of convex form which fits into a concave socket i^9 in the underside of the bottom of the cap. i^{10} is a stud depending from the bottom of the socket i^9 and passing through an opening i^{11} in the central part of the swell i^8. i^{12} is a curved wedge which is driven through a perforation or recess i^{13} in the stud and bears with its concave and convex sides respectively against the outer part of said stud and the concave side of said swell, as shown in Figs. 10, 11 and 33, thereby firmly drawing the cap and its clamping plate against opposite sides of the upper flanges b^3 of the back section of the jamb. The recess i^{13} of the upper stud opens upwardly or through the base of the stud in the same manner as the recess f^2 of the lower stud f^1. By thus constructing the recesses the same can be cast in the upper and lower coupling studs without requiring coring.

J represents coupling bars whereby the upper ends of the front sections of the jambs are stiffened and connected with the upper corner fittings in substantially the same manner in which the lower coupling bars connect the lower ends of the jamb fronts with the lower corner fittings. Each of the upper coupling bars is arranged transversely in rear of the upper end of the jamb face plate and is provided at its ends with lugs *j*, j^1 which are secured in the back of the inner and outer jamb stops b^6, b^7 by bolts j^2, as shown in Fig. 11. The central part of the upper coupling bar is provided with a tapering lug j^3 which fits into the back of the intermediate stop b^5. A bolt j^4 passing through an opening j^5 in the intermediate stop and a recess j^6 in the central lug of the upper coupling bar securely connect these parts, as shown in Figs. 10 and 11. On the central part of the upper coupling bar the same is provided with an upwardly-projecting lip j^7 having an inclined front side or face which engages with a corresponding face on the rear side of a lug j^8 which is arranged on the underside of the adjacent upper corner cap, as shown in Figs. 10 and 11, thereby securely holding the front and rear sections of the jamb together at the upper ends thereof.

In assembling and mounting the parts of the window frame in the window opening of the wall, the bases of the lower corner fittings are first placed in the lower corners of the window opening. The frame sill is then placed on the sub-sill with its ends fitting over the front ends of the bases and then these parts are secured together by the bolts d^5 whose nuts are pocketed in the bases before

the latter are covered by the frame sill, or the sill and base may be put in place after being connected. The frame head with the caps of the upper corner fittings secured thereto by the bolts c^6 is next placed in the upper recess and corners of the window opening. The back sections of the side jambs are now inserted in the side recesses of the window opening between the rear parts of the bases and the caps of the corner fittings on both sides. To permit of thus introducing the back jamb sections, the ends of their rear walls are provided with recesses or notches B^2 for clearing the studs f^1, i^{10} and lugs g^5, j^8 on the bases and caps. The clamping plates are now applied to the end flanges of the rear jamb sections by means of the wedges and then the front sections of the jambs are secured to the companion rear sections, thereby completing the window frame. In applying a front section the lip j^7 at its upper end is first engaged with the lug j^8 of the upper cap while this section is tilted, so that its lower end stands farther away from the rear jamb section and the nut of the bolt g^4 is placed in the pocket of the lug g^5 to permit of fastening the lower end of the jamb face thereto when the latter has been moved inwardly for alining the same with the rear section. That side of each clamping plate facing its corner piece is provided with a marginal rib i^{14} which bears against the adjacent flanges on the back section of the jamb, as shown in Figs. 4, 6, 10 and 33, thereby insuring a firm grip on said flanges and preventing weaving of the same. By extending the side walls of the rear jamb section from the doubled or grooved part b^4 of the front wall to the front section these parts form braces B^3 for the front section which materially stiffens and strengthens the structure. This construction of metal window frame permits any part thereof which may be damaged by fire to be conveniently replaced by a new part without requiring the whole frame to be removed for that purpose, thus reducing the cost of making repairs. If desired, the studs of both corner fittings may be so constructed that their free ends are flush with the faces of their corner pieces, as shown in Fig. 34, which permits the back sections of the jambs to pass over the same in assembling or dismembering the frame without requiring the notches B^2 in the rear walls thereof.

K, K′ represent the upper and lower sash of the window. These sash are constructed substantially alike but are arranged reversely to each other in the frame. The lower sash has a short horizontal lower bar or rail k, two vertical side bars or stiles k^1 which engage on the inner sides of their lower ends with the outer ends of the lower rail, and a long horizontal upper bar or check rail k^2 which engages on the under side of its opposite ends with the upper ends of the stiles. The upper sash has a short upper horizontal bar or rail k^3, two vertical side bars or stiles k^4 which engage on the inner side of their upper ends with opposite ends of the upper rail, and a horizontal lower bar or check rail k^5 which engages on the upper sides of its ends with the lower ends of the stiles k^4. Each member of the sash is hollow and constructed of sheet metal in any suitable and well known manner and provided on its inner wall with a longitudinal groove k^6 which receives the edge of the glass pane k^7.

The ends of the opposing sash members are connected by corner fittings each of which is constructed as follows: L represents a side coupling piece and L^1 an end coupling piece coöperating with the side coupling piece, as shown in Figs. 3, 5 and 23. The side coupling piece has a transverse filling plate l which closes the end of a side bearing sash member and a longitudinal clamping plate l^1 which bears against the inner longitudinal wall of said side bearing member adjacent to its end, the transverse and longitudinal plates being constructed in one piece in the form of an angle. The end coupling piece L^1 is likewise of angular shape and consists of a transverse clamping plate l^2 arranged at the end of the end bearing sash member and a longitudinal stiffening plate l^3 which engages with the inner side of the longitudinal outer or face wall of said end bearing sash member, as shown in Fig. 3. The vertical walls of the end bearing member are provided at their ends with lips or flanges k^8 which are turned inwardly over the outer side of the end bearing plate l^2, as shown in Fig. 5. The coupling plates l^1 and l^2 are drawn together by a bolt l^4 for clamping between them the inner wall of the side bearing member and the lips of the end bearing member. This bolt has its head and nut bearing against the rear sides of the side and end clamping plates, respectively, and passes through an opening in the end clamping plate and through longitudinal slots l^5, l^6 in the inner wall of the side bearing member and in the side clamping plate, respectively, which slots open outwardly, as shown in Figs. 23 and 35. The opposing coupling-plates of the corner fitting are constructed to conform with the inner and outer sides of the inner wall of the side bearing member and the lips of the end bearing member are likewise formed.

One of the clamping plates is provided with pins or dowels L^2 which pass through coinciding openings in the lips of the end bearing member, the inner wall of the side bearing member and the opposing side clamping plate, thereby uniting these parts more securely. As shown in Fig. 5, the dowel pins are formed on the clamping plate of the end bearing member.

In assembling two members of a sash, the coupling piece L is first placed in the end of

the side bearing member. The coupling piece L[1] with the bolt previously applied thereto is next inserted in the end of the end bearing member, so that its dowels project through the openings in the lips. The end bearing piece can be thus placed in its end bearing sash member by temporarily shifting the outer or face wall k^9 thereof lengthwise sufficiently for this purpose to afford access to the interior of the end bearing member, this being possible by connecting said face wall with its companion vertical or side walls by a sliding joint k^{10}, as shown in Figs. 21 and 32. The head of the bolt while mounted on the end bearing member is now passed through the slot of the clamping plate in the side bearing member and the dowels of the end bearing member are engaged with the openings in the opposing parts. The bolt is now tightened by means of suitable tools which engage with its head. Access to the latter is afforded through an opening l^7 in the outer face wall of the side bearing member, as shown in Fig. 5. In order to prevent the nut of the bolt from turning therewith, the rear side of the end clamping plate is provided with a lug or shoulder l^8 against which the flat side of this nut bears, as shown in Figs. 3 and 5. The bolt is also prevented from being wholly unscrewed from its nut by burring or upsetting the end of the bolt, as shown at l^9 in Fig. 5. This means of fastening together the several members of a sash permits of readily assembling the parts and also dismembering the same in the building and therefore avoids taking the sash to the factory when repairs are necessary in case of damage by fire:

Each of the window sashes is preferably provided with an intermediate vertical bar or mullion which is constructed as follows: The body of each mullion consists of two interlocking sections M, M[1] which are connected by a contracted neck m forming grooves on opposite sides of the mullion which receive the edges of the opposing panes of glass. Each section is constructed of a sheet of metal which is bent to form a tubular body having two longitudinal webs m^1, m^2 on its inner side which are arranged in line and form the walls on one side of the glass grooves, a long web m^3 and a short web m^4 extending transversely from the inner edges of the longitudinal webs m^1, m^2 toward the other tubular body and forming part of the rear walls of the glass grooves, and a single longitudinal web m^5 extending outwardly from the opposite edge or extremity of the long transverse web and forming part of the side wall on the opposite side of one of the glass grooves. The two sections of the mullion are assembled by telescoping or sliding one section lengthwise within the other, so that the single webs m^5 bear against the inner side of the webs m^2 which are diagonally opposite each other and the long transverse web m^3 of each section is arranged on the inner side of the short transverse web of the other section, as shown in Fig. 20. m^6 is a stiffening core or bar which is arranged within the mullion and bears at its longitudinal edges against the outer part of the tubular bodies while the central part fits in the neck of the mullion. The ends of the mullion are fitted against the adjacent rails of the sash and may be secured thereto by any suitable means. The preferred means for this purpose consist of plates m^7 secured to the inner side of the grooved walls of the rails by bolts m^8 and each provided with a stud m^9 projecting at right angles therefrom through an opening in the grooved wall into the adjacent end of the hollow mullion, as shown in Fig. 21. The stiffening bar is preferably of such length that it fills the space in the mullion body, as shown in Fig. 3. The studs conform to the interior shape of the hollow sections of the mullion which receives the studs.

For the purpose of permitting the panes of the sash to be cleaned on either side from the interior of the building the same are revolubly supported as follows: N, N[1] represent hanger bars or strips bearing against the vertical outer walls or sides of the sashes and guided in the channels n n^1 formed on the faces of the jambs between the stops thereof. Each of these hanger bars is hollow and bent out of sheet metal so as to form two side walls n^2 which engage with the side walls of its channel, a concave rear wall n^3 which recedes from the rear channel wall and connects the inner ends of the hanger side walls, an outer convex wall composed of two wings n^4 which extend inwardly toward each other from the outer edges of the hanger side walls, and longitudinal flanges n^5 which extend from the opposing edges of the wings rearwardly toward the rear wall of the hanger bar, as shown in Figs. 5 and 16. Each of the outer vertical sash stiles is provided on its outer side with a concave channel n^6 which receives the convex outer wall of the adjacent hanger bar. Midway of their height the sash stiles and the opposing hanger bars are connected by horizontal pivots which permit the sash to turn in a vertical plane on the hanger bars and present either side of the panes toward the interior of the building for convenience in cleaning or repairing the sash and also to ventilate the room. On turning the sash its concave sides coöperating with the convex sides of the hanger bars produces a wedge or cam action whereby the wings of the hanger bars are deflected inwardly sufficiently to permit the sash side bars to clear the hanger bars, as shown by dotted lines. Upon turning the sash back into alinement with the hanger bars the wings of the latter automatically resume

their outer position and engage the bottoms of the outer sash channel, the wings being sufficiently flexible for this purpose. In order to increase the frictional contact or interlocking effect between the hanger bars and the sash in the closed position, an outward or convex swell n^7 is formed on the inner edges of the wings which swells engage with corresponding concave seats or longitudinal grooves n^8 in the center of the outer sash channels n^6.

In addition to resisting the turning movement of the sash more effectively, the coöperating convex swells and seats of the hanger bars and sash serve to more effectually prevent the passage of air through this joint. On the outer face of each sash stile next to its weather side the same is provided with a longitudinal weather or water groove n^9. Any water which is driven during a rain storm into the joint between the hanger bars and sash is received by these grooves and conducted downwardly to the sill, thereby preventing the same from entering the building. By concaving the back wall of the hanger bars the same bear only at their corners against the bottom of the channels in which they are guided, thereby reducing the contact surface and the wear which would otherwise result and also enabling the hangers and sash to be slid vertically in the channels more easily.

The preferred means for pivotally connecting the sash and hanger bars is as follows: O, Figs. 3, 16, 17, 18 and 19, represents a horizontal pin passing transversely through a central opening in the outer face or wall of one of the sash stiles or bars, the space between the wings of the hanger bar and a longitudinal slot o^1 in the rear wall thereof. At its rear end the pivot pin is mounted on a fastening plate o^2 which is secured to the inner side of the hanger bar by riveting or otherwise, as shown in Fig. 19. At its front end the pivot pin is provided with a head or enlargement o^3 which is beveled on its rear side, as shown in Fig. 16, and is connected with the body of the pin by a contracted neck o^4. o^5 represents a locking plate which is applied to the inner end of the pivot pin and holds the latter and the hanger bar together. This plate is arranged in the space in rear wall of the hanger bar and secured to the outer side of said wall by a rivet o^6 or otherwise. Formed lengthwise in the locking plate is a slot having a wide upper part o^7 which is larger than the head of the pin, and a narrow lower part o^8 which is of less width than said head. The front side of the locking plate is provided with an incline o^9 leading downwardly to the upper front edge of the wide part of its slot and the rear side of this plate is provided with inclines o^{10} leading from the lower rear edge of said wide part of the slot downwardly along opposite sides of the narrow part of the slot, as shown in Figs. 17 and 19. These inclines slope inwardly or rearwardly from the top to the bottom of said slot. On the lower rear part of the locking plate the same is rabbeted to form a downwardly-facing shoulder o^{11} about midway of the narrow lower art of the slotp at which shoulder the lower inclines o^{10} terminate.

In assembling the sash and hanger bar, the convex side of the latter is first pressed against the concave side of the sash stile and the head of the pin is inserted in the upper part of the slot in the locking plate. The sash and hanger bar are now moved lengthwise relatively to each other in the direction for shifting the head of the pin from the wide to the narrow part of the slot in the locking plate. During this longitudinal movement the pin head rides over the lower inclines o^{10} and draws the front and rear walls of the hanger bar together, this being possible owing to the elastic character of the bar. When the neck of the pin reaches the lower end of the slot in the locking plate its head clears the highest part of the lower incline o^{10}, thereby permitting the hanger bar to expand into its normal position and causing the shoulders o^{11} to bear against the top of the head and opposite sides of the lower narrow part of the slot to engage with the sides of the head, whereby these parts are coupled. When the parts are in this position the resilience of the hanger bar causes the shoulder of the locking plate to bear against the head of the pin with sufficient friction to hold the parts against accidental displacement during the ordinary operation of the same. In order to prevent positive coupling of the sash and hanger bar and permit of dismembering the same, when necessary, the shoulder o^{11} is inclined or beveled sufficiently, as shown, so that the head of the pivot pin can be forcibly withdrawn from underneath the same.

For the purpose of locking the sash against turning on the hanger bars, means are provided for preventing the wings of the hangers from being deflected rearwardly. The preferred means for this purpose consists of locking blocks P one of which is inserted in the upper part of each hanger bar so as to fill the space between the rear wall and the flexible wings on the front thereof, as shown in Figs. 3 and 24. While the locking blocks are in place in the hanger bars the wings thereof are held against backward deflection, thereby preventing the sash from turning on its pivot. When it is desired to turn the sash for cleaning the same, or for other purposes, the locking blocks are temporarily removed from the hangers which can be conveniently done by means of a tool which is inserted in an opening p in the front side of the blocks. The locking blocks are retained in the upper ends of the hanger bars by

means of a shoulder p^1 on the bars which is formed by cutting away the upper edge of the rear wall of each hanger bar and constructing the locking block so that it overhangs this rear wall and rests on the shoulder p^1 thereof. In order to prevent the locking blocks from becoming displaced, the same are extended to the back of the channel of the jamb which receives the hanger bar and this rear part of the locking block is provided with a vertical opening p^2 which receives the adjacent balance chain of the sash. This means of locking the sash against turning is very desirable inasmuch as it retains the sash always in the proper position to be closed in case of fire and renders it difficult for any person unprovided with means for removing the locking blocks from turning the window and preventing rapid closing of the same in case of fire.

Any suitable means may be employed for counterbalancing the weight of the sash but I prefer for this purpose the counterbalancing device which is shown in Figs. 3, 17 and 19 of the drawings and which is constructed as follows: Q, Q represent counter or sash balancing weights which move vertically in the interior of the frame jambs in a well known manner. Each of these weights is connected with one of the hanger bars by a chain or cord q which passes with its bight over a sash pulley R mounted in the adjacent upper part of the frame, suitable openings being formed in the frame for the passage of the sash chain. A simple means of attaching the chain to the hanger bar consists in forming an eye q^1 on the upper end of the locking plate o^5, passing the end link of the chain downwardly through this eye and then applying a split or key ring q^2 which is larger than said eye to the lower end of said link as shown in Figs. 17 and 19, whereby the latter is held against pulling upwardly through the eye. This means of fastening the chain to the hanger bar avoids the use of any separate fastening for this purpose.

I claim as my invention:

1. A metal window-frame comprising corner pieces each of which has a top and side walls, a downwardly-opening bolt recess in each side wall which is enlarged at its lower end, and a pocket arranged on the inner side of each side wall in line with its recess and having a clearance opening in its back, a hollow sill having a top and side walls which fit at their opposite ends against the outer side of the corresponding parts of the corner pieces, a bolt passing through a side wall of the sill and the upper part of a bolt recess and pocket in the side wall of a corner piece, nuts arranged in said bolt within its respective pocket, a nut retaining block arranged in the lower part of said pocket and in the wide lower part of the bolt recess, substantially as set forth.

2. A metal window-frame comprising a corner piece, a clamping plate facing the corner piece, a hollow jamb provided with an internal flange arranged between said corner piece and plate, and means for connecting the corner pieces and clamping plate, substantially as set forth.

3. A metal window-frame comprising a corner piece, a clamping plate facing the corner piece, a hollow jamb provided with an internal flange arranged between said corner piece and plate, dowels arranged on the plate and entering openings in said flange and corner piece, and means for connecting the corner piece and clamping plate, substantially as set forth.

4. A metal window-frame comprising a corner piece provided with a stud having a transverse opening, a clamping plate provided with an opening which receives said stud, a hollow jamb provided with an internal flange arranged between said corner piece and clamping plate, and a wedge entering the opening of the stud and operating to draw the corner piece and plate together, substantially as set forth.

5. A metal window-frame comprising a corner piece provided with a stud having a transverse opening, a clamping plate provided with a curved part having an opening which receives said stud, a hollow jamb having internal flanges arranged between the corner piece and plate, and a curved wedge arranged in the opening of the stud and bearing on its opposite sides against the outer end of the stud and the curved part of the clamping plate, substantially as set forth.

6. A metal window-frame comprising a corner piece having a concave socket, a stud arranged on the bottom of the socket and a transverse opening in the stud, a clamping plate having a concavo-convex swell which engages its convex side with said socket and an opening in said swell which receives said stud, a hollow jamb provided with an internal flange which is arranged between the corner piece and clamping plate, and a curved wedge arranged in the opening of said stud and bearing with its convex and concave side against the concave side of said swell and the outer end of the stud, substantially as set forth.

7. A sheet metal window frame comprising a corner piece, a clamping plate having a marginal rib facing the corner piece, a sheet metal jamb having a flange arranged between the corner piece and the opposing rib of the clamping plate, and means connecting the corner piece and clamping plate, substantially as set forth.

8. A metal window frame comprising a jamb having flanges at its upper and lower ends, a lower corner piece and a lower clamping plate secured against opposite sides of the lower flange of the jamb, and an upper corner piece and clamping plate secured to op-

posite sides of the upper flange of the jamb, substantially as set forth.

9. A metal window-frame comprising a lower corner piece having an upwardly-projecting perforated stud, a lower clamping plate arranged above the lower corner piece having an opening which receives its stud, an upper corner piece having a downwardly-projecting perforated stud, an upper clamping plate arranged below the upper corner piece and having an opening which receives its stud, a jamb provided at its lower end with a flange which is clamped between the lower corner piece and plate and at its upper end with a flange which is clamped between the upper corner piece and plate, and wedges arranged in the perforations of said studs between the free ends of the studs and said clamping plates, substantially as set forth.

10. A metal window frame having a jamb composed of a back section and a front section, said back section consisting of a rear wall, two side walls and longitudinal grooves formed in the central parts of the side walls, and said front section consisting of a front wall and two side walls which latter engage at their inner edges in the grooves of the side walls of said rear section, substantially as set forth.

11. A metal window frame having a jamb composed of a back section and a front section, said back section consisting of a rear wall, two side walls and longitudinal grooves formed in the central parts of the side walls, and said front section consisting of a front wall and two side walls, said front wall bearing against the front or outer edges of the side walls of the rear section while the rear or inner edges of the side walls of the front section engage with the grooves in the side walls of the rear section, substantially as set forth.

12. A metal window frame comprising a corner piece, a hollow jamb engaging with said corner piece and composed of front and rear sections, and means for connecting said front section and corner piece comprising a lug projecting from the corner piece into the hollow jamb and a bolt connecting said front section and lug, substantially as set forth.

13. A metal window-frame comprising a corner piece, a jamb engaging said corner piece and composed of a rear section and a front section, a bar secured to the rear side of said front section, and means for connecting said bar and corner piece, substantially as set forth.

14. A metal window-frame comprising a corner piece, a pocket formed on the corner piece, a jamb composed of a rear section and a front section, a bar secured transversely to the rear side of the front section, and a fastening bolt passing through said front section and bar and having its nut arranged in said pocket, substantially as set forth.

15. A metal window-frame comprising a corner piece having a lug on the upper side of its front part which contains a pocket, a sill fitting over the front part of the corner piece and having an opening which receives said lug, a jamb composed of a rear section resting on the corner piece and a front section resting on the sill, a cross bar secured to the rear of the front jamb section, and a fastening bolt for the cross bar and front jamb section having its nut arranged in said pocket, substantially as set forth.

16. A metal window-frame comprising a corner piece having a lug, a jamb composed of a rear section and a front section, and a lug on the front section constructed to engage the lug of the corner piece, substantially as set forth.

17. A metal window-frame comprising a corner piece having a lug provided with an inclined rear face, a jamb composed of a rear section and a front section, and a cross bar secured to the rear side of the front section and having an inclined front face which engages the inclined face of said lug, substantially as set forth.

18. A metal window-frame comprising a lower corner piece having an upwardly-projecting lug, an upper corner piece having a downwardly-projecting lug, a jamb composed of a rear section and a front section, upper and lower cross bars secured to the rear side of said front section, a bolt connecting the lower cross bar and front section with the lug of the lower corner piece, and a lug arranged on the upper cross bar and engaging with the lug of the upper corner piece, substantially as set forth.

19. A metal window-frame comprising a corner piece having a grooved or corrugated surface, and a sill fitting over said surface, substantially as set forth.

20. A metal window-frame comprising a corner piece having a transverse groove and a plurality of longitudinal grooves connecting with the transverse groove, and a sill embracing the corner piece and fitting over its longitudinal grooves, substantially as set forth.

21. A metal window-frame comprising a corner piece having a grooved surface, and a jamb resting on the corner piece and having a conduit which communicates with said grooves, substantially as set forth.

22. A metal window-frame comprising a corner piece having a transverse groove and longitudinal grooves connecting with the transverse groove, a sill fitting over said longitudinal grooves, a jamb resting on the corner piece and having a hollow molding which is opposite said transverse groove and has notches in its lower end, substantially as set forth.

23. A metal window-frame comprising a sill having a longitudinal rib on its top which has a longitudinal groove on its front

side, and a hollow jamb having openings whereby the interior of the same communicates with said groove and with the exterior, substantially as set forth.

24. A metal window sash comprising hollow stiles and rails and having its corners constructed by fitting together the end of one member and the side of another member, clamping plates arranged wholly within the side bearing member and the end bearing member, and a fastening for connecting said plates, substantially as set forth.

25. A metal window sash comprising hollow stiles and rails and having its corners constructed by fitting together the end of one member and the side of another member, clamping plates arranged wholly within the side bearing member and the end bearing member, and a bolt connecting said plates within said members, substantially as set forth.

26. A metal window sash comprising hollow stiles and rails and having its corners constructed by fitting together the end of one member and the side of another member, clamping plates arranged in the side bearing member and the end bearing member, lips arranged on the end of the end-bearing member and turned inwardly between the clamping plate thereof and the inner face of the side-bearing member, and a fastening connecting said plates, substantially as set forth.

27. A metal window sash comprising hollow stiles and rails and having its corners constructed by fitting together the end of one member and the side of another member, clamping plates arranged in the side bearing member and the end bearing member, lips arranged on the end of the end-bearing member and turned inwardly between the clamping plate thereof and the inner face of the side bearing member and the other clamping plate, substantially as set forth.

28. A metal window-sash comprising hollow stiles and rails and having its corners constructed by fitting together the end of one member and the side of another member, a clamping plate arranged in the end bearing member and having a bolt opening, a clamping plate in the side bearing member and having a bolt recess which opens toward the outer end, and a bolt arranged in the opening and recess of said plates, substantially as set forth.

29. A metal window-sash comprising hollow stiles and rails and having its corners constructed by fitting together the end of one member and the side of another member, said side bearing member having a bolt-slot in its inner wall which opens toward the outer end thereof, and a tool opening in its outer wall, a clamping plate arranged in the side bearing member and having a transverse filling plate at its outer end for closing said member and a bolt slot opening outwardly and registering with the slot of said inner wall, a clamping plate arranged in the end bearing member and having a bolt opening, and a bolt arranged in said bolt opening and slots, substantially as set forth.

30. A metal window-sash comprising hollow stiles and rails and having its corners constructed by fitting together the end of one member and the side of another member, said side bearing member having a bolt slot in its inner wall which opens toward the outer end thereof, a clamping plate arranged in the side bearing member, a clamping plate arranged in the end bearing member, a bolt passing through said slot and clamping plates and having its head arranged in the side bearing member and its nut arranged in the end bearing member, a shoulder formed on the end of the bolt for confining the nut thereon, and a shoulder arranged on the clamping plate of the end bearing member and operating to prevent said nut from turning, substantially as set forth.

31. A metal window-sash comprising a mullion consisting of two interlocking hollow sections connected by a contracted neck forming pane receiving grooves, each of said sections being bent out of a sheet of metal to form a tubular body having two inwardly-extending longitudinal webs on its inner side which are in line and form one side of the pane grooves, short and long webs extending transversely from the inner edges of the longitudinal webs toward the body of the other section, and a single longitudinal web extending outwardly from the long transverse web, said sections being interlocked by engaging the long transverse web and the extreme longitudinal web of each section with the inner side of the short transverse web and the longitudinal connecting web of the other section, substantially as set forth.

32. A metal window sash comprising a mullion consisting of two like tubular sections which oppose each other and are interlocked, and a bar arranged within both of said sections and operating to hold the same in place relatively to each other, substantially as set forth.

33. A metal window-sash comprising hollow side bars each provided on its inner wall with an opening, an intermediate bar composed of two tubular interlocking sections, and a stud secured to the interior of each side bar and projecting through said opening into the end of the intermediate bar, substantially as set forth.

34. A metal window sash comprising hollow top and bottom rails or bars each of which has an opening centrally on its inner wall, a mullion composed of two tubular interlocking sections, plates secured to the in-

terior of the rails and having studs which project through said openings into the ends of the mullion, and a bar arranged in the mullion between said studs, substantially as set forth.

35. A metal window comprising a hollow hanger bar constructed of sheet metal to form two side walls, a rear wall connecting the rear edges of the side walls, and a convex front wall composed of two elastic wings which extend from the front edges of the side walls toward each other, substantially as set forth.

36. A metal window comprising a hollow hanger bar constructed of sheet metal to form two side walls, a rear wall connecting the rear edges of the side walls, a convex front wall composed of two wings which extend from the front edges of the side walls toward each other, and inwardly-projecting flanges arranged on the opposing edges of said wings, substantially as set forth.

37. A metal window comprising a hollow hanger bar constructed of sheet metal to form two side walls, a concave rear wall connecting the rear edges of the side walls, and a convex front wall composed of wings which extend from the front edges of the side walls toward each other, substantially as set forth.

38. A metal window comprising a jamb having a channel, a hollow hanger bar constructed of sheet metal to form two side walls bearing against the sides of said channel, a rear wall connecting the rear edges of the hanger bar side walls, and a convex front wall composed of two wings projecting from the front edges of the hanger bar side walls toward each other and having convex swells on the inner ends of said wings, and a sash having its stile provided with a concave outer wall which receives said wings and a concave seat in the bottom of said wall which receives the swell of said wings, substantially as set forth.

39. A metal window comprising a jamb having a channel, a hollow hanger bar constructed of sheet metal to form two side walls bearing against the sides of said channel, a rear wall connecting the rear edges of the hanger bar side walls and a convex front wall composed of two wings projecting from the front edges of the hanger bar side walls toward each other, and a sash having its stile provided with a concave outer wall which receives said wings and a longitudinal groove in the face of said wall adjacent to the weather side of the sash, substantially as set forth.

40. A metal window comprising a sash stile, a hollow hanger bar constructed of sheet metal and having a front wall bearing against the sash stile and a rear wall, a locking plate secured to said rear wall and having a slot which is wide at one part and narrow at another part, a pivot pin secured to said stile and having a head constructed to pass through the wide part of said slot and to bear against the inner side of said plate on opposite sides of the narrow part of said slot, substantially as set forth.

41. A metal window comprising a sash stile, a hollow hanger bar constructed of sheet metal and having a front wall bearing against the sash stile and a rear wall, a locking plate secured to said rear wall and having a slot which is wide at one part and narrow at another part and has a shoulder adjacent to its narrow part, a pivot pin secured to said stile and having a head constructed to pass through the wide part of said slot and to bear against the inner side of said plate on opposite sides of the narrow part of said slot and also against said shoulder, substantially as set forth.

42. A metal window comprising a sash stile, a hollow hanger bar constructed of sheet metal and having a front wall bearing against the sash stile and a rear wall, a locking plate secured to said rear wall and having a slot which is wide at one part and narrow at another part and inclines on its rear side leading from the wide to the narrow part of the slot, a pivot pin secured to the sash stile and having a head constructed to pass through the wide part of the slot, to ride over said inclines and to engage the rear side of the locking plate on opposite sides of the narrow part of its slot, substantially as set forth.

43. A metal window comprising a sash stile, a hollow hanger bar constructed of sheet metal and having a front wall bearing against the sash stile and a rear wall, a locking plate secured to said rear wall and having a slot which is wide at one part and narrow at another part, inclines on its rear side leading from the wide to the narrow part of the slot and shoulders at the inner ends of said inclines, a pivot pin secured to the sash stile and having a head constructed to pass through the wide part of the slot, to ride over said inclines and to engage the rear side of the locking plate on opposite sides of the narrow part of its slot and also engage said shoulder, substantially as set forth.

44. A metal window comprising a sash stile, a hollow hanger bar having a front wall engaging said stile and a rear wall, a locking plate secured to said rear wall and having an eye and a slot, a pivot pin secured to said stile and having a head constructed to pass through said slot and bear against the rear side of said plate, and a sash balance cord or chain connected with said eye, substantially as set forth.

45. A metal window comprising a frame having a guideway, a hollow hanger bar having a back wall bearing constantly against the bottom of said guide way and having a flexible convex front wall, a sash having

concave edge which receives the flexible front wall of the hanger bar, and means for preventing inward deflection of said flexible front wall, substantially as set forth.

46. A metal window comprising a hanger bar constructed of sheet metal and having a flexible front wall and a recess in the upper edge of its rear wall forming a shoulder, and a locking block arranged in said recess between the front and rear wall of said hanger bar and resting on said shoulder, substantially as set forth.

47. A metal window comprising a frame having a guide channel, a hollow hanger bar arranged in said channel and having a flexible front wall, a sash pivoted on said bar, a locking block arranged in said bar between its front and rear wall and having an opening in its rear part, and a sash balance having its chain or cord passing through said opening, substantially as set forth.

Witness my hand this 13th day of January, 1904.

CLINTON D. TABOR.

Witnesses:
THEO. L. POPP,
EMMA M. GRAHAM.