W. BAYLEY.

BALANCED WINDOW SASH.

APPLICATION FILED JULY 7, 1913.

1,258,388.

Patented Mar. 5, 1918.

3 SHEETS—SHEET 1.

Fig. 1.

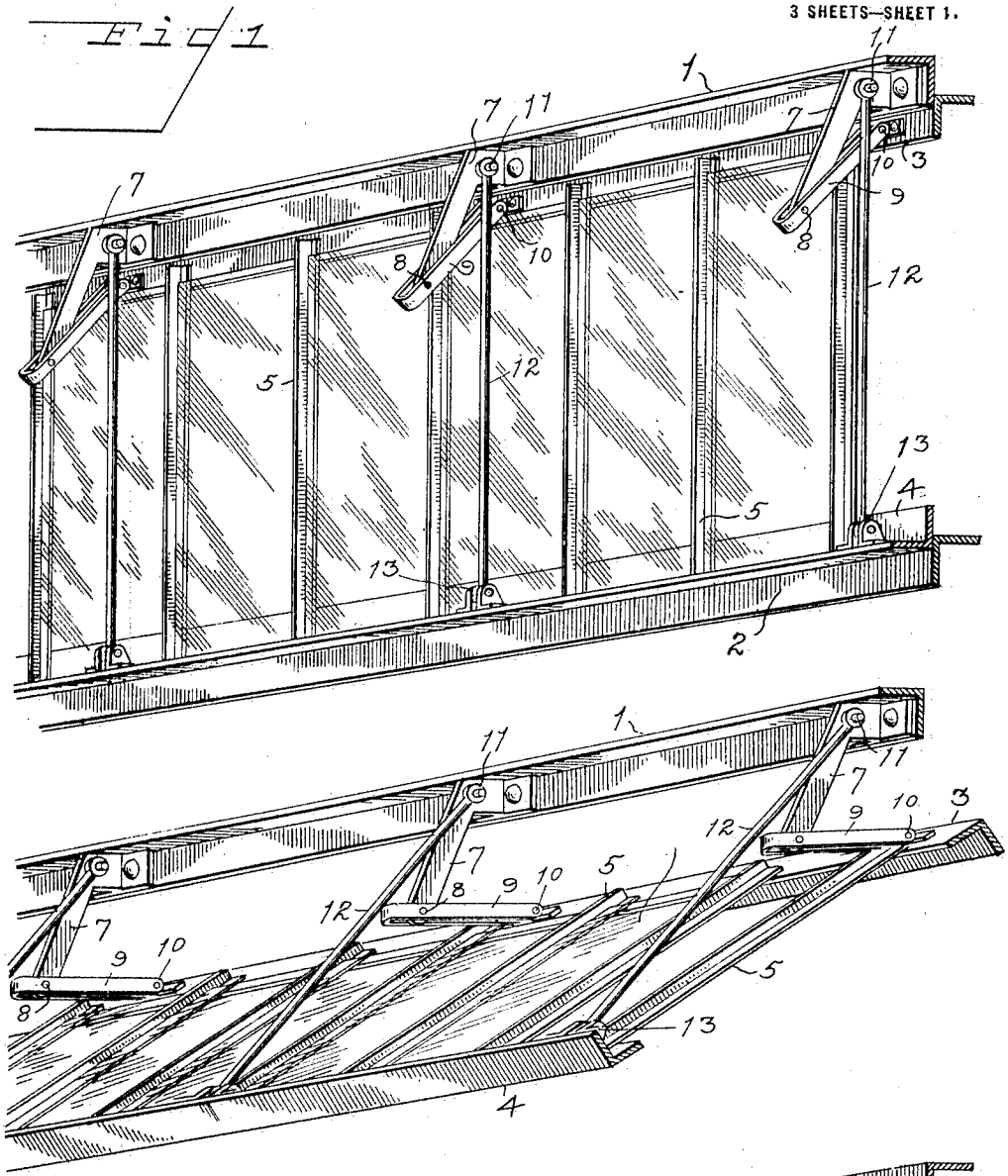
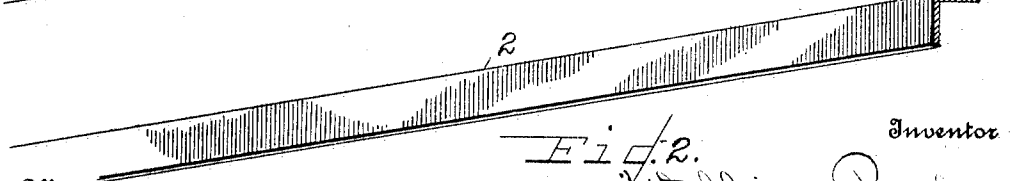


Fig. 2.



Witnesses

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3 SHEETS—SHEET 2.

Fig. 4.

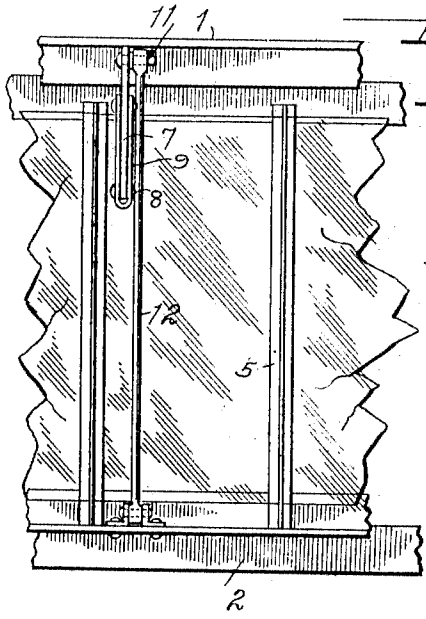


Fig. 3.

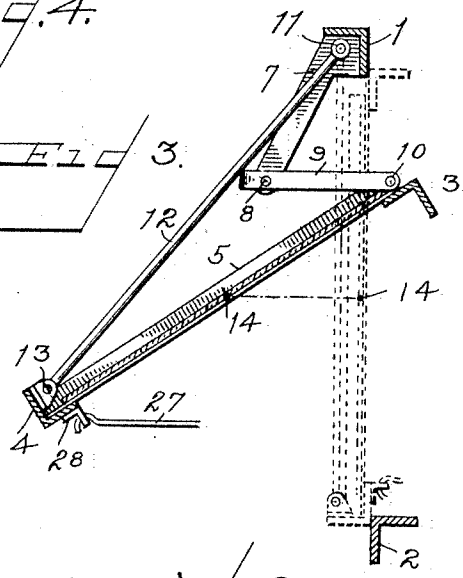


Fig. 6.

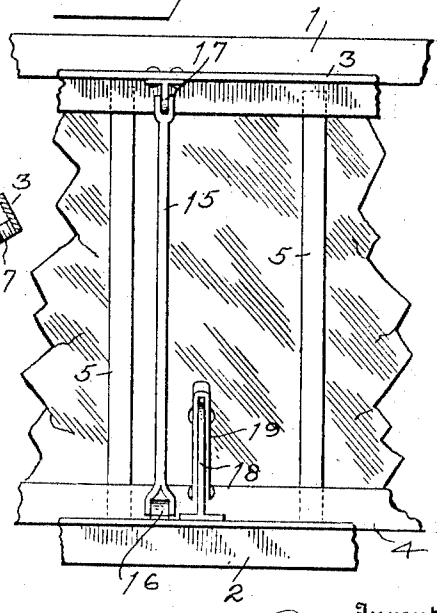
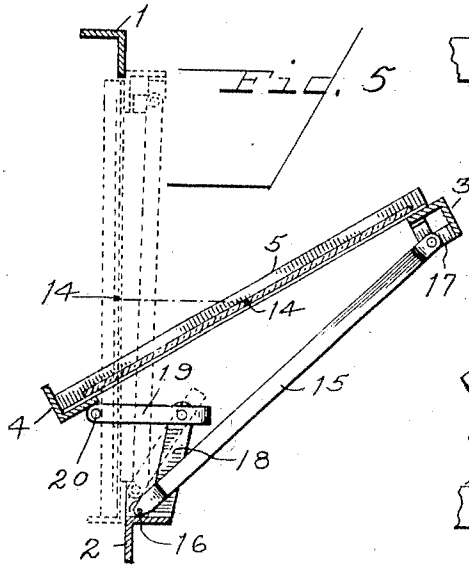


Fig. 5.



Witnesses

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3 SHEETS—SHEET 3.

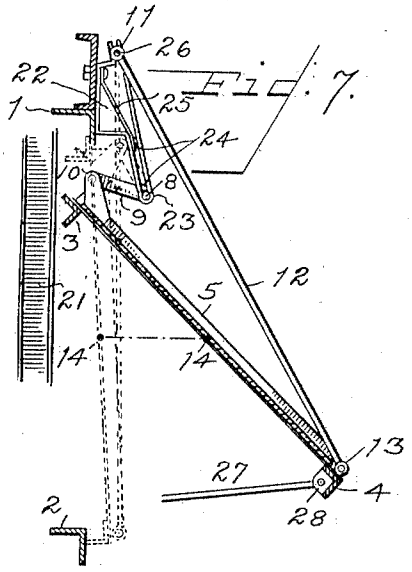


Fig. 7.

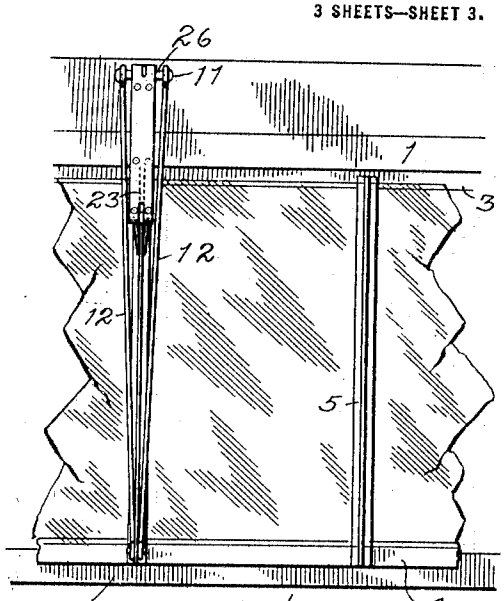


Fig. 8.

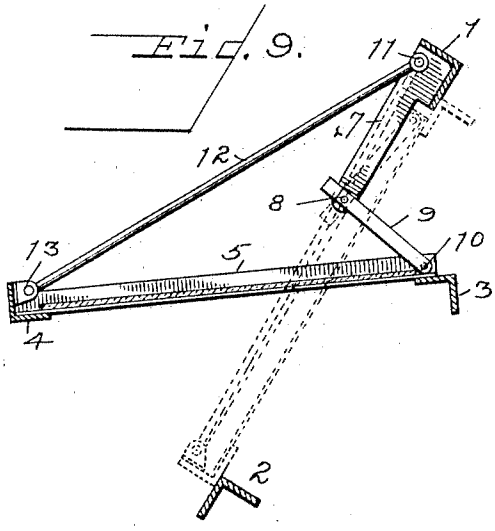


Fig. 9.

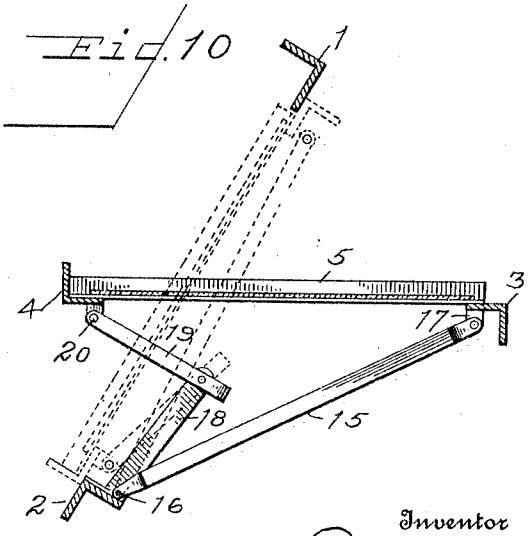


Fig. 10

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WILLIAM BAYLEY, OF SPRINGFIELD, OHIO.

BALANCED WINDOW-SASH.

1,258,388. Specification of Letters Patent. Patented Mar. 5, 1918.

Application filed July 7, 1913. Serial No. 777,634.

To all whom it may concern:

Be it known that I, WILLIAM BAYLEY, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Balanced Window-Sashes, of which the following is a specification.

My invention relates to the building arts and particularly to window construction and means for controlling the movable sashes thereof. While especially designed for use in factories or auditorium constructions wherein are embodied windows of large area, it is equally applicable to window sashes of comparatively small size as employed in residences, stores, vehicles, etc.

The object of the invention is to simplify the structure as well as the means and mode of operation of such devices, whereby they will not only be cheapened in construction, but will be more efficient in use, easily and quickly operated and unlikely to get out of repair.

The present construction is designed to afford an unobstructed window space of maximum extent and a variable sash therefor adjustably supported without the necessity of fixed supporting bars or posts extended across the window space, which tend to obstruct the view or light, and which may be shifted to open the top and bottom of the window space with minimum effort.

As before stated the construction is especially designed for use in large buildings, factories, auditoriums, etc., wherein the general use of the metallic window sash and panes of glass of extreme thickness render the variable sashes quite heavy and their adjustments slow and laborious. It is usual to divide such window sashes into separately adjustable units of comparatively small area.

The construction forming the subject matter hereof obviates the necessity of separate units of small area and enables a single unit of extreme size, even so long as several hundred feet, to be operated in a single body with comparative ease. While great effort will be required to elevate a heavy body, to lift its center of gravity to a higher plane, only a very small proportionate effort, merely sufficient to overcome the inertia of the body, will be required to move it, so long as the center of gravity remains in a substantially horizontal plane.

With this in view there has been provided in the construction, a variable window sash the center of gravity of which moves in a substantially horizontal plane throughout the full degree of adjustment of the sash. While in the past it has been a common expedient to support movable sashes upon trunnions or pivots coincident with the axis of their swinging movement, such construction has been found undesirable due to the proximity of posts or girders of the building structure, adjacent line shafting or machines when the windows are caused to swing inward, and to lack of space between adjacent buildings when swung outward.

To provide a balanced window sash operating through a shifting movement whereby the major portion of the sash may be projected either within or without the building according to the design of the control devices, which because of its balanced construction may be moved with minimum effort, is one of the primary objects of the present invention.

With the above primary and other incidental objects in view as will more fully appear in the specification, the invention consists of the features of construction and the parts and the combinations thereof and the mode of operation or their equivalents as hereinafter described and set forth in the claims.

Referring to the drawings, Figure 1 is a perspective view of the assembled window sash and its supporting and controlling members in closed position. Fig. 2 is a similar view of the window in open position. Figs. 3 and 4 are a transverse sectional view and a front elevation respectively of the construction shown in Figs. 1 and 2. Figs. 5 and 6 are a transverse sectional view and a front elevation respectively, of a modification of the former construction in which the window is supported

from below. Figs. 7 and 8 are a transverse sectional view and a front elevation respectively of the window arranged to be projected almost wholly outward as might be desirable to avoid a post or girder or some other object located in close proximity to the window opening. Figs. 9 and 10 are transverse sectional views of the window construction as applied to an inclined window space such as are found in light domes, saw tooth roof constructions, etc.

Like parts are indicated by similar characters of reference throughout the several views.

In the drawings 1 and 2 are longitudinal frame members of the building structure, shown in the drawings as angle bars and comprising the cap and sill respectively of the window opening. It is obvious that these members may be channel or eye beams or of other suitable shapes.

The variable sash comprises longitudinally disposed top and bottom rails 3 and 4 connected one with the other by transverse T shaped sash bars 5 arranged in parallel spaced relation, upon the lateral ledges of which the glass rests. The glass is secured in position by means of putty, cement or by sealing in the usual manner. The particular construction of the window sash is not essential in the present invention, but any suitable construction which will meet the conditions and requirements of use, may be employed.

Referring to Figs. 1 to 4 and Fig. 9 bracket arms 7 are secured at spaced intervals to the structural beam or bar 1 and project outward and downward therefrom. Pivoted at 8 to the lower ends of the bracket arms 7 are swinging links 9 of comparatively short length, the free ends of which are pivotally connected at 10 to suitable lugs or ears carried upon the longitudinal top rail 3 of the sash. The bracket arms 7 project below the level of the top of the sash whereby the links 9 will extend upward from their pivotal connections 8 to their connection with the sash when the sash is in its closed position.

Pivoted at 11 to the bracket 7 at a point removed from the pivotal connection 8 is a second swinging link 12 of greater length than the link 9. At its opposite end, the swinging link 12 is pivotally connected with ears or lugs 13 carried by the bottom rail 4 of the sash. The weight of the sash is suspended upon the swinging links 12. Both links 9 and 12 being connected with the sash will be caused to move in unison but inasmuch as the links are pivoted to the bracket 7 at widely separated points 8 and 11, the upper and lower edges of the sash will be moved simultaneously through eccentric paths of different radii. The upper edge 3 of the sash will move inward and downward through a path concentric with the pivotal point 8 of the link 9. The lower edge 4 of the sash will swing outward and upward through a path concentric with the pivotal connection 11 of the link 12. The links 9 and 12 are so proportioned in relation one with the other and their pivotal connections 8 and 11 are relatively located in such positions, that the swinging movement of the sash will occur about a horizontal axis projected through the center of gravity indicated at 14. The movement of the links 9 and 12 not only swings the sash about a horizontal axis but simultaneously therewith shifts the sash laterally causing the center of gravity to move in a substantially horizontal line as indicated by dotted and dash lines in the several figures, the axis about which the sash swings being coincident with the center of gravity the sash will be balanced, therefore requiring but little effort to produce its swinging movement. The sash being supported to move freely in a horizontal direction whereby the center of gravity travels in a substantially horizontal plane will necessitate but little effort to shift it laterally simultaneously with its swinging movement.

In Figs. 5, 6 and 10 there is shown a modification which is substantially a reversal of the construction heretofore described. In this form of device a strut 15, pivoted at 16 to a suitable lug or ear upon the sill beam 2 and at its upper end to a bracket 17 carried upon the top rail 3 of the sash, is substituted for the suspension link 12 of the previous construction. The sill beam 2 carries bracket arms 18 corresponding to the bracket arms 7 of the prior construction to which are pivoted short swinging links 19 pivotally connected at 20 to ears or lugs carried by the lower sash rail 4. Otherwise the construction is the same as that before described except that in this form of device the upper edge of the sash will describe an arc of greater extent than the lower edge thereof. The center of gravity which is coincident with the axis about which the sash swings will in this case move in a substantially straight line exactly as before described.

The construction shown in Figs. 7 and 8, while embodying the same principles as before described, discloses certain structural modifications of the supporting bracket and swinging links and further illustrates an application of the construction whereby the major portion of the sash is swung outward in order that the uper edge thereof may avoid an obstruction such as the post 21 located in close proximity to the window opening.

In practice it has been found entirely feasible and practicable to construct such a

swinging sash and operate it with a clearance less than one and one quarter inches between the edge of the sash rail and the obstruction when the sash is in closed position.

In this construction the bracket arm 7 is shown as formed from a flat metallic bar, bent into a trapeziform frame 22 from which extends a pendent U shaped finger 23. The parallel sides of the U shaped finger 23 are stiffened by interposed space blocks 24. Similar space blocks are located between the adjacent ends of the bar at the upper side of the trapeziform frame. A diagonal brace bar 25 is located within the frame 22.

Carried at the upper end of the frame 22 between the adjacent ends of the bar is a transverse stud or bolt 26 upon the extremities of which are engaged the loops or eye of two suspension links 12 which at their lower ends are connected to a common stud carried by a lug or ear upon the sash frame or extended through one of the T shaped sash bars. These double links are preferably inclined slightly in relation one with the other as shown in Fig. 8 to afford a lateral bracing effect for the structure.

The short swinging link 9 is pivoted within the lower extremity of the U shaped finger 23 and the under side of the U shaped finger is slotted as shown by dotted lines in Fig. 8 to accommodate the link when the sash is in its closed position. In this construction the lugs or ears to which the link 9 is connected are shown projecting to a greater extent beyond the sash than in the construction previously described.

Figs. 9 and 10 show constructions similar to those previously described except that the normal position of the sash is at an inclination to the vertical and in its operated or open position the sash assumes a position substantially horizontal. This particular construction will be found desirable when used in mansard roof constructions, light domes or saw tooth roof construction as commonly employed for factory buildings.

In the construction herein shown and described the sash which may be of great weight and large area is so balanced and its path of movement is such as to maintain its center of gravity in a substantially horizontal plane, enabling it to be adjusted by a pressure of a few pounds. To assist in adjusting the sash there is provided at intervals throughout the sash, links 27 pivotally engaging brackets or lugs 28 carried upon the sash rail and operated either by hand or by means of a controlling device not shown in the drawings to swing the sash about its floating axis.

In designing the window sash for a particular location, a cross sectional drawing of the sash as shown by dotted lines in the several views is made. The center of gravity of the sash is determined and a horizontal line 14—14 is drawn therethrough. The center 11 is assumed and an arc is struck with the distance 11—13 as a radius. Various stations are assumed upon the line 14—14 and with the distance 14—13 as a radius, the first drawn arc is bisected by an arc struck from each of the stations upon the line 14—14, thereby determining corresponding successive positions of the connection 13. Cross sections of the sash are then drawn in the various positions with the center of gravity coinciding with the successive stations upon the line 14—14 and the center 13 coinciding with the corresponding points upon the first arc. This will determine successive positions of the pivotal point 10 of the short link 9. Inasmuch as the path of the pivotal point 10 is concentric with the pivotal connections 8, the location of the latter point can readily be determined by the usual method of finding the center common to three or more points on an arc. It is obvious that the operation may be reversed by assuming the location of the pivotal connection 8 and determining the location of the connection 11.

In the drawings the sash has been shown with its weight equally distributed, whereby the center of gravity and axis about which the sash swings will coincide with the medial line. It is obvious however, that by making the sash rail 4 heavier than the rail 3 or vice versa, or by locating weights adjacent to either edge the center of gravity may be shifted toward the edge of the sash causing it to move through a different path of travel. Such distribution of weight may be utilized to cause the sash to assume a predetermined position when operated.

From the above description it will be apparent that there is provided a device of the character described, possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportion, detail construction or arrangement of parts, without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute, the invention has been described in language more or less specific as to certain structural features it is to be understood that the invention is not limited to any specific details but that the means and construction herein described comprise but one mode of putting the invention into effect, and the invention is therefore claimed broadly and in any of its possible forms or modifications within the scope of the appended claims.

Having thus described my invention, I claim,

1. A swinging sash, swinging links supporting the sash and guiding it in its swing-

ing movement, said links being so proportioned and arranged that the opposite edges of said sash will move in opposite directions through arcs of different radii, simultaneously with a swinging movement of the sash to and from the window opening.

2. A swinging sash, pivoted supporting links therefor extending in opposite directions from their pivotal connections and having their free ends pivotally engaged with the sash, the construction and arrangement being such that the opposite edges of the sash will be guided through arcuate paths but in opposite directions simultaneously with a shifting movement of the sash in a substantially straight line to and from the window space.

3. A swinging sash, oscillatory supporting links therefor guiding the sash in its swinging movement, the construction and arrangement being such that the sash will be simultaneously tilted and swung laterally, the opposite edges of the sash moving through arcs of different radii.

4. A swinging sash, a plurality of swinging links movable in vertical planes supporting and guiding said sash through a tilting movement and a simultaneous horizontal movement in which the center of the tilting movement moves in a substantially horizontal path.

5. A swinging window sash capable of bodily tilting movement and a simultaneous horizontal movement in which the center of the tilting movement will move in a substantially horizontal path, and supporting and guiding means for said sash adapted to proportion the degree of tilting movement to the degree of bodily horizontal movement within the limits of said supporting and guiding means substantially as specified.

6. A horizontally movable window sash capable of a tilting movement in a vertical direction, and guiding and supporting means for said sash controlling its horizontal and tilting movement, whereby the sash is balanced in its various positions of adjustment.

7. A tilting window sash, swinging links pivotally connected at one side of the window opening and projecting across the opening and engaging the sash adjacent to its opposite edge, bracket arms projecting into the window space from the side corresponding with the pivotal connections of the said links, and swinging links pivoted to the bracket arms and engaging the sash adjacent to the edge corresponding with the aforementioned side of the window opening.

8. A horizontally movable tilting window sash and swinging links movable in vertical planes connected to said sash and controlling its horizontal and tilting movements, the construction and arrangement being such that the sash is supported upon said links in a state of equilibrium in different angular positions at different points in its horizontal movement.

9. A tilting window sash and swinging links of different lengths connected to the sash adjacent to its opposite edges and movable in opposite directions about their pivotal connections whereby one edge of the sash will be lowered and the other edge simultaneously elevated, the degree of movement being so proportioned as to maintain the sash in a state of equilibrium.

10. A tilting window sash and swinging links of unequal length connected to the sash and extending in substantially opposite directions from their pivotal supports, one of said links swinging downward while the opposing link swings upward, adapted to guide said sash through a simultaneous tilting and swinging movement in which a predetermined point upon the sash moves in a path substantially perpendicular to the plane of the window opening.

11. A movable sash capable of a tilting movement in a vertical direction and supporting links therefor upon which the sash is suspended in balanced relation, the construction and arrangement being such that said links will guide the sash throughout its path of travel while maintaining it in a state of equilibrium substantially as specified.

12. A movable sash capable of a tilting movement in a vertical direction and a plurality of swinging supports therefor so proportioned and arranged that said sash will be maintained in a condition of equilibrium throughout its normal path of travel, substantially as specified.

13. A tilting sash, a swinging link extending across the window space and connected to the sash adjacent to the edge thereof opposite the pivotal connection of the link and a second link pivotally supported intermediate the sides of the window space and engaging the sash adjacent to the edge opposite that engaged by the first mentioned link.

14. A movable sash capable of a tilting movement in a vertical direction and swinging links supporting said sash, the tendency of one of said swinging links to move under the influence of the weight of the sash being counteracted by the same tendency of the opposing swinging link whereby the sash will be maintained in a state of equilibrium in different positions of adjustment of the links.

15. A tilting window sash, and swinging links engaging the sash adjacent to its opposite edges and extending thence in opposite directions over the face of the sash to their stationary pivotal connections

adapted to guide the opposite edges of the sash through arcuate paths.

16. A tilting window sash, a swinging link engaging the sash adjacent to one edge thereof and extending across the face of the sash to its pivotal connection adjacent to the opposite side of the window space, and a second link pivotally supported intermediate the sides of the window space and engaging the sash adjacent to the edge opposite that engaged by the first mentioned link.

In testimony whereof, I have hereunto set my hand this 24th day of June, 1913.

WILLIAM BAYLEY.

Witnesses:
JOHN L. ZIMMERMAN,
M. RAY WEIKART.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."