A. K. LOVELL.

WINDOW OPERATING MECHANISM.

APPLICATION FILED JAN. 15, 1914.

1,198,733.

Patented Sept. 19, 1916.

3 SHEETS—SHEET 1.

Fig. 1

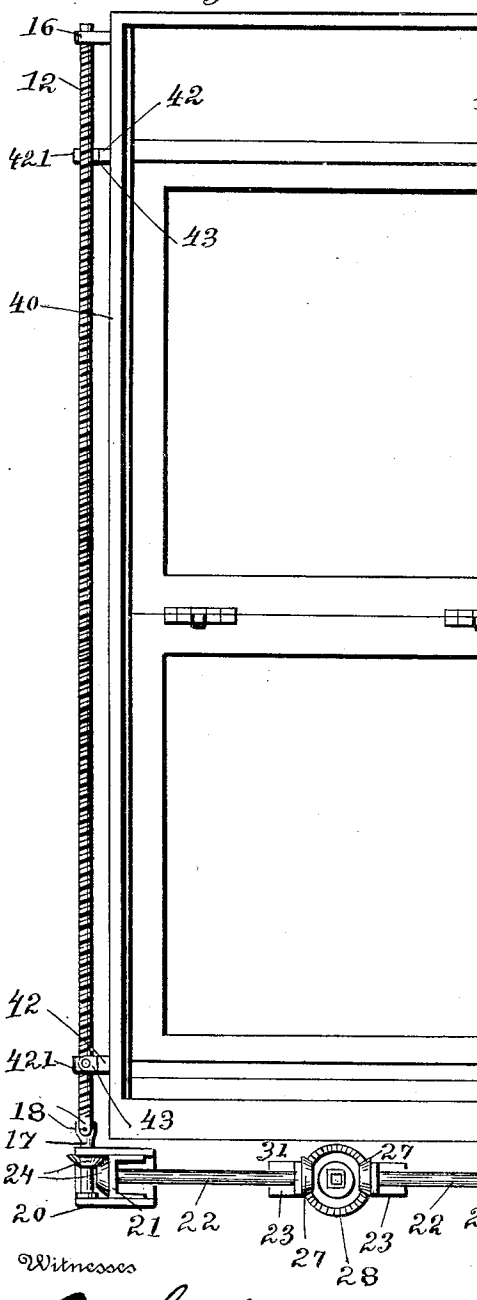
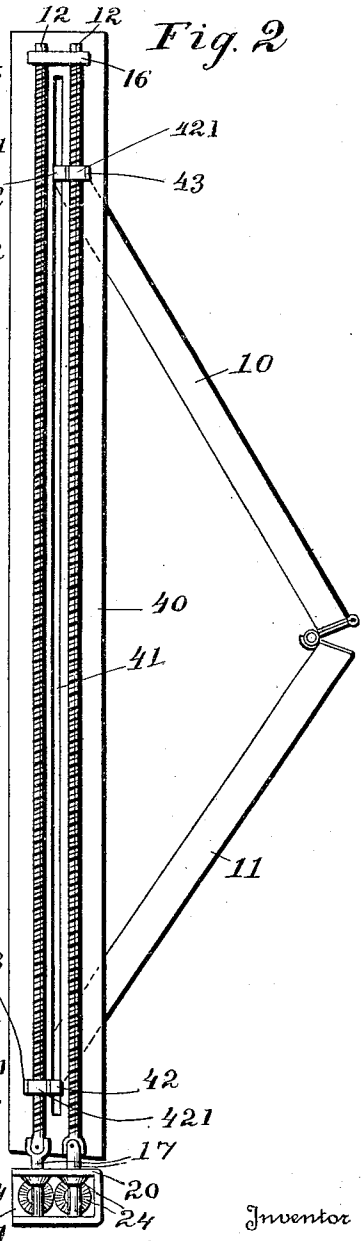


Fig. 2



Witnesses

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Fig. 3

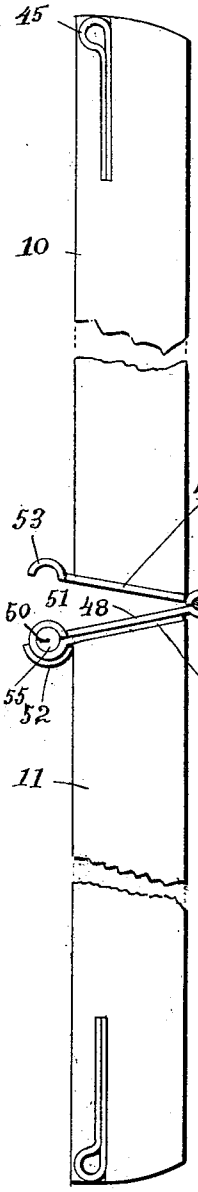


Fig. 6

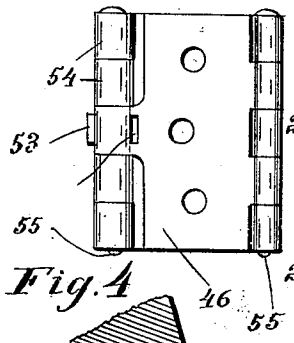


Fig. 4

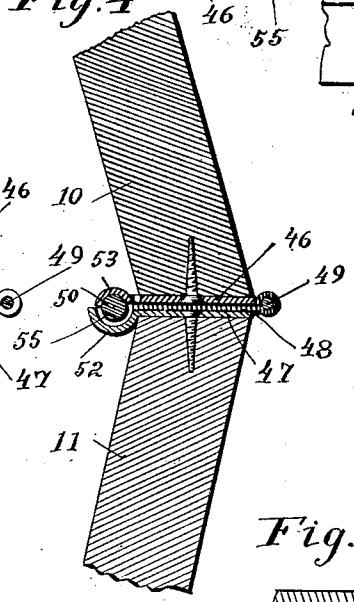


Fig. 7

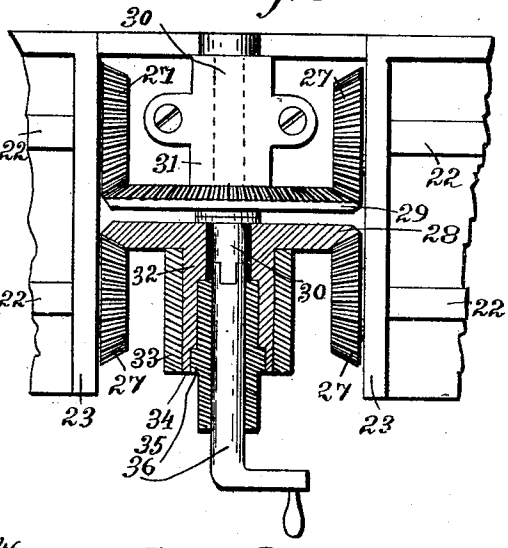


Fig. 8

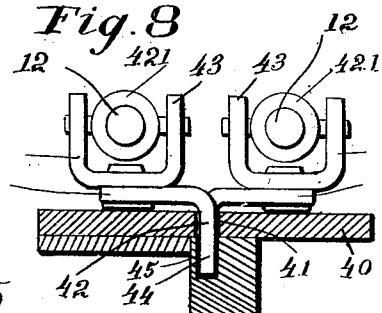
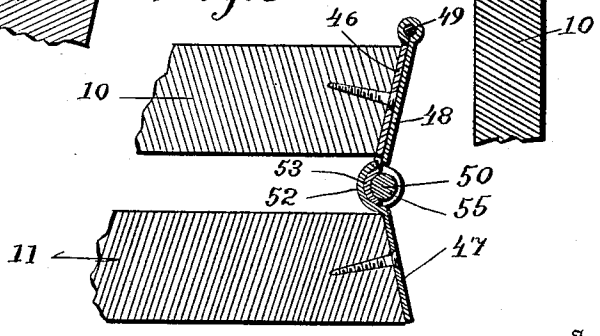


Fig. 5



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3 SHEETS—SHEET 3.

Fig. 9

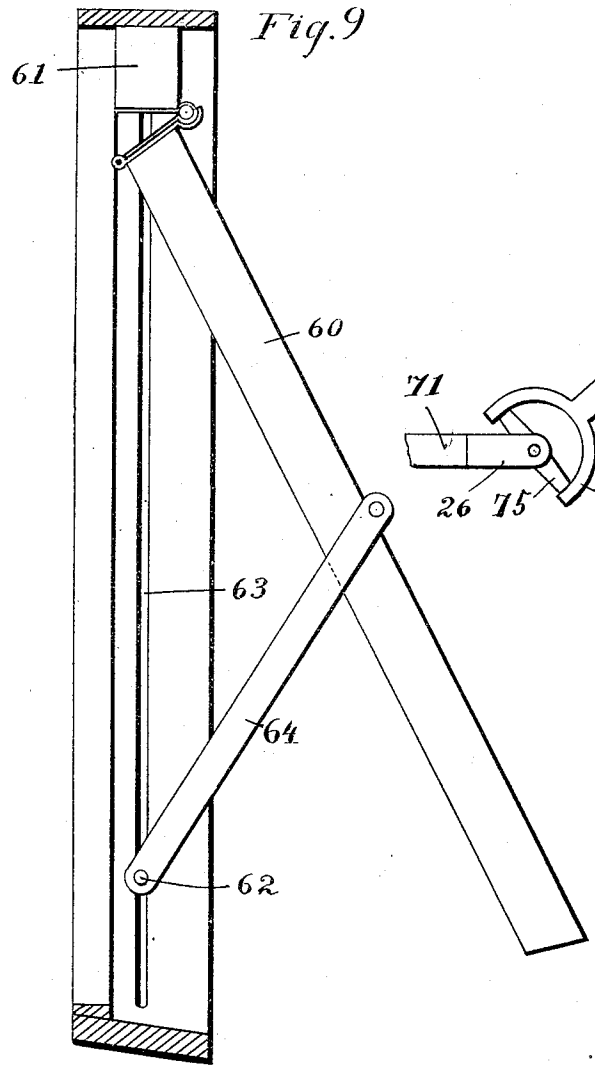
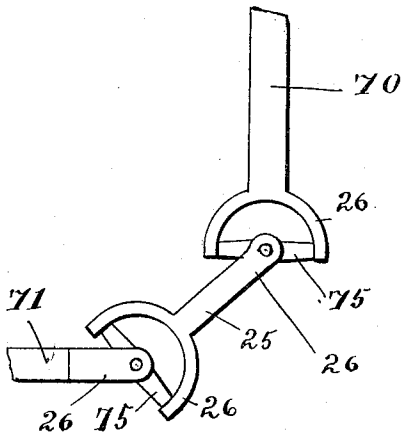


Fig. 10



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UNITED STATES PATENT OFFICE.

ALBERT K. LOVELL, OF NEW HAVEN, CONNECTICUT.

WINDOW-OPERATING MECHANISM.

1,198,733. Specification of Letters Patent. Patented Sept. 19, 1916.

Application filed January 15, 1914. Serial No. 812,181.

To all whom it may concern:

Be it known that I, ALBERT K. LOVELL, of the town of New Haven, in the county of New Haven, in the State of Connecticut, United States of America, inventor, have invented certain new and useful Improvements in Window-Operating Mechanism; and I do hereby declare that the following is a full, clear, and exact description of the said invention, reference being had to the accompanying drawings, in which—

Figure 1 is a front elevation of a window frame and pair of swing sashes embodying my improvements. Fig. 2 is a side elevation of Fig. 1. Fig. 3 is a side elevation of the sashes detached, and respectively shown in the relation for closing the window opening. Fig. 4 is a vertical cross section through the sashes on the central plane of one of the hinges which connect the sashes, the parts being in the position for swinging on the main operating axis of the hinge. Fig. 5 is a similar cross section, showing the sashes in the position for opening the window. Fig. 6 is a plan view of the double axis sash hinge. Fig. 7 is a view of the operating shaft and driving gears. Fig. 8 is a cross section through the adjusting screws and sashes on the pivotal line of the brackets. Fig. 9 is a vertical cross section of a single sash modification of this improved window mechanism, with the sash shown in elevation. Fig. 10 is a view of a universal joint construction for transmitting motion from the driving shafts to the adjusting screws.

My invention relates to window operating mechanism, and it has for its object to provide a system of traveling swing sashes and adjusting screw mechanism for operating the sashes and locking them in every position.

The invention consists in the novel combination and arrangement of traveling swing sashes connected in toggle joint construction, in connection with screw operating mechanism for actuating the sashes in the direction of their travel and holding them locked at any point of their movement and in the novel construction of parts as hereinafter more fully described and claimed.

The form of the invention shown in the principal figures of the drawings embodies a pair of swing sashes 10 and 11 hinged together and pivotally hung upon adjusting screws 12 mounted in the frame, and adapted to be operated after the manner of a toggle joint. Said screw mechanism for operating and locking the sashes forms the subject of a pending application, No. 748,501, filed by me February 14, 1913, for sliding windows, and may be here described in its relation to the new construction of parts. The screws are arranged in pairs at either side of the frame as in the case of the ordinary sliding windows, that is, a screw at each side of the central vertical plane of the sash. At their upper ends the screws are stepped in bearings 16 which steady them in position, but the holes in the bearings for this purpose are made larger than the screws to permit a certain amount of lateral movement thereof to prevent binding action through disturbance of the relation of the parts by settling of walls or other cause. At their lower ends the screws are coupled to short shafts 17 by means of ordinary universal joints comprising forks 18 in their ends, pivoted to the connecting heads 19. Said shafts are journaled in suitable double bearings 20 comprising the respective upper and lower flanges of channel beam sections suitably mounted in the building underneath the window frame. Channel beam sections 21 are fixed between said flanges to form bearings for pairs of horizontal shafts 22 corresponding to the screws, and the opposite ends of the horizontal shafts are journaled in angle plates 23 which may be mounted on the building under the window frames with the axes of the shafts on the respective sides in alinement. Motion is imparted to the screws from the horizontal shafts 22 by bevel gearing 24, or, when desired, by an intermediate shaft 25 and universal joint couplings 26 connecting the parts.

The corresponding screws of the respective sides of the window, that is, those pertaining to the same sash, are rotated in unison by means of bevel gears 27 on the inner ends of the horizontal shafts, driven by larger bevel gears having their axes at right angles to the horizontal shafts, and here shown also horizontal, whereby alined shafts are driven together as one pair, the front pair or those nearer the interior of the room being operated by the gear 28, and the rear pair similarly turned by the gear 29. The bevel gears are placed in juxtaposition in the central plane between the shafts, the gear 29 being secured on the shaft 30 jour-

naled in the bearing 31, and the gear 28 being mounted on a sleeve 32 journaled in the bearing 33, which bearings are adapted to be supported in connection with the window frame. The front end of the shaft of the rear gear 29 is provided with a flatted tongue or part of square cross section or otherwise shaped to be engaged by a suitable key by means of which it may be rotated, and the end of the sleeve is also suitably shaped to provide shoulders by which it may be engaged by a key for being rotated, in the present instance being formed with an internal rectangular recess 34. A corresponding rectangular part 35 adapted for entrance into and engagement with said recess is provided in combination with a part 36 which is fitted centrally within it, and upon which the part 35 is adapted to slide, but prevented from rotation upon by rectangular or other suitable cross sectional configuration, as shown. The said parts 35 and 36 comprise a two-part key, by means of which, with the concentric arrangement of the driving gears, either or both of the gears may be operated, that is, singly or independently of each other to operate either set of screws individually or both sets together, as required, as hereinafter more fully described.

In each of the side parts 40 of the window frame is a central slot or way 41, co-extensive with the sash movement, for the travel of the brackets which support the sashes upon the screws. Each of said brackets comprises a part 42 adapted to travel in the slot 41 pivoted to the sash and connected with a nut 421 engaging the adjusting screw. As here shown the bracket proper is pivoted to a fork 43 which is pivoted to the nut, the respective axes being at right angles to each other and thus comprising a universal joint which, in connection with the similar couplings of the screws, provides a construction which will enable the screws to assume a slight obliquity with the frames when the settling of the foundations of the building or distortion of the walls throws the parts out of their original relation or alinement.

The pivotal connection of a bracket with the sash comprises a pintle 44 extending inwardly from the groove engaging part and entered within a bearing 45 at the corner of the sash formed by a strip of sheet metal bent into loop shape and inserted into the sash, as shown in Fig. 3. Thus hinged upon said pintles, the sashes are free to swing from the plane of the frame into any angle therewith in the operation of opening the window, which is accomplished by rotation of the screws and their operating gearing, and movement of the brackets in their grooves.

The pair of sashes comprising a window are hinged together at their meeting edges by means of the form of hinge which is employed to enable a door or gate to swing each way from its central or closed position, and which comprises two parts respectively attached to the opposite elements of the structure and pivotally connected by an intermediate link part, thus providing two centers of motion separated by a space. In Figs. 3, 4, 5 and 6 the hinge plate 46 is fastened to the lower edge of the upper sash and its counterpart plate 47 is similarly mounted on the upper edge of the lower sash, both connected by and hinged to the link part 48. The object of the employment of two separate hinge centers 49 and 50 respectively on opposite sides of the sashes, as shown, is as follows: It is obvious that if a single pivotal axis only were embodied in the hinge for connecting the sashes, such center of motion would need to be offset from a straight line of pressure between the respective pivotal axes of the sashes in the frame sufficiently to insure the pressure of the screws thereon acting to swing the sashes outwardly from a common plane, as, for instance, at the point 49 in Fig. 3. But with the axis at that point the sashes can only break away or swing from their straight common plane to an extent permitted by corresponding removal of their meeting edges, as shown by the space 51 in said figure. It is, therefore, necessary to provide an auxiliary axis in addition to the primary axis on the inner face of the sashes, as at the point 50 in Fig. 3, in which position it will allow the sashes to be opened until they fold together, as shown in Fig. 5, the sashes first swinging on the primary center 49 and secondarily on the auxiliary axis 50.

In order to confine the action of the hinge to the auxiliary center 50 after it has ceased to act from the primary center, two engageable concentric guiding surfaces 52 and 53 are provided respectively on the hinge plates which are adapted to be brought into contact by the continued movement of the parts on the auxiliary axis. The curved socket 52 on the hinge plate of the lower sash is offset from the ears 54 of the hinge sufficiently to permit the entrance between it and the hinge pin 55 of the curved lip 53 projecting from the hinge plate of the upper sash, and in operation if the hinge is opened on the auxiliary center the said lip 53 will engage the socket 52, as illustrated in Fig. 5, and such engagement of the parts will prevent the opening of the hinge plate of the upper sash and the intermediate link part 48, because in such engagement the socket 52 is brought on the side of the lip 53 in which the lip with its hinge part would swing in such opening action of the hinge 49.

In Fig. 9 a modified form of the mechanism is shown comprising a single swing

sash 60 hinged at the top either to the frame or to a sliding head or sash 61 guided in the frame and having the engaging nuts of the adjusting screws attached to it for the purpose of raising or lowering it similarly as the top sash in Figs. 1 and 2 is actuated. The screw construction in such modification is similar to that of Fig. 2 with the brackets of upper engaging nuts secured rigidly to the head 61, while the lower brackets are of the form described in relation to said figures, having the pivotal bearings or pintles 62 projecting interiorly beyond the slots or ways 63 in the frame. A pair of links 64 is pivoted at their lower ends to the said pintles 62 and hinged at their upper ends to the sash, whereby they comprise toggle joint construction for operating the sash substantially as described with reference to the preceding figures. In this modified construction, however, which involves the same laws of action, it becomes expedient to place the double axis hinge at the top of the sash and in reversed arrangement in relation to the frame to that shown in Figs. 3, 4 and 5, inasmuch as the angles of the respective surfaces are reversed in the respective situations. In Fig. 9 the auxiliary center is shown at the outer side of the hinge instead of at the inner side, as shown in Fig. 3, the effect in the respective cases being the same. In operation one pair of screws is adapted to actuate the links while the other operates the sash, which two parts are buckled to open the window, and the sashes are held locked at any position. With this construction the relation of the axes of oscillation of the parts to a straight plane representing the pressure of the screws is the same as described in relation to Figs. 3, 4 and 5, and the sash may be similarly controlled and opened at top or bottom, as desired.

In place of the bevel gears employed for transmitting the motion of the driving shafts to the operating screws, universal joint couplings may be used instead, as shown in Fig. 10, in which 70 designates the screw, 71 the driving shaft, each having the fork 26 with axial bearings at right angles to the shaft, said parts being connected by the short shaft 25 provided with similar forks 26, and the two heads 75 having trunnions at right angles engaging the bearings of the forks, as shown. As one universal joint is used in connection with the construction first described for each screw, an additional universal joint only suffices to transmit the motion from driving shaft to screw, the bearings for the respective journals being properly arranged to support the parts.

I claim as my invention:

1. In window operating mechanism, the combination with a window frame, of a sliding head guided in the frame, a swing sash hinged to the sliding head, a link member pivoted to the sash, sliding pivot bearings guided in the frame and hinged to the link member, whereby the link member and sash comprise toggle joint construction, and mechanism for actuating the sliding head and sliding pivot bearings relatively to each other in their guideways to actuate the sash and link member in folding movement.

2. In window operating mechanism, the combination with a window frame, of adjusting screws mounted at the sides of the frame, a pair of sets of engaging nuts carried upon the screws, a sliding part guided in the frame and carried by one set of engaging nuts, a swing sash hinged to the sliding part, a link member pivoted to the sash, sliding pivot bearings carried upon the other set of engaging nuts and hinged to the link member, and mechanism for operating the adjusting screws.

3. In window operating mechanism, the combination of a frame, sash conveying mechanism at each side of the frame for moving the sashes bodily therein, and a pair of sashes hinged together at their meeting edges, and to the conveying mechanism at their respective opposite edges in foldable toggle joint construction.

4. In window operating mechanism, the combination with a frame for a two-part sash window, of a pair of sashes fitting the opening in the frame, and hinged together at their meeting edges, sash-carrying mechanism for each sash mounted on the frame and pivotally and slidably attached respectively to the edges of the sashes opposite their meeting edges.

5. In window operating mechanism, the combination with a frame for a two-part sash window, of sash-carrying screw mechanism for each of the sash parts mounted on the frame, and a pair of sashes pivotally supported on the screw mechanism and hinged together at their meeting edges.

6. In window operating mechanism, the combination with a frame for a two-part sash window, of a pair of screws for each sash part mounted on the frame, and a pair of sashes pivotally supported on the screws and hinged together at their meeting edges to comprise foldable toggle joint construction of the parts.

7. In window operating mechanism, the combination with a frame for a two-part sash window, of sash-carrying mechanism for each of the sashes, and a pair of sashes pivotally supported on the sash-carrying mechanism and hinged together at their meeting edges by an intermediate hinge member having a hinge connection with each of the sash parts comprising independent axes of motion whereon the sashes are successively swung, substantially as and for the purpose specified.

8. In window operating mechanism, the combination with a frame, of a swing sash adapted to swing from the frame, a link element hinged thereto comprising toggle joint construction with the sash, and an intermediate hinge member having a hinge connection with each of two co-acting elements of the mechanism and comprising two independent axes of motion whereon the sash is successively swung, substantially as and for the purpose specified.

9. In toggle joint construction comprising a pair of link elements hinged together and pivotally supported from actuating mechanism adapted to fold the link elements by action in the line of the supporting axes, the combination of a hinge element interposed between two of the co-acting members of the structure and independently hinged to each of them to provide independent axes of motion whereon the parts are successively swung, substantially as and for the purpose specified.

10. In toggle joint construction comprising a pair of link elements hinged together and pivotally supported from screw mechanism adapted to actuate the link elements in the line of the supporting axes, the combination of a hinge element interposed between two of the co-acting members of the structure and independently hinged to each of them to provide independent axes of motion whereon the parts are successively swung, substantially as and for the purpose specified.

11. In combination hinge mechanism having two independent axes of motion, the combination with the three parts of the hinge comprising the hinge bases and an intermediate connecting link element, of engageable guiding surfaces on the respective hinge bases, interengageable by movement of a base away and opening from the link member while the opposite base is closed upon the link, the parts co-acting to confine the movement of the parts to one of the axes, substantially as and for the purpose specified.

In testimony that I claim the foregoing, I have hereunto set my hand.

ALBERT K. LOVELL.

Witnesses:

JAMES H. MARR,

A. T. HAYES.

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