2 Sheets—Sheet 1.

J. M. VAN OSDEL.

Hatchway.

No. 207,571. Patented Aug. 27, 1878.

Fig. 1.

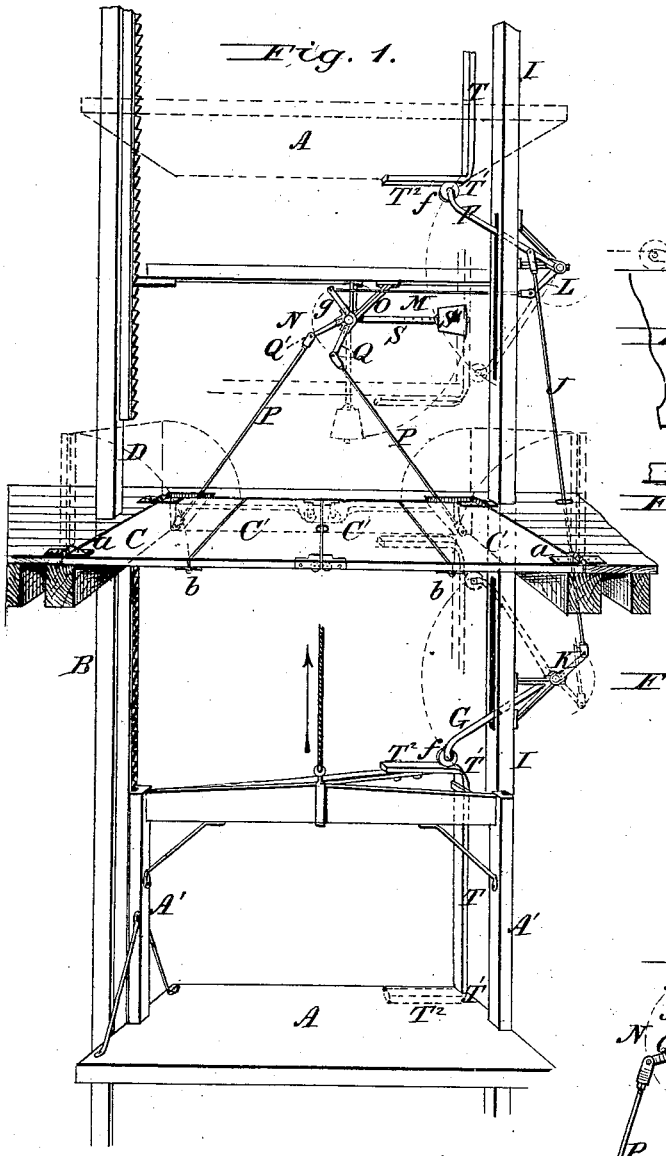


Fig. 3.

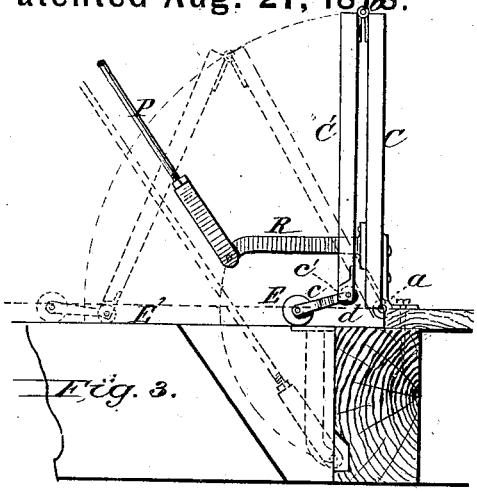


Fig. 4.

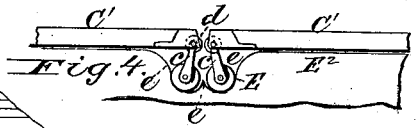


Fig. 5.

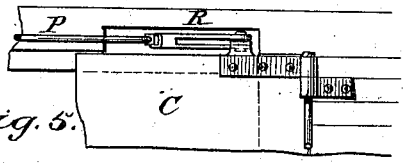


Fig. 6.

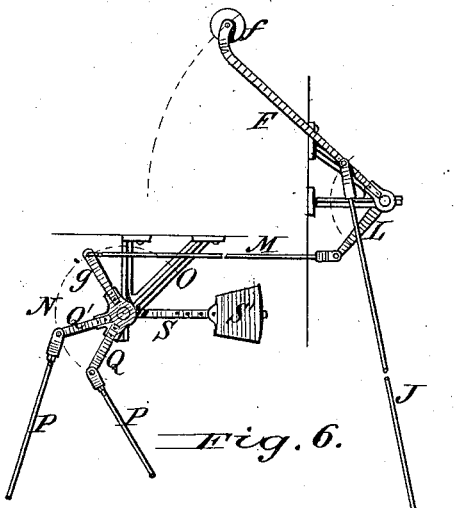
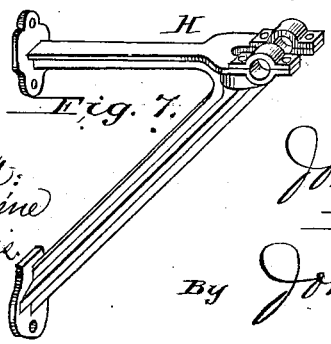
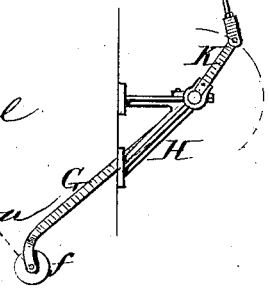


Fig. 7.





Attest:
H. L. Perrine
Floyd Norris.

John M. Van Osdel
Inventor:
By Johnson and Johnson
Atty's

2 Sheets—Sheet 2.

J. M. VAN OSDEL.

Hatchway.

No. 207,571. Patented Aug. 27, 1878.

Fig. 2.

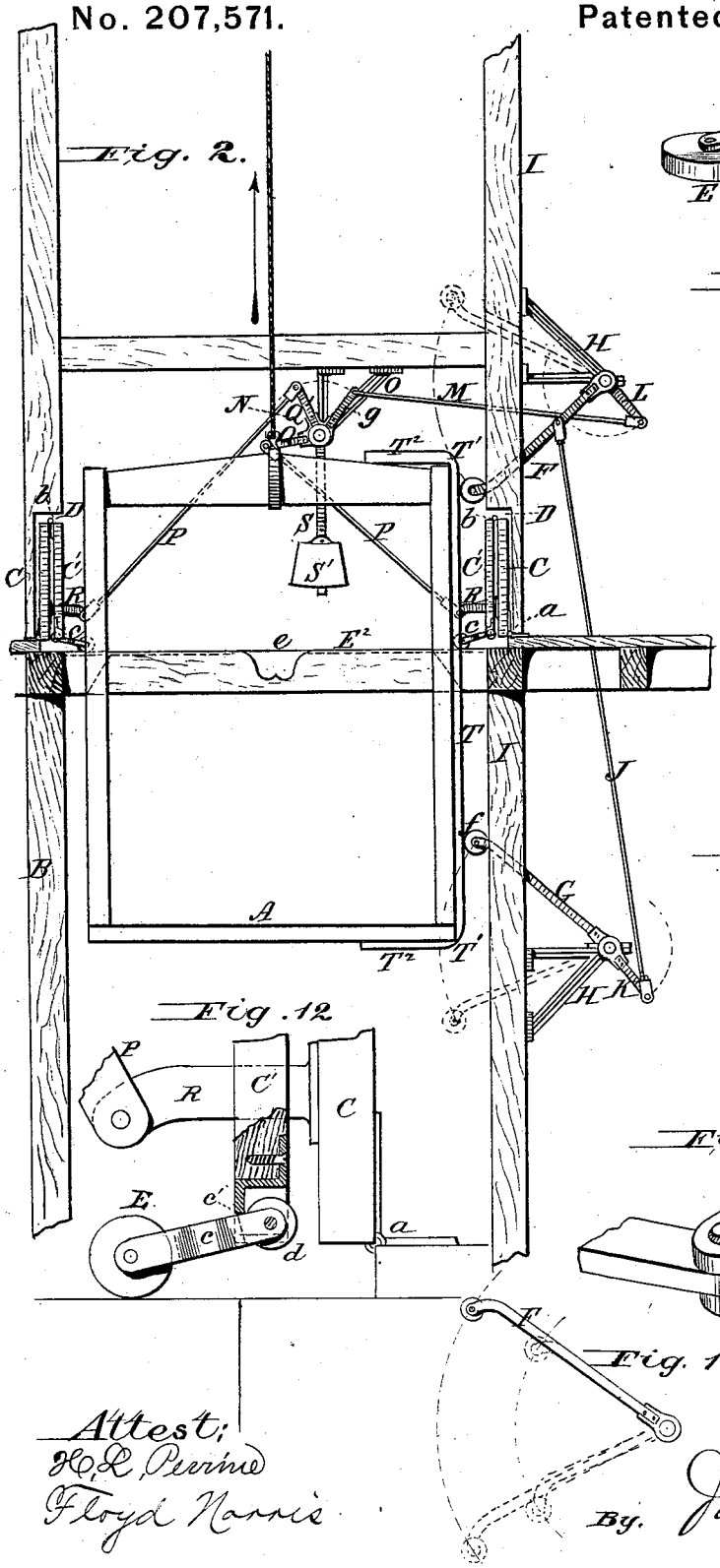


Fig. 8.

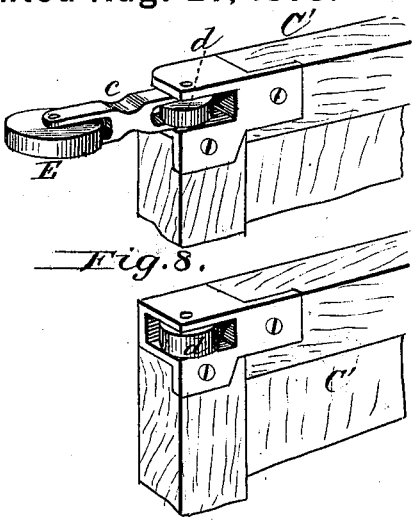


Fig. 9.

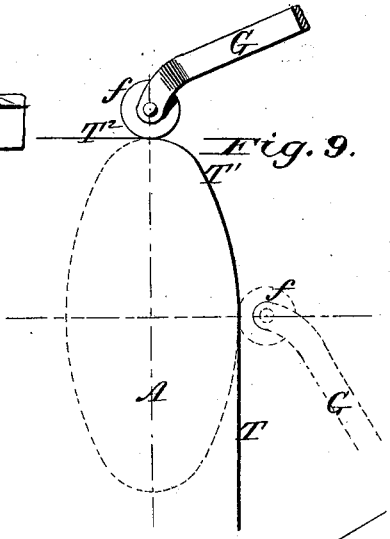


Fig. 12.

Fig. 10.

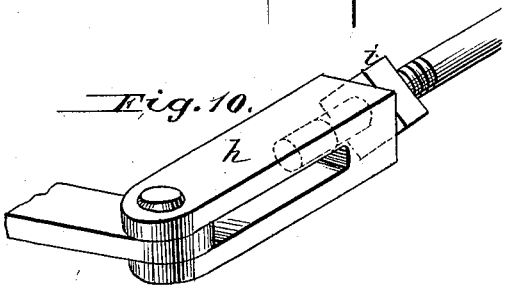


Fig. 11.

Attest:
H. R. Perrine
Floyd Norris

John M. Van Osdel
Inventor.

By. Johnson & Johnson
Atty's

UNITED STATES PATENT OFFICE.

JOHN M. VAN OSDEL, OF CHICAGO, ILLINOIS.

IMPROVEMENT IN HATCHWAYS.

Specification forming part of Letters Patent No. **207,571**, dated August 27, 1878; application filed July 27, 1878.

CASE A.

To all whom it may concern:

Be it known that I, JOHN M. VAN OSDEL, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Self-Closing Hatchways for Elevators; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

By my improvements in self-closing hatchways for elevators the doors are opened and closed with the least possible force and noise by a novel construction and combination of devices for effecting these movements through the intervention of a bearing-way of novel construction, carried by the elevator-car, for operating levers adapted thereto.

The doors are constructed of sections of two leaves each, and these are hinged to the opposite sides of the hatchway and to each other in a manner to allow the sections of two leaves to close by their gravity. A leading roll or runner is combined with the flap-leaf of each section in such a manner as to start and separate or open them from the outer leaves and lead them out in closing, and thus prevent their tendency to close when in folded position. After serving this important function, these leading-rolls pass idly out of the way beneath the closed doors at their junction. Both sections of the doors stand up in folded position in recesses in the guide-posts and on opposite sides of the hatchway. Both sections of the door are connected for simultaneous folding and unfolding by means of primary levers, having a simultaneous movement toward and from each other, above and below the doors, the same being connected with secondary levers, and operated with a long free sweep by means of a bearing-way upon the elevator-car, consisting of a vertical plane united to horizontal planes at the top and bottom of the elevator-car by curves forming a quarter of an ellipse. The horizontal top and bottom planes of this bearing-way operate the primary levers to open and to close the doors in the ascending and descending movements of the elevator. The vertical plane is to retain the doors in their open positions and free from the elevator while it is passing through the hatchway, while the curves uniting these planes serve to effect the opening of the doors by a gradual variable movement to prevent slamming, slowing the movement of the doors when nearly open and during the passing of the primary lever from the horizontal onto the vertical plane. These curves are adapted to secure a slow movement in commencing to close the doors, and they serve to keep the primary lever in close contact with the bearing-way in changing from the vertical to the horizontal plane, upon which it travels through an arc of ninety degrees, or thereabout, to close or open the doors, so that, while these horizontal planes serve to open and close the doors, they also effect their opening and closing in a manner to avoid slamming. One of the primary levers holds the doors open and free of the elevator until the other comes into operation, and in this way both primary levers bear upon the same plane, whether the elevator be moving upward or downward.

The primary levers are connected in such a manner as to balance each other, and thereby relieve the elevator from lifting the weight of either. They are so arranged that the horizontal planes of the bearing-way act to force their bearing ends upward and downward simultaneously in opposite directions, according to the direction of the movement of the elevator, any required distance to give time for the doors to open quietly and without sudden strain upon the moving parts. A single adjustable counterpoise serves to balance all the doors by positive connections therewith and with the primary levers.

The speed of the opening and closing movements of the doors is regulated and controlled to any given movement of the elevator by the adaptation of longer or shorter primary levers. For a slow-moving elevator these levers are of less length than that required for a fast-moving elevator; but in either case their bearing

ends move through an arc of ninety degrees, or thereabout, upon the horizontal planes to open and close the doors.

A safety-connection with the upper primary lever at a point intermediate with its door-connections serves to prevent the elevator-car from falling through the hatchway in case of accidental breaking of the cable or of the motor. In such event the safety-connection will be severed by the violent descent and concussion of the elevator upon the acting end of the upper primary lever, and thus freeing it from operating-connection the doors will remain closed and arrest the elevator-car. This safety-connection, however, cannot be broken by the working of the elevator, as in such working it is not subjected to any undue strain.

The adjustments of the parts to effect the proper working of the doors and the equal bearing of the primary levers upon the elevator bearing-way are effected by screw-coupling lock-nut connections of the several parts.

Referring to the drawings, Figure 1 represents a view, in perspective, of so much of an elevator and its hatchway-shaft as embraces and illustrates the application of my invention, the doors being shown as closed and the elevator in the position it occupies just before opening the doors in its ascent, or in position as just having closed the doors in its descent, the dotted lines above the doors showing the corresponding position of the elevator after closing the doors in its ascent, or in the position it occupies to commence opening the doors in its descent; Fig. 2, a vertical section of the same, showing the doors folded open, the elevator in the position as passing through the hatchway, and both primary levers in contact with the vertical plane of the bearing-way of said elevator to hold said doors clear thereof; Fig. 3, an enlarged section of one of the doors, of two leaves, folded open, and showing its leading roll or runner in position to start, separate, and lead out the flap-leaf, as shown by dotted lines. Fig. 4 shows a part of the two flap-leaves as closed and their leading-rolls turned down beneath them, out of the way, in their receiving-pockets; Fig. 5, a detail top view, showing a part of the outside door-leaf as closed, and the recess in the frame-work to receive the arm R, which connects said door-leaf with its lifting secondary lever; Fig. 6, a detail elevation of the primary levers and their connections with each other, and with the counterpoise device and secondary levers; Fig. 7, a detail of one of the bearing-brackets enlarged; Fig. 8, a detail of the leading-roll of the flap-leaf and of the supporting-rolls thereof enlarged; Fig. 9, a detail, enlarged, of a part of the bearing-way of the elevator-car, showing the point of impact of the horizontal plane of said way with the roll end of the lower primary lever to open the doors, the form of the curve to give a variable movement in opening, and, by dotted lines, the bearing of said lever upon the vertical plane of said bearing-way to hold said doors open; Fig. 10, a detail of the screw-coupling lock-nut connection for the several parts, for making their proper adjustments to determine the opening and closing of the doors and the bearing of the primary levers; Fig. 11, a detail illustrating the different lengths of primary levers for slow and fast moving elevators, and Fig. 12 a detail of the leading-roll.

My improvements are applicable alike to what is known as "freight" and "passenger" elevators, and may be applied to either side or corner-post elevators.

The elevator A may be of the usual construction, and adapted to move between guideways B (one of which only is shown) extending from the top to the bottom of the shaft or passage-way, and operated by any suitable motor. The doors are in two sections, folding in two leaves each—that is, of four leaves—adapted to close and rest in rabbets in the same plane with the floor, and form a part thereof. The outer leaf, C, is hinged on its outer side at *a* to the frame-work, as in Fig. 3, and the flap-leaf C′ is hinged on its inner side at *b* to the leaf C, so that when folded it will hang down by the inner side of the outer leaf, with the weight of both constantly tending inward, so that the door resting upon the floor-hinges, if unrestrained, would fall inward, as shown in Fig. 3.

The fixed guideways B are recessed at D D, as shown in Fig. 2, to receive the doors when folded open, and by reason of their folded positions this cut-away part of the guideways is comparatively short, so that the elevator-guides A′ A′ will easily span them without affecting its steadiness of movement. The doors being in two leaves, each require less force to raise them; but means must be provided to insure their proper closing and prevent the flap-leaf from falling down beneath the outer leaf.

The device which I have contrived for this purpose consists of a leading-roll, E, being on the rabbet-way E^2, and carried by an arm, *c*, pivoted to one corner or angle of each flap-leaf C′, as shown in Figs. 3, 8, and 12, so as to bear against a shoulder, *c′*, thereof, Fig. 3, to hold the arm *c* in position to start, open, and lead out the flap-leaf C′ to insure its separation from the outer door-leaf. Both leaves will then be supported in closing by small rolls *d*, Figs. 8 and 12, at the lower corners or angles of the flap-leaf running on the side rabbet-ways E^2, leaving the leading-roll E free to pass over said rabbet-way and into a receiving-pocket, *e*, Figs. 2 and 4, beneath the plane of the rabbet-way. This rabbet-way, traversed by the leading and starting rolls, I prefer to make of maple, so as to reduce the noise to a minimum. This construction gives the easiest possible movement to the doors.

The device for opening and closing the doors consists of primary levers F and G, pivoted above and below the doors in suitable brackets

H at one corner of the frame, or to a post, I, and certain secondary levers arranged at one side of the shaftway above the doors, having connection therewith and with the said primary levers. The primary levers move in slots in the post I, and are arranged to project at their inner ends, which carry anti-friction rolls *f*, within the shaftway, to receive the action of the elevator-car, while their other ends extend outside of said shaftway, and are connected by a rod, J, leading from a short lever, K, on the axis-pin of the lower primary lever, G, and joining with the upper primary lever, F, at a point intermediate between the axis-pin of said lever and its bearing-roll end.

The distance of the connected ends of the rod J from the axis of the levers is equal, to give equal movement to each lever. The axis-pin of the upper primary lever, F, carries a short lever, L, which connects by means of a horizontal rod, M, with one branch, *g*, of a tri-armed lever, N, pivoted upon a short axis-pin in a bracket, O, depending from a side cross-beam of the frame.

Lifting-rods P P connect, respectively, with the branches Q Q′ of the tri-armed lever N, and, extending down, connect with arms R R, Figs. 2 and 3, extending inward from the lower corners of the outer door-leaves, C, and thus make the connection with the folding doors of both sides of the shaftway. The counterpoise S S′ is fixed upon the axis-pin of the tri-armed lever N, so as to describe the arc of a circle in unison with the opening and closing movements of the door, and to balance all the doors by positive connections with a single counterpoise. In effecting this, all the levers describe the arc of ninety degrees, which is also the extent of the movement of the counterpoise.

The acting element for effecting the proper movements of the doors to allow of the passage of the elevator-car and to close the hatchway openings consists of a bearing-way arranged upon the side of the elevator-car, near one corner, in position to act upon the roll ends of the primary levers in its ascent and descent. This bearing-way consists of a vertical plane, T, terminating at each end in a curve, T^1, which extends in a horizontal plane, T^2, at the top and bottom of the elevator-car. The horizontal planes T^2 T^2 serve to effect the opening and closing movements of the doors, while the vertical plane T serves to hold the doors open and away while the elevator is passing through the hatchway; and for this purpose the height of the elevator and the distance apart of the axis of the primary levers must be such as to cause the vertical plane to engage the second lever before it leaves the first in either movement of the elevator, and thus hold the doors away from the elevator-car until both levers leave the vertical plane, as shown in Fig. 2.

The end curves T^1 are made the quarter of an ellipse, as shown in Fig. 9, having a greater run on its vertical side than on the horizontal plane. The effect of this form of curve is to complete the opening of the doors with a retarded movement, so as to avoid slamming as they rise into a completely-folded condition, and also to accommodate the slow movement of the doors when commencing to close, and thereby cause the primary lever to follow the horizotal bearing-way closely. This bearing of the primary levers upon the horizontal plane serves also to let the doors down easily and prevents slamming in closing; and in this action of the primary levers, whether the elevator be moving up or down, the roll end moves both inward and outward over said horizontal plane in describing the arc of ninety degrees, and in this it conforms to the extent of the opening and closing movements of the doors and in unison therewith. This, so far as I know, is a new method of opening and closing hatchway-doors, and in practice gives the best results.

The ends of the primary levers are curved, one downward and the other upward, for the purpose of allowing them to clear the end curves of the bearing-way while the roll is passing off the horizontal plane, and to make a more direct impact upon the horizontal planes, as well as to give a more direct bearing upon the vertical plane.

The movements of the doors are regulated to suit a fast or slow movement of the elevator by having the primary levers made longer for a fast-moving elevator and of less length for a slow-moving elevator, thus regulating the movements of the doors in opening and closing to any given movement or speed of the elevator.

A single counterpoise, S′, made adjustable upon its arm S, serves, by positive connections with each set of folding doors, to balance them all and assist in their opening movement, and when in a pendent position has no influence against the weight of the doors in starting to close.

The weight of one of the primary levers balances that of the other by means of the described manner in which said levers are connected, so that no power is required to raise the weight of the lower lever.

The connecting-rod J of the primary levers acts upon the upward movement of the elevator with a pulling force upon the upper primary lever, to pull its roll end down in position to receive the action of the vertical plane of the elevator, and to open the doors through the connections with the tri-armed lever N; while on the downward movement of the elevator this rod J acts with a pushing force to raise the roll end of the lower lever in position to receive the action of the vertical plane of the elevator as it passes downward, and to open the doors through the same connections.

It is important, in effecting the proper movements of the folding doors, that the distance from the axis of the hinge of the outer door-

leaf to the connection of the arm R with the lifting-rod P must be equal to the radii of the lifting-branches Q Q′ of the tri-armed lever.

The primary levers are arranged so that, when at rest to receive the impact of the elevator in either its upward or downward movements, the angles of said levers in relation to a horizontal line is less than when their ends are nearest each other and one or both are resting against the vertical plane of the bearing-way, so that the acting ends of said levers will project in far enough to receive the action of the horizontal planes.

As a means of safety against accident in the falling of the elevator from any cause, I provide the rod M, which connects the upper primary lever to the tri-armed lever N, with an attachment of sufficient strength for the proper and safe working of the elevator; but such connection will be severed in the event of the sudden falling of the elevator by the concussion thereby produced upon the primary lever, and will thereby arrest the descent of the elevator, because the inertia of the doors precludes the possibility of their being suddenly opened by such blow, and therefore the disconnection at the point stated is effected, and the doors must necessarily remain closed, and receive the falling elevator. I prefer to have this safety attachment at the connection of the rod M with the branch *g* of the tri-armed lever; but it may be made at any point between the connection of the upper primary lever with the doors of each hatchway.

It is of great importance that the doors should arrive at their stationary points simultaneously, and to effect this with exactness the several connecting-rods have right and left screws upon their ends, adapted to enter screw-thread couplings *h*, so that by turning any of said rods the proper adjustments are effected, and said rods held to such adjustments by lock-nuts *i*, as shown in Fig. 10. For example, in case one door should arrive at its vertical position sooner than the other, the rods P P are adjusted by turning them so as to lengthen one and shorten the other. So, also, as to the primary levers, it is necessary that they should be adjusted to give equal bearing upon the vertical plane of the bearing-way of the elevator-car, and this is readily obtained by turning the connecting-rod J and then locking it, so that these levers will always come to the same points at once.

In the operation of the elevator, supposing it to be upon its ascending movement and in position between floors, the upper horizontal plane T^2 of the bearing-way will come in contact with the roll *f* of the lower primary lever, G, and, raising it in the arc of a circle, will partially-revolve its axis-pin, and thereby depress the secondary lever K, fixed to said axis-pin, and by the connecting-rod J pull down the upper primary lever, F, and by its partially revolving axis-pin move the secondary lever L fixed thereon outward, which draws the connecting-rod M with it, and partially rotates the tri-branched lever N, which, by its lifting-rods P, causes the doors to open with a folding and variable movement and assume vertical positions within their respective recesses D in the guideways. This movement is completed just as the roll end of the lower primary lever is passing over the upper curved end, T^2, of the bearing-way and upon the vertical plane T of said way. During this opening movement of the doors the counterpoise S′ descends from a horizontal to a pendent position, as in Fig. 2, and in such movement it balances all the doors and assists in their opening movement. In the meantime the roll end of the upper primary lever, F, has been brought down to a position to cause it to pass on to the vertical plane T of the bearing-way, upon which it acts to continue holding the doors open before the elevator has left the lower primary lever, as shown in Fig. 2. The continued ascent of the elevator will bring the bearing-roll of said upper primary lever to the lower curved end, T^2, of the bearing-way, over and beneath which it passes onto the lower horizontal plane, T^2, and maintains its contact thereon, rising with the elevator to effect the closing of the doors.

In the closing of the doors their gravity raises the counterpoise from its pendent position to a horizontal position. In the descent of the elevator the lower horizontal plane of the bearing-way comes in contact with the roll end of the upper primary lever, and, depressing it, causes the several connecting parts to act and the lifting-rods P P to open the doors the same as in the ascending movement of the elevator, and with the same results. The depressing of the upper primary lever, as stated, causes the connecting-rod J to be pushed down, and thereby raises the roll end of the lower primary lever to a position to receive the action of the vertical plane of the bearing-way, and the continued descent of the elevator engages with both levers to hold the doors open and away, as in the upward movement of the elevator. The closing of the doors as the elevator descends is effected by the roll end of the lower primary lever passing over the upper curved end of the bearing-way, and, resting upon and moving over the horizontal plane, follows the elevator, with the same results as stated on the ascending movement of the elevator. In this way the doors of the several floors are successively opened and closed, without noise and with little force, by the movements of the elevator and the co-operating movements of the connected primary levers through the intervention of a tri-armed lever, combined with and controlling the movements of the counterpoise.

The primary levers may be arranged upon either side of the shaftway, and when used with a corner elevator they are arranged in

one of the posts of the frame, but not the guide-post.

In Fig. 1 the dotted arcs show the extent of the movement of the acting ends of the primary levers, which gives a free and easy movement of the levers upon the elevator, as contradistinguished from any cam-lever movement.

The door-flaps are provided with notches, to allow the elevator-cable to pass between them when closed.

It will be noticed that one of said horizontal planes act first upon one of said primary levers to open the doors, while the action of both of said levers upon the vertical plane holds the doors open, with the ends of said levers at the limit of their movement toward each other.

The state of the art shows self-closing hatchways for elevators opened and closed in various ways to allow the passage of the elevator, and in which the doors are both opened and closed by the direct contact therewith of the elevator-car, and also without the direct contact of the elevator-car with said doors, by means of levers operated by cams, so that whatever force is required to raise the doors is transferred laterally to the car, and thence to its guideways, increasing the friction and binding action of the car upon its guides in passing the hatchway. My invention, however, is distinguished from these things in the important particular of effecting the opening and closing of the doors by the action of levers adapted to exert their force upon the elevator-car in the direction of its vertical movement, and thus avoid all lateral pressure in effecting the opening and closing movements of the doors.

I claim—

1. The combination, with elevator-hatchway doors of two leaves, hinged as described, adapted to fold open into a vertical position and to close free of contact with the elevator-car, of one or more leading rolls or runners, arranged on the flap-leaf in advance of its closing edge, to start and lead out the flap-leaf in the closing movement of the doors.

2. In self-closing hatchway-doors of two leaves, hinged as described, the flap-leaf, having one or more leading rolls or runners, E, in combination with flap-supporting rolls *d*, said leading-rolls being adapted to pass out of the way idly when the flap-supporting roll becomes active.

3. In self-closing hatchway-doors, a leading roll or runner, combined with the flap-leaf of a door of two hinged leaves, for the purpose stated, by a pivoted carrying-arm, whereby to adapt said leading-roll to pass out of the way into pockets as the doors close.

4. A hatchway-door for elevators made in two sections of two hinged leaves each, adapted to close by their gravity, opened with variable movements, and balanced by a single counterpoise by positive connections with the outer hinged leaves of each section of the door, the several parts being connected for co-operative action, substantially as herein set forth.

5. The combination, with hinged doors, of two folding leaves each, of an elevator-hatchway, and the lifting-rods connected to the inner sides of the outer leaves, substantially as described, of a single counterpoise upon the axis-pin of the lifting-lever connections, operating to balance all the doors in opening by positive connections, substantially as herein set forth.

6. In self-closing doors for elevator-hatchways, the means herein described for opening the doors with a variable movement to prevent slamming, consisting of the curves T^1, joining the horizontal and vertical planes of the elevator bearing-way, said curves operating by their shortest curvature to slow the doors as they fold into the guide-post recesses.

7. The curves T^1 T^1 of the elevator bearing-way, adapted to gradually transfer the primary lever from the vertical plane T to the horizontal plane T^2, to secure the slow commencement of the closing movement of the doors.

8. In self-closing doors for elevator-hatchways, a bearing-way upon the elevator-car, consisting of a vertical plane, T, horizontal planes T^2 T^2, overlying the top and bottom of the elevator-car, and intermediate curves T^1 T^1, joining said planes at the angles of the elevator-car, in combination with primary levers adapted to receive the impact of the elevator-car upon said horizontal planes, and to move in a long sweep in contact therewith, to both open and close the doors.

9. The primary levers F G, arranged above and below the hatchway, connected by suitable mechanism, to operate toward and from each other in opposite directions, and connected to the inner sides of the outer doors, substantially as described, in combination with an elevator-car bearing-way having horizontal and vertical planes joined by intermediate curves, adapted to operate said levers simultaneously to effect the opening and closing movements of the doors, substantially as described.

10. The combination, with the primary levers, arranged to operate, substantially as described, of the secondary tri-armed lever N, connected by the rod M, the lifting-rods P P, and the doors connected therewith, for operation substantially as herein set forth.

11. The lower primary lever connected by the secondary lever K to the lower end of the rod J, and the upper primary lever connected to the upper end of said rod at a point between the axis and the acting end of said lever, whereby to cause the weight of one lever to balance that of the other, and thus relieve the

elevator-motor from lifting the lower primary lever in the operation of opening the doors by the descent of the elevator.

12. As a means of preventing the accidental passage of the elevator-car through the hatchway, the rod M, having one of its points of connection weaker than the other, but sufficiently strong for the safe working of the elevator, whereby said weak point will give way upon a sudden descent of the elevator-car upon the inward-projecting end of the upper primary lever, F, to prevent the opening of the doors.

In testimony that I claim the foregoing I have affixed my signature in the presence of two witnesses.

JOHN M. VAN OSDEL.

Witnesses:

A. E. H. JOHNSON,

J. W. HAMILTON JOHNSON.