Nov. 17, 1953 P. R. DOEG 2,659,457

LATCH FOR COUNTERBALANCED ELEVATOR DOORS

Filed July 28, 1950

4 Sheets-Sheet 1

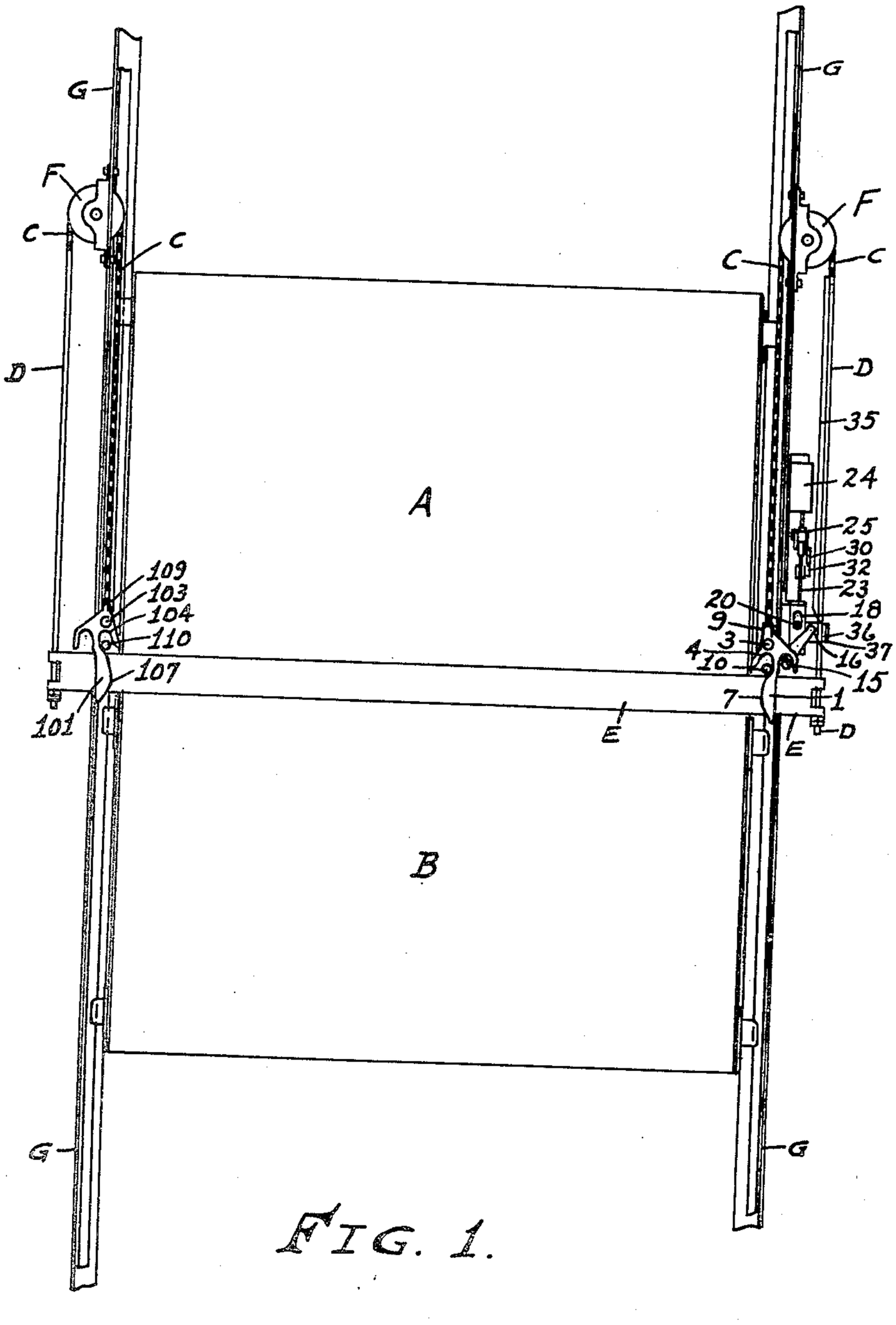

FIG. 1.

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4 Sheets-Sheet 2

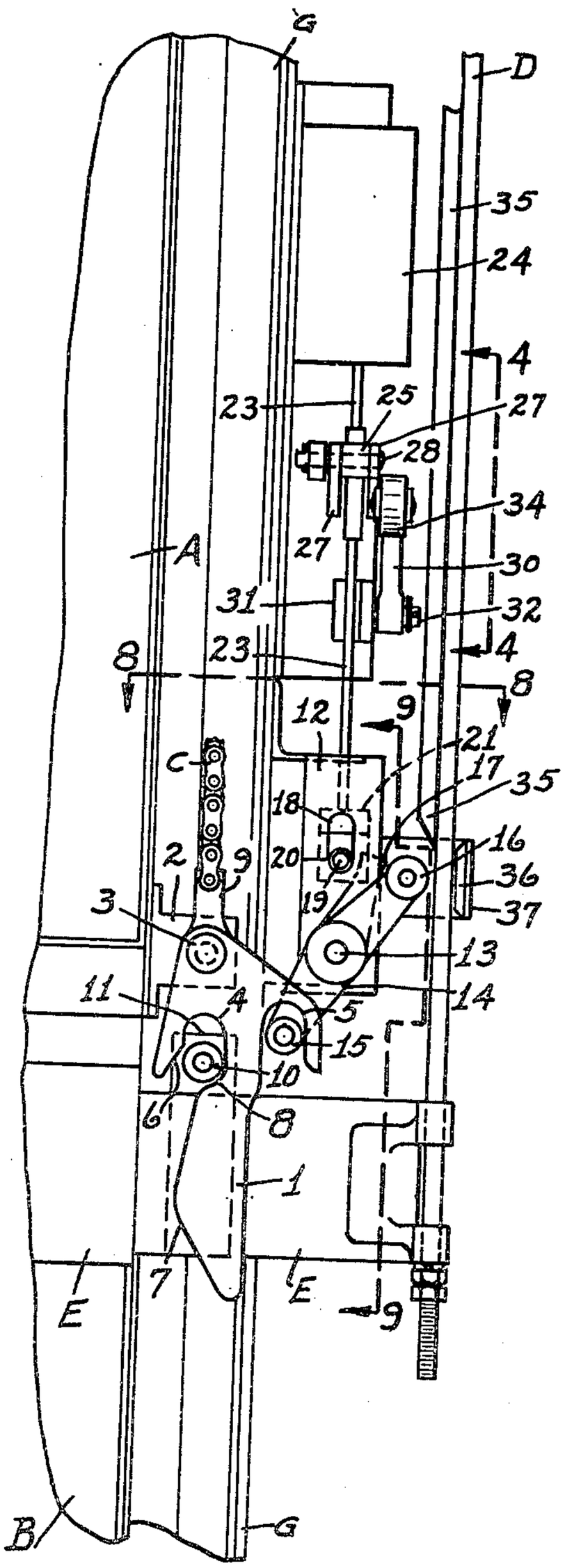

FIG. 2.

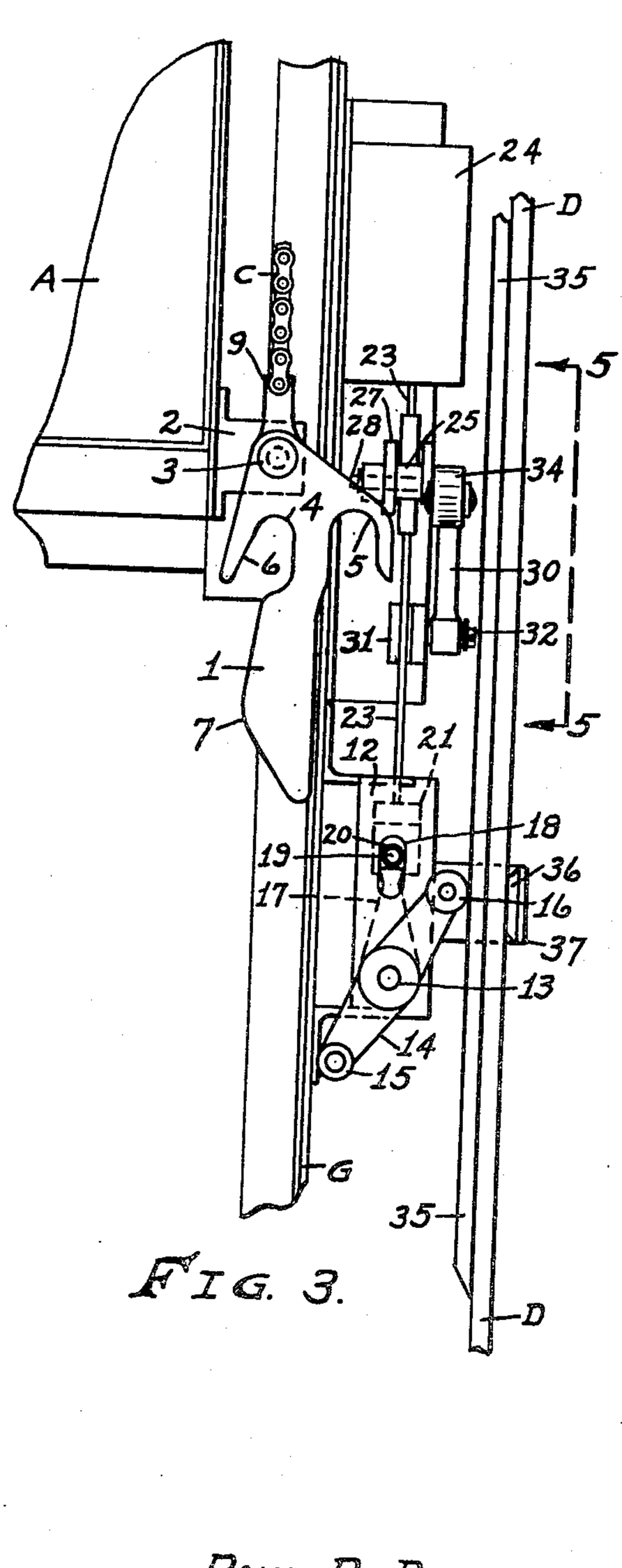

FIG. 3.

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4 Sheets-Sheet 3

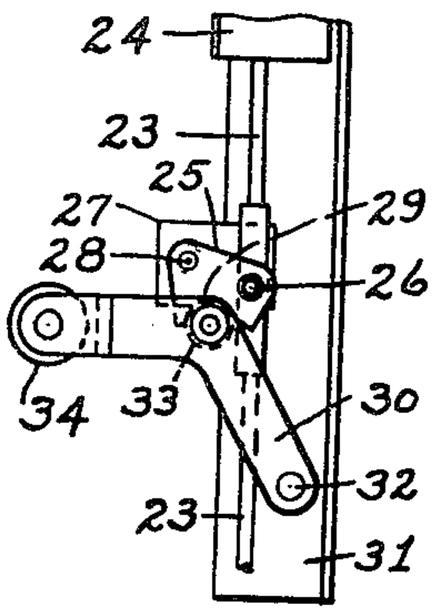

FIG. 4.

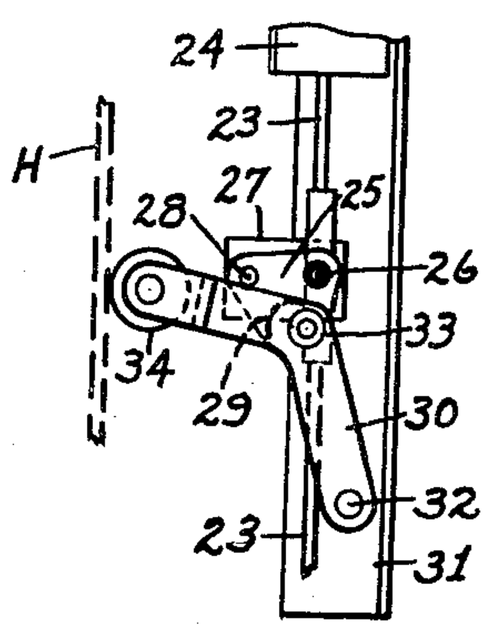

FIG. 5.

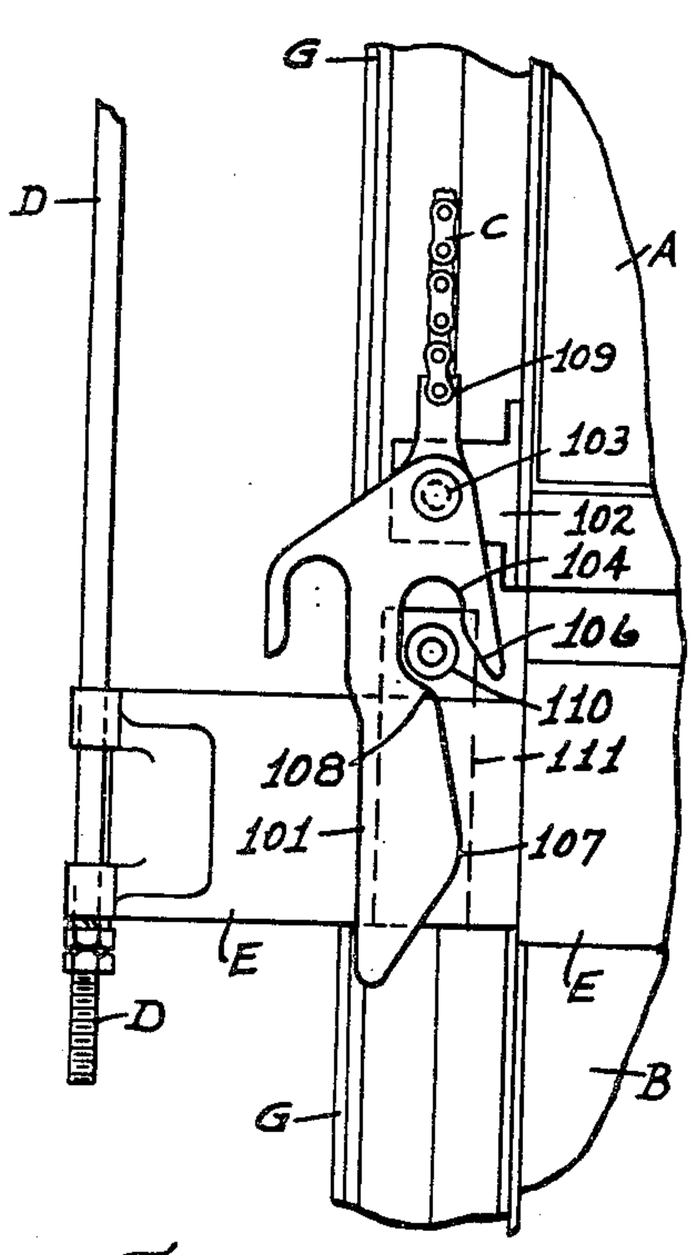

FIG. 6.

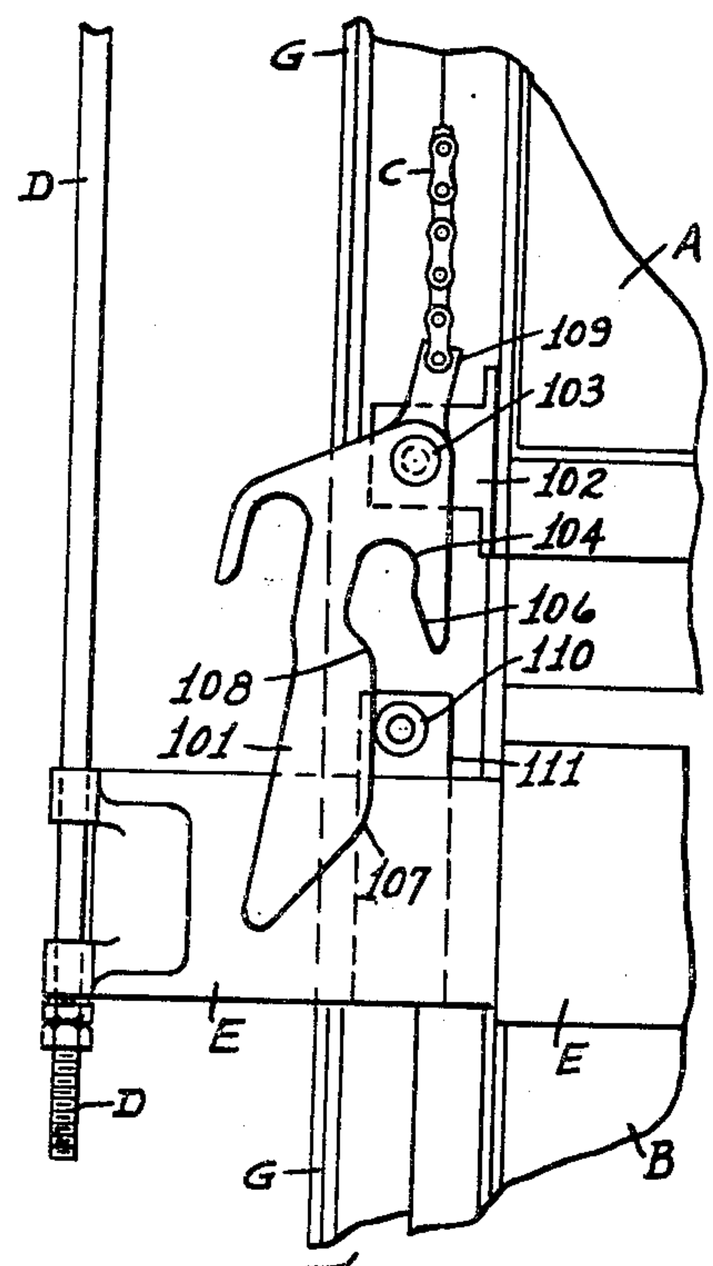

FIG. 7.

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4 Sheets-Sheet 4

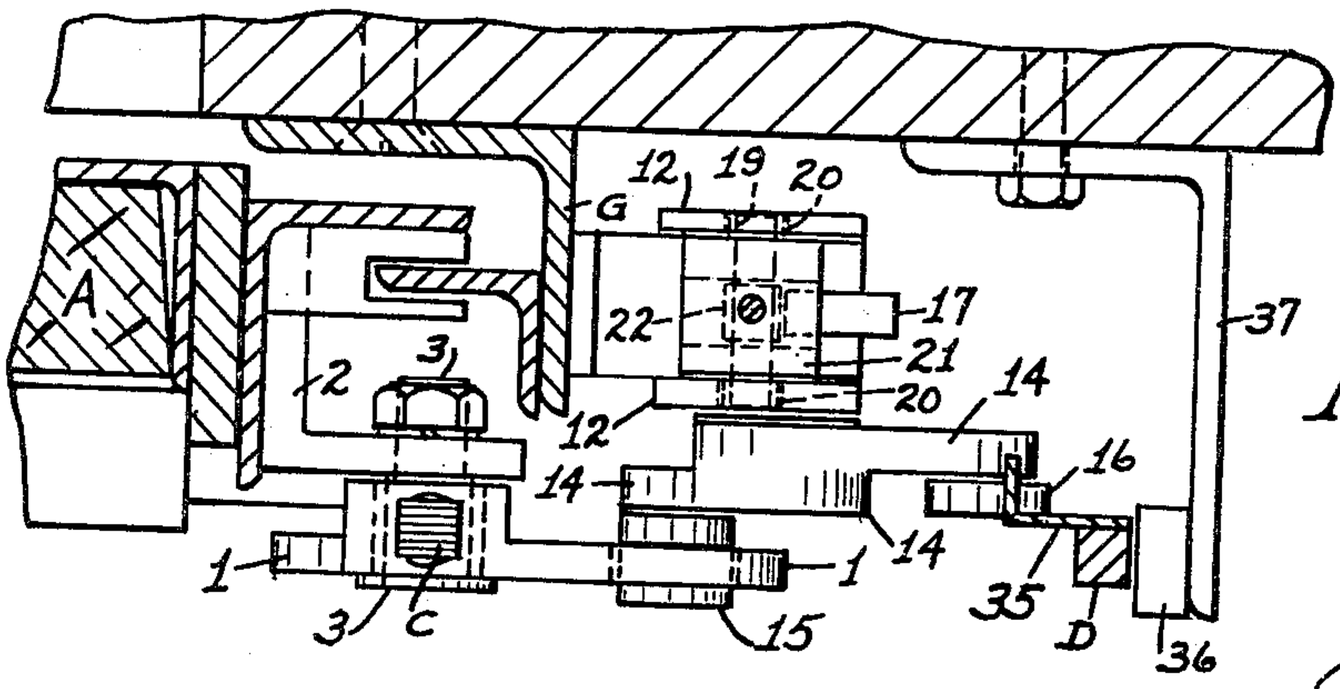

FIG. 8.

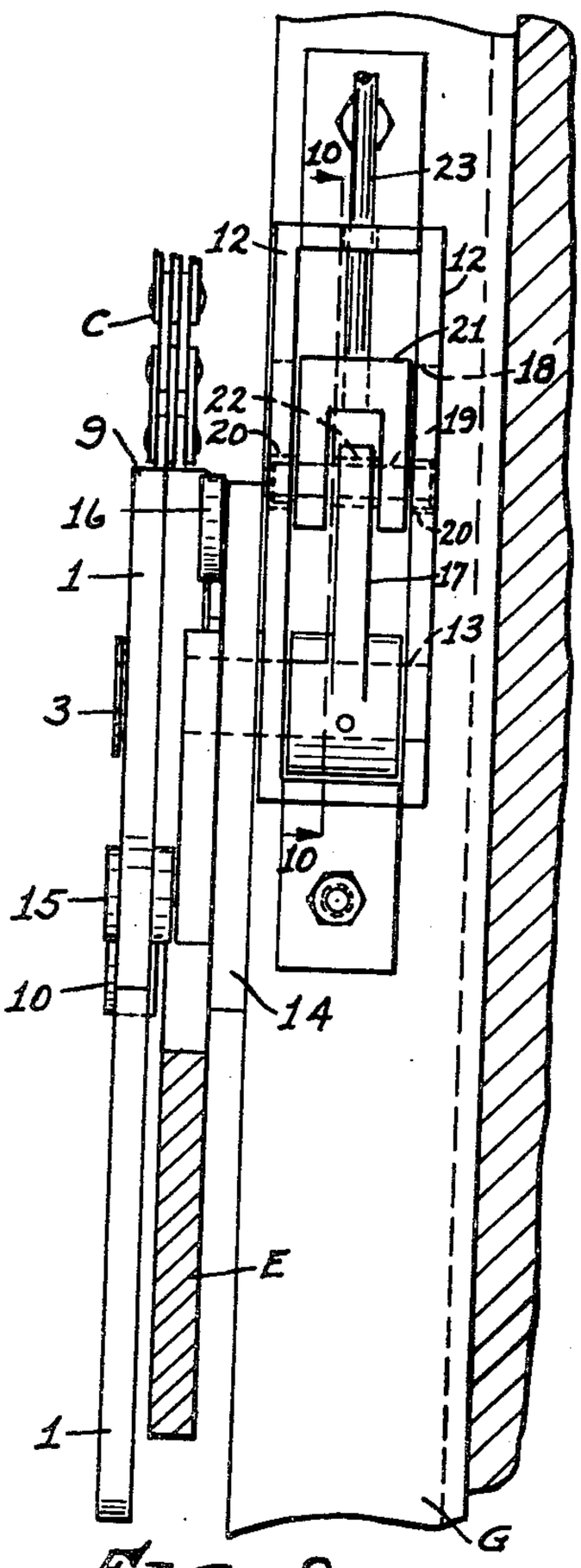

FIG. 9.

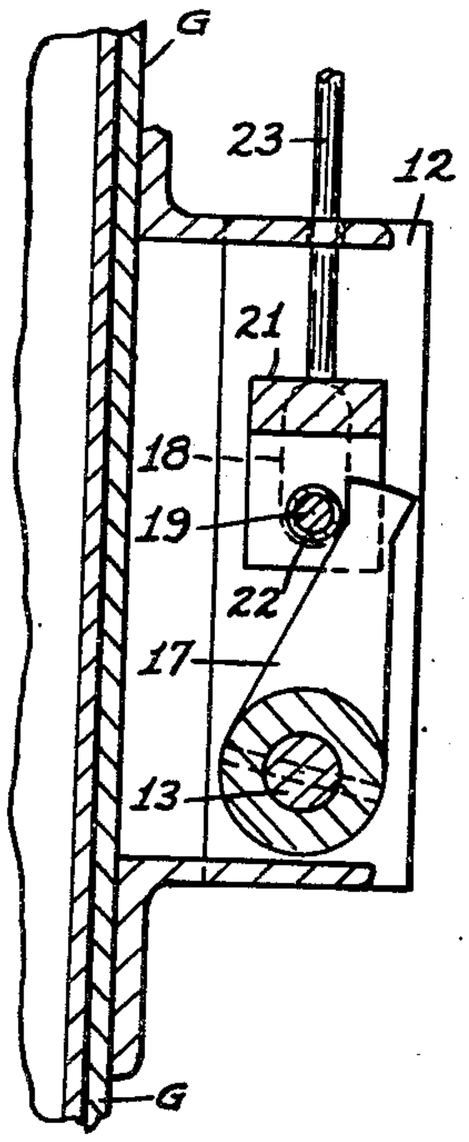

FIG. 10.

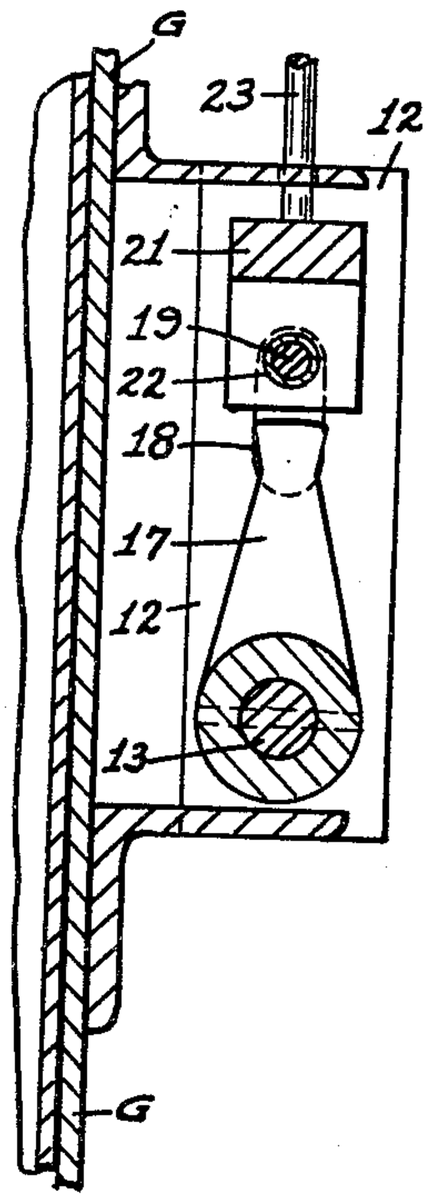

FIG. 11.

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UNITED STATES PATENT OFFICE

2,659,457

LATCH FOR COUNTERBALANCED ELEVATOR DOORS

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Application July 28, 1950, Serial No. 176,356

4 Claims. (Cl. 187—59)

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The latches described herein and shown in the accompanying drawings are primarily for use in connection with freight elevator doors of either the manually operated type or the motorized type.

Counterbalanced freight elevator doors are each composed of a pair of vertically movable sections with the sections moving simultaneously between suitable guides in opposite directions in a vertical plane in their opening and closing movements. In order to prevent a door from being opened except when the elevator car is at the respective floor, latches are provided to maintain the door in a normally closed position and to prevent opening of the door from the floor side thereof unless the elevator car is at that particular floor level.

We are aware that latches used in connection with counterbalanced elevator doors are old in the art and that latches have been positioned on the doors substantially midway between the edges of the doors and also at both sides of the doors. However, it will be noted that both types of latches, when used, have been manually operated.

In our present invention, we have eliminated the necessity for manual operation of the latching mechanism, and have provided a latching mechanism which is automatically operable by means of the movement of the door sections.

The principal object of the present invention is the provision of a latching mechanism which is automatic and positive in its operation.

A second object is the provision of a latching mechanism which acts as a retardant in checking the speed with which the door sections travel in closing, such retarding action being applied to the door sections by the latch members at a time when the door sections are assuming their final closing movement, and with the retarding action preventing the sections from slamming together in their closing movements.

A third object is the provision of a latch mechanism which prevents the door sections from rebounding from their fully closed position to a partially opened position by the instant, positive, and automatic engagement of the latch parts in the final closing movements of the door sections.

A still further object of the invention is the utilization of the weight of the door sections, through the latch mechanism, to hold the door sections in closed position and to prevent the rebounding thereof in their final closing movements.

Further objects and advantages of the invention will become apparent in the course of the following description, and that which is new will be pointed out in the appended claims.

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In order that the invention and the operation thereof may be more fully understood, we will now take up a detailed description thereof in which the same will be more fully set forth, reference being made to the accompanying drawings, in which:

Figure 1 is a shaft side elevation of a counterbalanced elevator door having oppositely-disposed latches in connection therewith, and embodying the features of the invention.

Figure 2 is an enlarged view of the latch device which is located at the right side of the door and showing the latch members in engaged position.

Figure 3 is also an enlarged view of the latch device which is located at the right side of the door, but showing only the upper door section, with the same being in partially opened condition, and showing the latch members thereof and carried thereby in completely disengaged or unlatched condition.

Figure 4 is a detail right side elevation of the latch-releasing mechanism, as taken from line 4—4 of Figure 2.

Figure 5 is a detail elevation similar to that shown in Figure 4 except that the latch lift rod is shown in lifted position, and as taken from line 5—5 of Figure 3.

Figure 6 is a detail elevation of the latch located at the left side of the door and showing the latch parts in engaged and latched condition.

Figure 7 is a detail elevation similar to that shown in Figure 6 except with the latch parts being shown in partially disengaged condition.

Figure 8 is a detail cross section, taken on line 8—8 of Figure 2, and showing the relative locations of the associated latch members.

Figure 9 is a detail section-elevation of the latch parts, taken on line 9—9 of Figure 2.

Figure 10 is a detail vertical section, taken on line 10—10 of Figure 9, and showing the position of the latch arm when the latch is in latched condition.

Figure 11 is a detail section similar to that shown in Figure 10 except that the latch arm is shown in the position assumed while the latch is in disengaged condition, as more clearly shown in Figure 3.

Like characters of reference designate like parts throughout the several views.

In order that the construction and the operation of the invention may be more fully understood, we will now take up a detailed description thereof, in which the same will be more comprehensively set forth.

Referring now to the drawings in detail, A designates the upper door section while B desig-

nates the lower door section. The sections, while not being physically connected with each other, are operatively connected with each other by means of chains C and chain rods D. One end of each of the chains is secured to an appurtenance located on the upper door section, while the opposite end thereof is secured to the upper end of a chain rod D which extends downwardly therefrom with the lower end of the rod being adjustably secured to an extension of a trucking bar E which forms a part of the lower door section. Each of the chains extend over a respective sheave F which is secured to an angle track assembly G. From the above, and with reference being had to Figure 1, it is obvious that, in the opening movements of the door, the upper section moves upwardly and the lower section moves downwardly, while in the closing movements, the upper section moves downwardly and the lower section moves upwardly, with the two sections meeting at a point substantially midway between the sill or floor of the opening and the lintel thereof.

The latch mechanisms are provided to prevent the two door sections from drifting apart and normally maintaining the same in locked condition while closed.

For reasons of simplification of description, the right side latch mechanism will be described first, after which the left side latch mechanism will be described.

Referring now to the latch and to the associated parts thereof, 1 designates a latch arm which is secured to upper door section A through bracket 2 and by means of stud 3 which provides for free pivotal movement of the latch arm with relation to the door section. Latch arm 1 has a roller-receiving channel or pocket 4 and a second roller-receiving channel 5 formed therein and located on opposite sides laterally thereof. Roller-receiving channel 4 is provided with an incline portion 6 for guiding roller 10 thereinto. The lower extending portion of latch arm 1 has a cam surface 7 formed on the side thereof adjacent the door sections. A radius 8 is formed on the latch arm and forms a part of the roller-receiving channel 4, the purpose of which is to prevent the roller 10 from being disengaged from its channel 4 except when the latch arm is actuated. The upper end of the latch arm is provided with a chain lug 9 to which the respective chain C is secured, as more clearly shown in Figures 2 and 3.

Roller 10 is carried by the trucking bar member E of the lower door section B, with the roller being mounted on an upstanding lug 11 which is secured to the trucking bar. Roller 10 is adapted to enter channel 4 of the latch arm, as shown in Figure 2.

A housing 12 is rigidly secured to a side surface of guide rail assembly G in any suitable manner. A shaft 13 extends through and projects forwardly of the front face of housing 12 with roller arm 14 being secured on the projecting portion thereof. A latch arm-engaging roller 15 is secured on the lower end portion of roller arm 14 with a cam-engaging roller 16 being mounted on the upper end of the roller arm. Also secured on shaft 13, but located within housing 12 is a lock lever 17 which is operated by the action of roller arm 14 through shaft 13.

Each side of housing 12 has a vertically disposed slotted aperture 18 formed therethrough and providing for vertical movement of shaft 19

which has a roller 20 positioned on each end thereof and with the rollers 20 being adapted to ride vertically within the slotted apertures 18. A slidable housing 21 is located within housing 12 and through which shaft 19 is journalled. Slidable housing 21 is channel-shaped with the opening formed by the shape thereof providing space for roller 22 to be mounted on shaft 19, as more clearly shown in Figure 9. A lift rod 23 is secured at its lower end into slidable housing 21 and having its upper end extending into electric interlock housing 24 where the upper end of the rod is secured into a suitable circuit-breaking switch (not shown) and which is located within the housing 24.

Lifting of the rod 23 is accomplished through the means of a lift cam 25 which is secured to the rod by a loose rivet 26 or by other suitable means. Lift cam 25 is pivotally secured to a mounting plate 27 by means of a loose rivet 28, or by other suitable means. A roller-receiving surface 29 is formed in the lower surface of lift cam 25, as shown in Figures 4 and 5. We provide an actuating arm 30 pivotally secured to mounting plate 31 by means of loose rivet 32 or other suitable means, and with a lifting roller 33 being secured on the side of actuating arm 30 and with the roller 33 being adapted to ride in the roller-receiving surface 29 of lift cam 25. Actuating arm 30 extends toward the elevator car and has a cam-engaging roller 34 secured in the end portion thereof, the purpose of which will be hereinafter more fully explained.

The chain rod D carries an extending cam member 35 which is adapted to engage the cam-engaging roller 16 upon opening movement of the door. A guide 36 is located on the opposite side of chain rod D and prevents undue flexure of the rod upon contact of cam 35 with roller 16. The guide 36 is supported by means of bracket 37 which may be secured to the face of the elevator shaft wall in a usual manner.

The left side latch members are complementary with the right side latch members except the same are oppositely disposed with relation thereto. Numeral 101 designates the left side latch arm which is secured to upper door section A through bracket 102 and by means of stud 103 which provides for free pivotal movement of the latch arm with relation to the door section. Latch arm 101 has a roller-receiving channel or pocket 104 and a second roller receiving channel 105 formed therein and located on opposite sides laterally thereof. Roller-receiving channel 104 is provided with an incline portion 106 for guiding roller 110 thereinto. The lower extending portion of latch arm 101 has a cam surface 107 formed on the side thereof adjacent to the door sections. A radius 108 is formed on the latch arm and forms a part of the roller-receiving channel 104. The upper end of latch arm 101 is provided with a chain lug 109 to which the respective chain C is secured, as more clearly shown in Figures 6 and 7.

A roller 110 is carried by the trucking bar member E of the lower door section B, with the roller being mounted on an upstanding lug 111 which is rigidly secured to the trucking bar. Roller 110 is adapted to enter channel 104 of the latch arm, as shown in Figure 6.

Operation

With the door in closed condition, as shown in Figures 1, 2, and 6, the associated latch members are in engaged relation. In the operation of the

door in opening from its closed position, the elevator car (not shown) carrying cam H (shown in Figure 5), is stopped at the desired landing. The cam member is preferably of the electrically-operated type and engages cam-engaging roller **34** causing the actuating arm **30** to move from the position shown in Figure 4 to the position shown in Figure 5. With the actuating arm **30** moving to the position shown in Figure 5, roller **33** rides along roller-receiving surface **29** of the lift cam **25** and causes lift cam **25** to pivot upwardly from rivet **28** and thereby causing lift rod **23** to be raised to the position shown in Figure 5.

With the raising movement of lift rod **23**, housing **21** is raised by reason of the same being secured to the lower end of rod **23**. When rod **23** is raised, electrical contact of the elevator operating circuit is broken in the interlock case **24**. Raising of lift rod **23** and associated housing **21** raises roller **22** clear of lock lever **17** which permits the door to be opened. Upon initial opening movement of the door, cam **35**, in its downward movement, contacts cam-engaging roller **16** and thereby causes lock lever **17** to swing to the position shown in Figure 11 and blocking downward movement of housing **21** and lift rod **23**. Also, the movement of cam-engaging roller **16** causes roller arm **14** to pivot on its shaft **13** which action causes latch arm-engaging roller **15** to move outwardly and engage the outer surface of the roller-receiving channel **5** and to swing latch arm **1** outwardly and thereby releasing roller **10** from within its roller-receiving channel **4**, which permits the door to be freely opened. At the same time roller **10** moves out of engagement with its roller-receiving channel **4**, roller **110** is also in the act of disengagement with relation to its roller-receiving channel **104** by reason of the movement of the door sections.

In the closing of the door and the latching thereof the operation of the parts is reversed to that described in the unlatching and opening of the door. As the door sections assume the closed position, rollers **10** and **110** contact the respective cam surfaces **7** and **107** which action has a tendency to slow the movement of the door sections toward each other. When the rollers **10** and **110** have passed the cam surfaces **7** and **107** they enter their respective channels **4** and **104**, and at the same time cam **35** becomes disengaged from its cam-engaging roller **16**. After the members have again assumed the positions as shown in Figures 2 and 6, the weight of the door sections, being suspended on rods D and chains C, create a pull on chain lugs **9** and **109** and thereby providing means normally maintaining the latch arms **1** and **101** in their latched positions.

When the latch arms **1** and **101** assume their normal latching positions as shown in Figures 2 and 6, lock lever **17** is also swung free of the downward path of roller **22**. Upon movement of the elevator car from the door, cam H is disengaged from the cam-engaging roller **34** which permits the actuating arm **30** to return to the position shown in Figure 4 whereupon lift cam **25** also returns to the position shown in Figure 4 and lowering lift rod **23** to the position shown in Figure 10. Upon the lowering of lift rod **23**, electrical contact is made to the elevator operating circuit and permitting movement of the elevator car away from the door.

It will be noted that, should anyone attempt to open the door without the elevator car being at that particular floor, it is possible to move the door only slightly toward open position due to

the lock lever moving into contact against roller **22**. This prevents unlatching of the door and it is not possible for the door to be unlatched without roller **22** being raised to the position as shown in Figure 11.

The lift rod **23**, being connected with the operation of the make and break contacts of the elevator operating circuit, makes it impossible to block the interlock in closed contact position and to operate the elevator car with a door standing open.

In the above description, taken with the drawings, it is obvious that the latching and unlatching means is entirely automatic in operation. The arrangement also provides safety features in connection with the doors and the operation thereof. The method of rollers **10** and **110** riding on the respective cam surfaces **7** and **107** provides means slowing the movement of the door sections toward each other, and thereby prevent undue slamming of the door sections in closing.

The invention is shown in its preferred form, but it is to be understood that minor changes may be made in the several parts and in the arrangement thereof, insofar as the changes therein may fall within the scope of the appended claims.

What we claim is:

1. In combination with a counterbalanced elevator door composed of an upper section and a lower section movable vertically in the same plane but moving away from each other in their opening movements and moving toward each other in their closing movements, a latch mechanism comprising a latch arm located on and carried by the upper door section and having a roller-receiving channel formed therein, a roller located on and carried by the lower door section, with said roller being adapted to engage the roller-receiving channel of the latch arm, means preventing disengagement of the roller from the roller-receiving channel until the elevator car is adjacent to the door, and with slight opening movement of the door sections operating the latch mechanism to unlatched position.

2. In combination with a counterbalanced elevator door, a latch mechanism comprising a latch arm swingably secured to and carried by the upper section of said door, a roller-receiving channel formed in the latch arm, a roller located on and carried by the lower door section, with said roller being adapted to engage the roller-receiving channel upon closing movements of the door sections, a second roller-receiving channel formed in the swingable latch arm, a roller arm pivotally secured to and carried by the upper door section and having a roller secured on the upper and lower ends thereof, with the roller on the lower end of the roller arm engaging the second roller-receiving channel of the latch arm, with the roller secured on the upper end of the roller arm being engageable by a cam carried by the door operating mechanism, and with the engagement of the upper roller of the roller arm with the cam carried by the door operating mechanism causing pivotal movement of the roller arm with the lower roller of the roller arm bearing against the second roller-receiving channel of the latch arm and swingably moving said latch arm to permit disengagement of the roller of the lower door section from the first roller-receiving channel of the latch arm.

3. The combination as set forth in claim 2, and with means preventing pivotal movement of

the roller arm except when an elevator car is positioned adjacent the door.

4. A latching mechanism in combination with a counterbalanced elevator door, means preventing the operation of said latching mechanism until an elevator car carrying a cam member is located adjacent the door, said means comprising a lift rod operable by means of an actuating arm, with the lifting of the lift rod raising said rod and carrying a roller upwardly out of the path of a lock lever of the latching mechanism, and with the unlatching operation being accomplished by a slight opening movement of the door.

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