

F. K. FASSETT.
 OPERATING MECHANISM FOR ELEVATOR DOORS.
 APPLICATION FILED MAR. 7, 1908.

937,696.

Patented Oct. 19, 1909.
 3 SHEETS—SHEET 1.

Fig. 1.

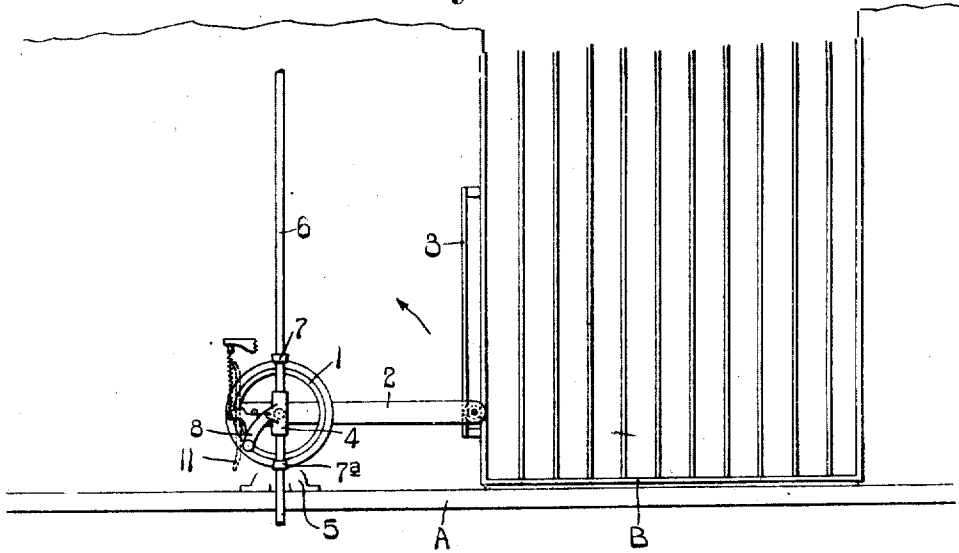
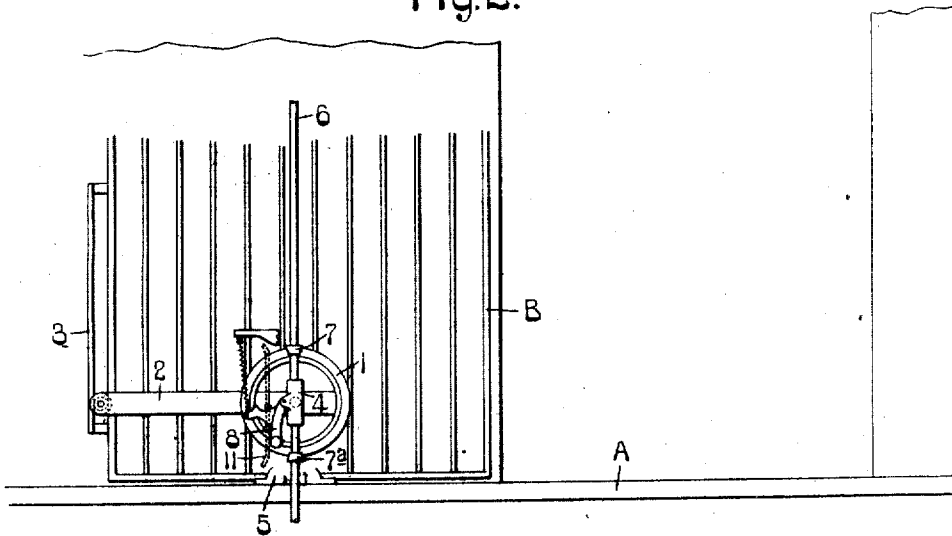


Fig. 2.



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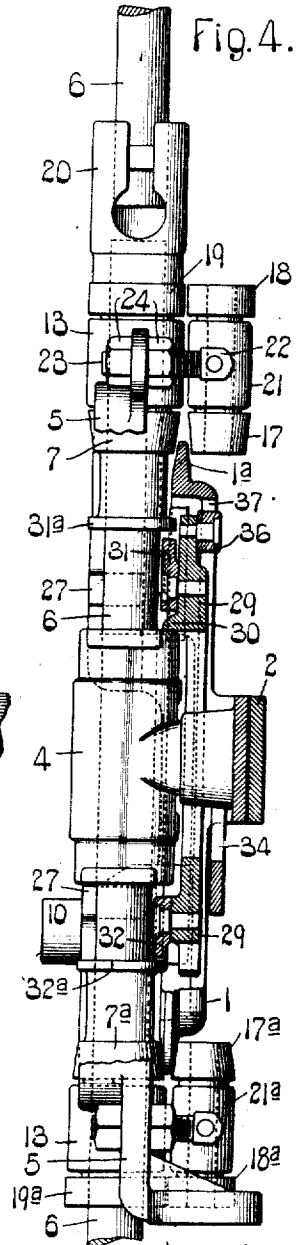
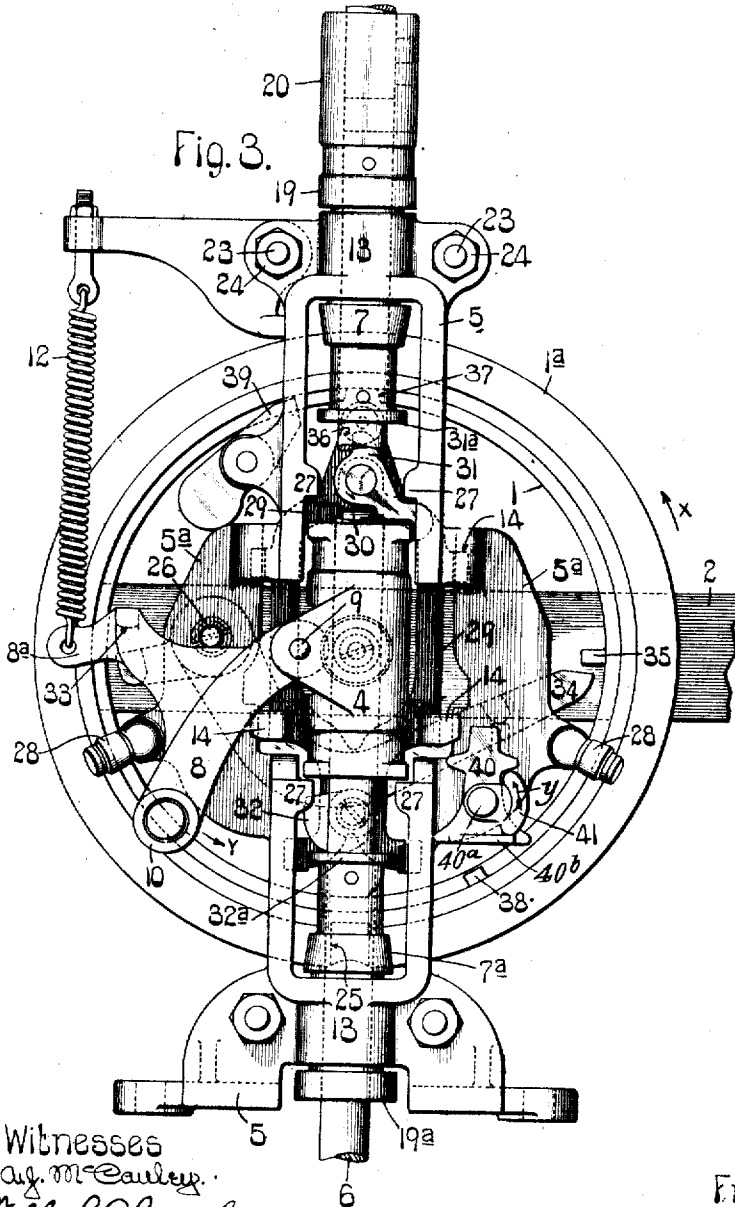
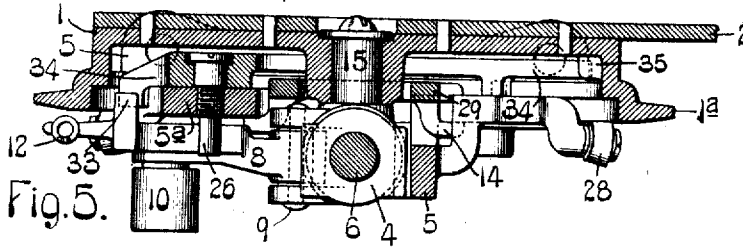
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3 SHEETS—SHEET 2.



Witnesses
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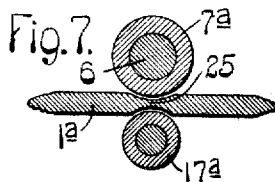
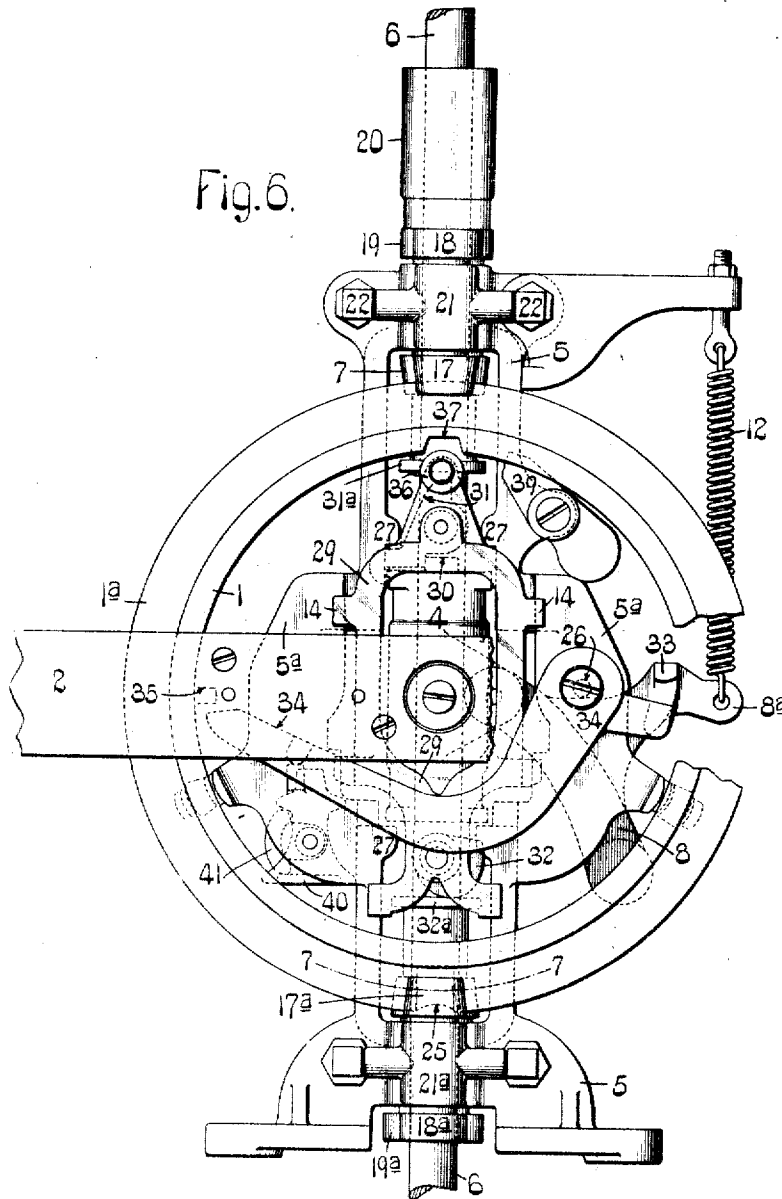
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3 SHEETS—SHEET 3.



Witnesses
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UNITED STATES PATENT OFFICE.

FRANCIS K. FASSETT, OF DAYTON, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO
ELEVATOR SUPPLY AND REPAIR COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION
OF ILLINOIS.

OPERATING MECHANISM FOR ELEVATOR-DOORS.

937,696.

Specification of Letters Patent.

Patented Oct. 19, 1909.

Application filed March 7, 1908. Serial No. 419,816.

To all whom it may concern:

Be it known that I, FRANCIS K. FASSETT, a citizen of the United States, residing at Dayton, Ohio, have invented a certain new and useful Improvement in Operating Mechanism for Elevator-Doors, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is an elevational view showing a door closing an opening in an elevator shaft and my improved mechanism for operating said door, the door being closed; Fig. 2 is a view similar to Fig. 1 showing the door in its open position; Fig. 3 is a front elevation of my improved door-operating mechanism; Fig. 4 is an end elevation, partly in section, of the mechanism shown in Fig. 3; Fig. 5 is a horizontal cross sectional view of the mechanism shown in Fig. 3; Fig. 6 is a rear elevational view of the mechanism shown in Fig. 3; and Fig. 7 is a detail sectional view taken on the line 7—7 of Fig. 6.

This invention relates to mechanism for operating elevator doors, and has for its main object to provide a door-operating mechanism of simple construction that is noiseless and which will securely lock the door in its closed position.

Other desirable features of my improved mechanism will be hereinafter pointed out. Briefly described, my mechanism consists of an oscillating device provided with an arm that is connected to the elevator door, a constantly rotating shaft provided with clutch members, and means for causing the clutch members on the shaft to engage said oscillating device so as to actuate it for opening and closing the elevator door.

In the preferred form of my invention as herein shown, the oscillating device consists of a wheel provided with a flange that co-operates with friction drive members on the constantly rotating shaft, one of said drive members turning the wheel in one direction to open the door and the other drive member turning the wheel in the opposite direction to close the door. The wheel is moved into and out of engagement with said friction drive members by mechanism actuated by a shoe on the elevator cage, said shoe be-

ing manually operated by the elevator conductor inside of the cage. Means are provided for locking the wheel so as to hold the door in open or closed position, and means are also provided for automatically disengaging the wheel from its locking means so that the door can be opened and closed manually in case the constantly rotating shaft should be idle.

Referring to the drawings which illustrate the preferred form of my invention, A designates one floor of a building and B designates a sliding door that closes an opening in the elevator shaft. The mechanism for opening and closing said door consists of an oscillating member herein shown as a wheel 1 provided with a rigid arm 2 that has a sliding connection with the door, the arm 2 having a pin or projection at its outer end that enters an elongated loop 3 on the rear edge of the door, as shown in Figs. 1 and 2. The oscillating wheel 1 is journaled in a bearing 4 that is reciprocally mounted in a frame or support 5 secured to the floor, and means are provided for oscillating said wheel 1 so that the arm 2 will move the door into its open and closed positions.

The means herein shown for mechanically oscillating the wheel 1 comprises a constantly rotating shaft 6 that extends vertically through the several floors of the building and which is provided with friction drive members 7 and 7* that are adapted to coöperate with a friction surface on the wheel 1, said shaft 6 being driven continuously by some suitable means, not shown, such, for example, as a motor located in the basement of the building. The friction drive member 7 on the shaft 6 causes the wheel 1 to turn in the direction indicated by the arrow in Fig. 1 to open the door, said wheel normally occupying such a position that its friction surface is out of engagement with said friction drive member.

The bearing 4 on which the wheel 1 is journaled is moved vertically to carry the friction surface on said wheel into engagement with the friction drive member 7 on the shaft 6 by means of a lever 8 pivotally connected at 9 to said bearing and provided at its lower end with a roller 10 which is engaged by an actuating shoe 11 on the elevator cage, said actuating shoe being shown

in dotted lines in Figs. 1 and 2. The actuating shoe 11 forms no part of my present invention and I have therefore not shown the mechanism that is employed for operating it. Suffice it to say, that said shoe 11 is moved by mechanism under control of the operator or conductor in the elevator cage so that when the cage approaches the floor at which it is to stop the shoe 11 will be in position to engage the roller on the lever 8 and thus actuate said lever to move the bearing 4 upwardly, thereby carrying the friction surface on the wheel 1 into engagement with the constantly rotating friction drive member 7 which causes said wheel to turn in the direction of the arrow in Fig. 1 and thus open the door. When the operator in the cage releases the mechanism that actuates the shoe 11, said shoe will move out of engagement with the roller on the lever 8 and a coiled spring 12, which is connected at one end to a stationary support and at its opposite end to an arm 8^a on the lever 8, will return said lever to normal position and thus move the bearing 4 downwardly to carry the friction surface on the wheel 1 into engagement with the friction drive member 7^a on the shaft 6, the rotary movement of the member 7^a causing the wheel 1 to oscillate in the opposite direction and thus move the door into its closed position. If the shaft 6 is idle the door can be opened and closed manually by the conductor in the cage who actuates the shoe 11 so as to force it into engagement with the roll on the lever 8, thereby moving the bearing 4 upwardly to disengage the wheel 1 from locking means, hereinafter described, and also imparting a slight movement to said wheel to carry the arm 2 out of its normal dead center position in which it acts as a lock to retain the door in its closed position.

In Figs. 3 to 7 I have shown in detail the wheel 1 and the mechanism that causes it to oscillate, and referring to said figures it will be seen that the frame 5 which is secured to the floor is of skeleton construction and is provided at its upper and lower ends with bearings 13 for the constantly rotating shaft 6, the frame comprising two side pieces 5^a between which the bearing 4 is slidably mounted on the shaft 6. At approximately the center of said bearing is a laterally projecting horizontal stub shaft 15 on which the wheel 1 is journaled, as shown in Fig. 5. The friction surface on the wheel 1 consists of a vertically disposed beveled flange 1^a and the friction drive members 7 and 7^a on the shaft 6 consist of cone-shaped pulleys that are pinned to said shaft. Auxiliary cone-shaped pulleys or drive members 17 and 17^a cooperate with the friction drive members 7 and 7^a, respectively, to clamp the flange 1^a of the wheel between them, and said auxiliary pulleys 17 and 17^a are secured to shafts

provided with rolls 18 and 18^a that cooperate with rolls 19 and 19^a on the constantly rotating shaft 6.

As shown in Fig. 3, the friction drive members 7 and 7^a on the constantly rotating shaft are arranged inside of the frame 5, and the rolls 19 and 19^a consist of collars that are connected to said shaft at points outside of the frame 5, said friction drive members and collars operating to prevent the shaft 6 from moving longitudinally. In the construction herein shown the shaft 6 is formed in sections that are connected together by means of couplings 20, as shown in Figs. 3 and 4. The shaft to which the pulley 17 and roll 18 are connected, is journaled in a pivotally mounted bearing 21 arranged adjacent the upper end of the frame 5, and the shaft to which the pulley 17^a and roll 18^a are connected is journaled in a bearing 21^a of the same construction arranged adjacent the lower end of said frame. As the bearings 21 and 21^a are of practically the same construction I will describe only the bearing 21. Said bearing is provided at approximately its center with laterally projecting trunnions that enter openings in the heads 22 of screws 23 which are secured to wings or ears on the frame 5 by means of nuts 24, thus producing a pivotally mounted bearing that can be moved toward and away from the frame 5 to vary the frictional contact between the cooperating drive members 7 and 17 and the flange 1^a on the wheel 1. Preferably, the trunnions for the bearing 21 are arranged slightly off center or to the left of the longitudinal center of said bearing, as shown in Fig. 4, so as to permit force of gravity to hold the bearing in such a position that the roll 18 is normally out of engagement with its cooperating constantly rotating roll 19 on the shaft 6. The trunnions for the bearing 21^a are arranged slightly to the right of the longitudinal center of said bearing so that the roll 18^a will not engage its cooperating roll 19^a on the shaft 6 when the bearing 4 for the wheel 1 is in its elevated position. When the wheel 1 is in normal position the flange 1^a thereon will be arranged between the friction drive member 7^a and its cooperating pulley 17^a and out of engagement with the cooperating drive members 7 and 17, as shown in Figs. 3 and 4. No movement will be imparted to the wheel 1 at such times, however, due to the fact that the flange 1^a of the wheel has a cut-out portion 25 in which the members 7^a and 17^a lie, as shown in Fig. 7, and also in dotted lines in Fig. 3. When the bearing 4 for the wheel 1 is moved upwardly the flange 1^a thereon will be forced into engagement with the friction member 7 and its cooperating pulley 17, thereby causing said wheel to oscillate in the direction of the arrow X in Fig. 3 so as to move the

door into its open position, the wheel coming to rest when the cut-out portion 25 in the flange thereon comes into alinement with the cooperating members 7 and 17. As the flange 1^a on the wheel 1 is forced into engagement with the drive member 7 and pulley 17, the bearing 21 rocks and thus brings the cooperating rolls 18 and 19 into intimate engagement with each other so that rotary movement is imparted to the pulley 17, thereby causing the flange of the wheel 1 to be gripped by two rotating members. Preferably, the taper of the drive members 7, 7^a and the cones or pulleys 17, 17^a is so proportioned to their diameter and the bevel of the flange 1^a on the wheel is such, that the action of the drive members and cones upon the wheel is a rolling one, the relative diameters of the rolls 19, 19^a and 18, 18^a also being such as to secure a rolling effect.

When the lever 8 that moves the bearing 4 is returned to normal position by means of the spring 12, as previously described, the flange 1^a on the wheel 1 will pass out of engagement with the friction drive member 7 and its cooperating pulley 17 and into engagement with the drive member 7^a and cooperating pulley 17^a at the lower end of the frame 5, thereby causing the wheel 1 to be oscillated in the opposite direction so as to move the door into its closed position, the wheel 1 coming to rest when the cut-out portion 25 in the flange thereon arrives between the cooperating members 7^a and 17^a. The fulcrum on which the lever 8 turns consists of a stud or pin 26 on one of the side pieces of the frame 5 arranged above the arm 8^a of said lever, the spring 12 operating to hold the upper edge of said arm in contact with said pin, and consequently forcing the bearing 4 downwardly so that the flange of the wheel 1 will normally lie between the cooperating members 7^a and 17^a. When the lever 8 is moved in the direction indicated by the arrow *y* in Fig. 3, it will rock on said pin 26 as a fulcrum and thus move the bearing 4 upwardly so as to force the flange of the wheel 1 between the cooperating drive members 7 and 17. When the wheel 1 cannot move any higher, if the inward movement of the lever 8 continues, said lever will no longer rock on the pin 26, but leaving the pin 26, will rock on the pin 9 which connects it to the bearing 4, and the pressure tending to keep the flange of the wheel engaged with the upper driving members 7 and 17, increases in proportion to the further movement of the lever 8.

Lugs 27 on the frame 5 limit the upward and downward movement of the bearing 4 but said bearing does not come into contact with said lugs until the door has reached its open or closed position; namely, when the cut-out portion 25 in the flange 1^a of the

wheel 1 comes into alinement with the cooperating drive members at the top and bottom of the frame 5. Previous to this time the upward or downward movement of the bearing 4 has been limited by the flange 1^a of the wheel wedging in between the cooperating drive members at the top or bottom of the frame 5. When the cut-out portion 25 comes into alinement with the cooperating drive members, the bearing 4 continues its upward or downward movement until arrested by the lugs 27. Owing to the beveled shape of the flange 1^a and the corresponding taper of the cooperating drive members, the space between the drive members will not be broad enough to admit the flange 1^a after the bearing 4 has abutted the lugs 27, hence, it follows that the wheel 1 will be locked against rotary movement. The wheel 1 is guided and kept trued up by means of rollers 28 on the frame 5 that bear upon a flat surface on said wheel.

A member 29 that is slidably mounted on the frame 5 is provided with a lug 30 that normally rests upon the upper edge of the bearing 4, as shown in Fig. 4, and at the upper and lower ends of said member 29 are cams 31 and 32, respectively. This member 29 and its cams 31 and 32 performs no function when the shaft 6 is rotating, for when the bearing 4 is moved upwardly, said member 29 will move with it and thus carry the cam 31 at the upper end thereof into engagement with a laterally projecting flange or collar 31^a on the rotating shaft 6. If the shaft 6 were at rest this collar 31^a and cam 31 would act as a stop to limit the upward movement of the member 29 but when the shaft is rotating the rotary movement of the collar 31^a will cause the cam 31 to swing on its pivot and thus bring a reduced portion of the cam underneath the collar so that the member 29 and bearing 4 can move upwardly far enough to force the flange on the wheel 1 between the cooperating drive members 7 and 17. When the member 29 moves upwardly the cam 32 at the lower end thereof will swing on its pivot and thus bring the high point of said cam onto a flange or collar 32^a on the shaft 6, located below said cam, as shown in Fig. 8. If the shaft 6 were idle said cam 32 and collar 32^a would form a stop that would prevent the member 29 from moving downwardly back to normal position but when the shaft is rotating the rotatory movement of the collar 32^a will swing the cam 32 back to normal position when said cam comes into engagement with same.

If the lever 8 is actuated when the shaft 6 is idle, the bearing 4 and member 29 will move upwardly until the cam 31 engages the flange or collar 31^a on the shaft 6 but the cam will not rock on its pivot, and the cam 32 at the lower end of said member 29

will swing inwardly and rest upon the collar 32^a on the shaft 6. The bearing 4 is moved upwardly far enough to carry the flange of the wheel 1 out of engagement with the cooperating drive members 7^a and 17^a but not far enough to force the flange on the wheel between the cooperating drive members 7 and 17 so that the wheel is unlocked and free to rotate. As the lever 8 continues to move, a lug 33 on the arm 8^a of said lever comes into engagement with a cooperating lug on an arm 34 which is pivotally mounted on the stud 26, as shown in dotted lines in Fig. 3. The outer end of said arm 34 is located underneath a lug 35 on the wheel 1 so that when said arm is actuated by the lug 33 on the lever 8, the free end of said arm will engage the lug 35 on the wheel and rotate said wheel far enough to carry the arm 2 off dead center, thereby releasing the door B so that it can be opened manually. The point on the lever 8 that engages the stud 26 is considerably closer to the lug 33 than the pivot 9 and because of this, the downward movement of the lug 33 is slight as long as the lever 8 rocks on the stud 26, but the movement of the lug 33 becomes relatively much greater when the lever 8 rocks on the pivot 9. The distance that the wheel 1 will move upwardly when the shaft is idle before being stopped by the cam 31 engaging the flange 31^a, is relatively small. Considering the above, it will be clear that when the shaft is revolving the flange 1^a will engage the members 7 and 17 before the lug 33 engages the lever 34, while when the shaft is idle the lug 33 will engage the lever 34 early in the movement of the lever 8. With this arrangement and proportion of the parts, when the shaft is revolving, pressure applied to the lever 8 does not act directly upon the door to move same, while when the shaft is idle it does.

A roller 36 on the member 29 just clears a laterally projecting flange on the wheel 1 when said member 29 is in its normal lowered position, but when said member 29 is elevated and is resting upon the cam 32, the laterally projecting flange on the wheel 1 rides on said roller 36, and thus prevents the spring 12 from moving said wheel and the bearing 4 downwardly to normal position even when pressure is removed from the operating lever 8.

From the foregoing it will be seen that the roller 36 on the member 29 acts as a stop to prevent the flange 1^a on the wheel 1 from moving into engagement with the cooperating members 7^a and 17^a after the door has been opened manually, said roller retaining the wheel 1 in its elevated position until the door has been closed and a cut-out portion 37 in the laterally projecting flange on the wheel 1 has come into alignment with the roller 36. The cut-out portion 37, shown in

dotted lines in Fig. 3, permits the wheel 1 and the bearing 4 to move downwardly so that the cooperating members 7^a and 17^a can enter the cut-out portion 25 in the flange 1^a of the wheel and thus lock it, the member 29 remaining in its elevated position until the shaft 6 is again rotated.

To prevent the arm 2 on the wheel 1 from moving to a dead center position when the door is opened manually, I have provided the wheel 1 with an inwardly projecting lug 38 that is engaged by a pivotally mounted dog 39 on the frame 5 before the wheel has moved far enough to carry the arms 2 to a dead center position. When the shaft 6 is rotating this dog 39 is inoperative, however, because the wheel 1 occupies a higher position at such times and the lug 38 does not engage said dog when the wheel is oscillated.

For enabling the door to be opened and closed manually even when the shaft 6 is rotating, I have provided means for holding the wheel 1 in such a position that it is not engaged by either set of driving members 7 and 17 or 7^a and 17^a. This means comprises a pawl 40 pivotally mounted on a stud 40^a on the frame 5 and provided at its lower end with a laterally projecting flange 40^b. A weight 41 that is pivotally mounted on the stud 40^a bears upon the flange 40^b on said pawl and holds the pawl in either of the two positions. When the weight 41 is arranged in its normal position, as shown in Fig. 3, it will force the lower end of the pawl toward a portion of the frame 5 and thus hold the upper end of said pawl out of alignment with one of the guide lugs 14 on the member 29. When the counterweight is swung in the direction indicated by the arrow *y* in Fig. 3 it will engage the flange 40^b on the pawl 40 and thus move the lower end of said pawl away from the portion of the frame 5 with which it previously contacted. When the member 29 is raised the upper end of the pawl moves inwardly or toward said member 29 so that the lug 14 will engage said pawl when the member 29 moves downwardly. Consequently, the pawl 40 and the lug 14 with which it cooperates prevent the member 29 from moving downwardly to its extreme lowest position, thus holding the flange 1^a on the wheel out of engagement with either set of driving members. The door B can now be moved manually to any desired position and will remain in such position. To restore the pawl 40 to normal position the counterweight is swung into the position shown in Fig. 3 and the pawl will swing into its normal position the next time the lever 8 is operated to raise the bearing 4.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a door-operating mechanism, a door, 180

a rockable door-actuating member, an arm rigidly secured to said member, a slot and pin connection between said arm and door, a rotating member provided with devices that are adapted to engage said door-actuating member and move it in opposite directions, and means for shifting said door-actuating member to move it into and out of engagement with the devices on the rotating member; substantially as described.

2. A door-operating mechanism comprising an oscillating member, means for transmitting the movements of said member to a door, a rotating member provided with devices that are rigidly secured thereto and which are adapted to engage said oscillating member and move it in opposite directions, and means for causing said devices to engage said oscillating member, said devices being adapted to lock said oscillating member when the door arrives in its closed and opened positions; substantially as described.

3. In a door-operating mechanism, an oscillating member provided with an arm that is adapted to be connected to the door, mechanical means adapted to engage said member and move it in opposite directions, and manually-operated means for initially moving said actuating member to open the door slightly when said mechanical means is inoperative; substantially as described.

4. In a door-operating mechanism, an actuating member, means for transmitting the movements of said member to a door, means for locking said actuating member, and manually-operated means for releasing said member from its locking means and for imparting initial movement thereto; substantially as described.

5. In a door-operating mechanism, an oscillating member provided with an arm that is adapted to be connected to a door, means for locking said member to retain the door in its closed position, and manually-operated means for disengaging said oscillating member from its locking means and for imparting movement to said member; substantially as described.

6. In a door-operating mechanism, a wheel provided with a friction face, an arm carried by said wheel, said arm being adapted to transmit the rotary movement of said wheel to a door, a rotating shaft provided with friction drive members that are adapted to engage the friction face on said wheel and move it in opposite directions, devices cooperating with the friction drive members on said shaft for causing them to firmly engage said wheel, and means for shifting said wheel to carry the friction face thereon into engagement with one of said drive members and its cooperating device, and thereafter into engagement with the other drive member and its cooperating device; substantially as described.

7. In a door-operating mechanism, a wheel provided with a vertically disposed flange, means for transmitting the movements of said wheel to a door, a pair of friction drive members located adjacent the upper side of said wheel, a pair of friction drive members located adjacent the lower side of said wheel, and means for shifting said wheel to cause the flange thereon to be engaged by one set of said drive members and thereafter by the other set of drive members, said flange being provided with a recess into which said drive members extend when the wheel reaches certain positions and thus causes said wheel to come to rest; substantially as described.

8. In a door-operating mechanism, a wheel provided with a friction face, a rotating friction drive member located adjacent the upper side of said wheel, a rotating friction drive member located adjacent the lower side of said wheel, means for shifting said wheel into and out of engagement with said drive members to cause the wheel to be moved first in one direction and then in the opposite direction, and a rigid arm on said wheel adapted to be connected to a door for transmitting the movements of said wheel thereto; substantially as described.

9. In a door-operating mechanism, a wheel provided with a flange, a friction drive member for engaging said flange and moving the wheel in one direction, and a second friction drive member for engaging said flange and moving the wheel in the opposite direction, the flange on said wheel being provided with a cut-out portion which causes the wheel to come to rest when said cut-out portion comes into alignment with either of said drive members; substantially as described.

10. In a door-operating mechanism, a wheel provided with a flange having a cut-out portion therein, means for transmitting the movements of said wheel to a door, a pair of friction drive members adapted to move the wheel in one direction and normally lying in the cut-out portion of said flange so as to lock the wheel, a pair of friction drive members adapted to engage the flange of said wheel and move it in the opposite direction, and means for shifting said wheel to force the flange thereon into intimate engagement with said pairs of drive members; substantially as described.

11. In a door-operating mechanism, a wheel provided with a beveled flange, a rotating shaft provided with cone-shaped drive members, pivotally mounted bearings, auxiliary cone-shaped drive members on said bearings that cooperate with the drive members on said shaft, means for shifting said wheel to force the flange thereon between one of the drive members on said shaft and its cooperating auxiliary drive members, and means for transmitting the movements of

said wheel to a door; substantially as described.

12. In a door-operating mechanism, an oscillating actuating member provided with a friction face flange, rotating drive members adapted to embrace said flange and move said actuating member in opposite directions, and yielding means for maintaining the frictional engagement between said drive members and said actuating member; substantially as described.

13. In a door-operating mechanism, an actuating wheel provided with a tapered flange, a rotating shaft provided with conical-shaped drive members that are adapted to engage said flange and move the wheel in opposite directions, auxiliary conical-shaped drive members cooperating with those on said shaft to engage the opposite face of the wheel flange, pivotally mounted bearings in which said auxiliary drive members are mounted, and means for adjusting said bearings; substantially as described.

14. In a door-operating mechanism, a rotating shaft, a pair of conical-shaped drive members on said shaft, collars on said shaft adjacent said drive members, pivotally mounted bearings, shafts journaled in said bearings and provided with rolls and auxiliary cone-shaped drive members that cooperate with the drive members and collars on said rotating shaft, an actuating wheel provided with a tapered flange, and means for shifting said wheel to force the flange thereon into and out of engagement with said drive members and auxiliary drive members; substantially as described.

15. In a door-operating mechanism, an elongated frame adapted to be connected to the floor of a building, a rotating shaft mounted in bearings on said frame, cone-shaped drive members secured to said shaft inside of said frame, a wheel having a tapered flange that cooperates with said drive members and provided with an arm that is adapted to be connected to a door, a bearing reciprocatingly mounted in said frame and having said wheel journaled thereon, means for moving said bearing, and manually-operated means for imparting initial movement to said wheel when said shaft is idle; substantially as described.

16. In a door-operating mechanism, an elongated frame adapted to be connected to the floor of a building, a rotating shaft mounted in bearings on said frame, cone-shaped drive members secured to said shaft inside of said frame, a wheel having a tapered flange that cooperates with said drive members and provided with an arm that is adapted to be connected to a door, a bearing reciprocatingly mounted in said frame and having said wheel journaled thereon, means for moving said bearing, collars connected to said shaft outside of said

frame, pivotally mounted bearings located adjacent the upper and lower ends of said frame, and shafts mounted in said bearings and provided at their inner ends with cone-shaped drive members that cooperate with the drive members on the rotating shaft and at their outer ends with rolls that cooperate with the collars on said rotating shaft; substantially as described.

17. In a door-operating mechanism, a wheel provided with an arm that is connected to a door, said arm lying on a dead center when the door is closed or opened, mechanical means for oscillating said wheel to open and close the door, means for initially moving said wheel to partially open the door when said mechanical means is inoperative, and means whereby when the mechanical means is inoperative, the movement of the wheel is limited, to the end that said arm will not assume a dead center position when the door is open; substantially as described.

18. In a door-operating mechanism, a door-actuating member, mechanism for moving said member in opposite directions to open and close the door, said mechanism being adapted to lock said member so as to hold the door closed, and yielding means for holding said actuating member in position to be locked by said mechanism; substantially as described.

19. In a door-operating mechanism, a frame, a rotating shaft journaled in said frame and provided with drive members, a bearing reciprocatingly mounted in said frame, a wheel mounted upon said bearing, said wheel being adapted to be engaged and rocked by said drive members in opposite directions, an arm on the wheel for transmitting the movements of said wheel to a door, a lever connected to said bearing for moving it in one direction, a stationary support, and a spring connected to said lever and to said stationary support for moving the bearing in the opposite direction; substantially as described.

20. In a door-operating mechanism, a frame, a rotating shaft journaled in said frame and provided with friction drive members, a bearing reciprocatingly mounted in said frame, a door-actuating wheel carried by said bearing and adapted to be engaged and rocked by said friction drive members, and stops on said frame for limiting the movement of said bearing; substantially as described.

21. In a door-operating mechanism, a frame, a rotating shaft journaled in said frame and provided with drive members, a bearing reciprocatingly mounted in said frame, a door-actuating wheel carried by said bearing and adapted to be engaged and moved by said drive members, an actuating lever pivotally connected to said bearing, a

stationary support, a spring fastened to one end of said lever and to said stationary support, and a pin or stud on said frame engaging one edge of said lever to form a fulcrum therefor; substantially as described.

22. In a door-operating mechanism, a frame, a rotating shaft journaled in said frame and provided with drive members, a bearing reciprocally mounted in said frame, a wheel carried by said bearing and adapted to be engaged and moved by said drive members, rollers on said frame which bear upon said wheel to cause it to run true, and a rigid arm on said wheel that is adapted to be connected to a door for transmitting the movements of the wheel directly to said door; substantially as described.

23. In a door-operating mechanism, a frame, a shaft rotatably mounted in said frame and provided with drive members, auxiliary drive members cooperating with those on said shaft, a bearing reciprocally mounted in said frame, a door-actuating wheel carried by said bearing and provided with a flange that is adapted to be engaged and moved by said cooperating drive members, said flange having a cut-out portion in which one of the drive members on the shaft and its cooperating auxiliary drive member normally lie and thus lock said wheel, a lever for elevating said bearing to move the cut-out portion of the wheel out of engagement with said cooperating drive members, and an arm actuated by said lever for imparting initial movement to said wheel; substantially as described.

24. In a door-operating mechanism, a rotatable shaft provided with drive members, a door-operating wheel adapted to be engaged and moved in opposite directions by said drive members, means for causing said wheel to be locked when it occupies a certain position so as to hold the door closed, means for releasing said wheel so as to permit the door to be opened manually, and means for preventing said wheel from becoming locked until the door reaches its closed position; substantially as described.

25. In a door-operating mechanism, a frame, a rotatable shaft mounted in said frame, drive members on said shaft adjacent the upper and lower ends of said frame, a bearing reciprocally mounted in said frame, a door-actuating wheel carried by said bearing and adapted to be engaged and moved in opposite directions by said drive members, means for causing said drive members to lock said wheel when it occupies certain positions, means for raising said bearing to carry said wheel into engagement with the drive member at the upper end of said frame and out of contact with the drive member at the lower end of the frame that locks said wheel when the bearing is in its

lowered position, and a stop which permits the bearing to be raised far enough to carry the wheel out of engagement with its locking drive member but not far enough to cause it to be engaged by the drive member at the upper end of the frame when said rotatable shaft is idle; substantially as described.

26. In a door-operating mechanism, a frame, a rotating shaft journaled in said frame and provided with drive members, a bearing reciprocally mounted in said frame, a door-actuating wheel on said bearing that is adapted to be engaged and moved by said drive members, a member reciprocally mounted on said frame and adapted to be raised by said bearing, pivotally mounted cams connected to said member, and flanges or collars on the rotating shaft that cooperate with said cams; substantially as described.

27. In a door-operating mechanism, a frame, a rotating shaft mounted in said frame and provided with drive members, a bearing reciprocally mounted on said shaft, a door-actuating wheel carried by said bearing and adapted to be engaged and moved by said drive members, a member reciprocally mounted on said frame and adapted to be raised by said bearing, a stop on said member for limiting the upward movement of said bearing when said shaft is idle, a device on said member for holding it in a raised position, and a roll on said member for engaging the wheel so as to prevent said bearing from moving downwardly, one of said drive members being adapted to lock the wheel when the bearing is in its lowered position and said wheel being provided with a cut-out portion which comes into alinement with the roll on said member when the door reaches its closed position; substantially as described.

28. In a door-operating mechanism, a frame, a rotating shaft journaled in said frame and provided with drive members, a bearing reciprocally mounted inside of said frame, a door-actuating wheel carried by said bearing and adapted to be engaged and moved in opposite directions by said drive members, means for moving said bearing to carry the wheel first into engagement with one of said drive members and then into engagement with the other drive member, means that holds the wheel out of contact with either of said drive members, and a manually operated pawl cooperating with said means; substantially as described.

29. In a door-operating mechanism, a door, a rotating member, a pivotally mounted door-actuating member, means for causing said rotating member to directly engage said door-actuating member and rock it, an arm rigidly secured to said actuating mem-

ber, and a slot and pin connection between said arm and door; substantially as described.

30. In a door-operating mechanism, a rotating friction drive member, a rockable door-actuating member, means for causing said drive member to engage said door-actuating member and impart movement thereto, and means for causing said drive member to lock said actuating member when it reaches a certain position; substantially as described.

31. In an elevator door-operating mechanism, a rotating shaft provided with two drive members, an oscillating door-actuating member, means adapted to be operated by a device on the elevator cage for shifting said door-actuating member to bring it into engagement with one of the drive members on said shaft, means for shifting said door-actuating member in the opposite direction to bring it into engagement with the other drive member on the shaft when the means first referred to is released, and means for initially moving said door-actuating member when the rotating shaft is idle; substantially as described.

32. In a door-operating mechanism, two drive members, a pivotally-mounted door-actuating member, manually-operated means for moving said door-actuating member into engagement with one of said drive members, yielding means for moving said door-actuating member into engagement with the other drive member when said manually-operated means is released, and means for initially moving said door-actuating member when said drive members are idle; substantially as described.

33. In an elevator door-operating mechanism, a rotating drive member, a rocking door-actuating member, means cooperating directly with said door-actuating member for locking it, and means adapted to be operated by a device on the elevator cage for shifting said door-actuating member out of engagement with said locking means and into engagement with said drive member; substantially as described.

34. In a door-operating mechanism, a rotating shaft provided with a drive member, a door-actuating member, a bearing on which said door-actuating member is mounted, means for moving said bearing to carry the door-actuating member into engagement with said drive member which causes the door to open, and means for preventing said bearing from moving far enough to carry said actuating member into engagement with said drive member when the rotating shaft is idle; substantially as described.

35. In an apparatus of the character described, a door-operating mechanism, a medium for applying power to said mechanism for moving the door, and means whereby

when the power-applying medium is operative the door-operating mechanism is permitted to engage same and when the power-applying medium is inoperative, the door-operating mechanism is prevented from engaging same so that the door can be moved manually; substantially as described.

36. In an apparatus of the character described, a door-operating mechanism, a medium for applying power to said mechanism for moving the door, and automatic means whereby when the power-applying medium is operative the door-operating mechanism is permitted to engage same and when the power-applying medium is inoperative, the door-operating mechanism is prevented from engaging same so that the door can be moved manually; substantially as described.

37. In an apparatus of the character described, a door-operating mechanism, a medium for applying power to the said mechanism for moving the door, and means depending upon the inactivity of the power-applying medium whereby when the power-applying medium is inoperative the door-operating mechanism is automatically adjusted so the door may be moved manually; substantially as described.

38. In an apparatus of the character described, a power-operated mechanism for doors, means for applying power to said mechanism to actuate same, and automatic means whereby when the power-applying medium is inoperative the power-operated mechanism is converted into a manually-operated mechanism so that the door may be operated manually; substantially as described.

39. In an apparatus of the character described, a door-operating mechanism, means for locking the door in a closed position, a medium for applying power to the door-operating mechanism for moving the door, and means whereby when the power-applying medium is inoperative the door-operating mechanism is employed to unlock and start the door so the latter can be operated manually; substantially as described.

40. In an apparatus of the character described, a door-operating mechanism, power-driven means for actuating said mechanism to move the door, and automatic means for preventing the power-driven means from interfering with the movements of the door-operating mechanism when said power-driven means is inoperative so as to permit the door to be operated manually; substantially as described.

41. In an apparatus of the character described, a door-operating mechanism, power-driven means for actuating said mechanism to move the door, and automatic means for causing the door-operating mechanism to assume an inoperative position relatively to the power-driven means when said power-

driven means is idle and thus permit the door to be operated manually; substantially as described.

42. In an apparatus of the character described, a door-operating mechanism, power-operated means for engaging and actuating said mechanism and also locking it, and automatic means for preventing said door-operating mechanism from being engaged by said power-operated means when said means is inoperative so that the door can be operated manually; substantially as described.

43. In an apparatus of the character described, a door-operating mechanism adapted to be connected to a door, power-driven means for actuating said mechanism, and means whereby the power-driven means, though operative, can be rendered ineffective except for moving the door-operating mechanism to open the door; substantially as described.

44. In an apparatus of the character described, a door-operating mechanism adapted to be connected to a door, a power-driven means for actuating said mechanism, and manually-operated means for causing said door-operating mechanism to assume an abnormal condition relative to said power-driven means, so that the door-operating mechanism will only operate to open the door though the said power-driven means continues in operation; substantially as described.

45. In an apparatus of the character described, a door-operating mechanism, a power-driven means for actuating said mechanism, a controlling member for causing said means to engage said mechanism, and means whereby when the power-driven means is idle the door-operating mechanism

is prevented from engaging said means when the controlling member is operated; substantially as described.

46. In an apparatus of the character described, a power-operated mechanism for doors, means for applying power to said mechanism to actuate same, and means whereby when the power-applying medium is inoperative the power-operated mechanism is completely disengaged from said power-applying medium; substantially as described.

47. In an apparatus of the character described, a power-operated mechanism for doors, power-driven means for actuating said mechanism to move the door, and means for causing the door-operating mechanism to assume an inoperative position relatively to the power-driven means and remain completely disengaged therefrom during the time said power-driven means is idle; substantially as described.

48. In an apparatus of the character described, a door-operating mechanism, power-driven means for engaging and actuating said mechanism, said power-operated means being so constructed that it locks said door-operating mechanism, and means for completely disengaging said door-operating mechanism from said power-operated means when said means is inoperative substantially as described.

In testimony whereof I hereunto affix my signature in the presence of two witnesses, this twenty-ninth day of February 1908.

FRANCIS K. FASSETT.

Witnesses:

CARROLL SPRIGG,
WM. H. KUHLMAN.