

No. 807,043.

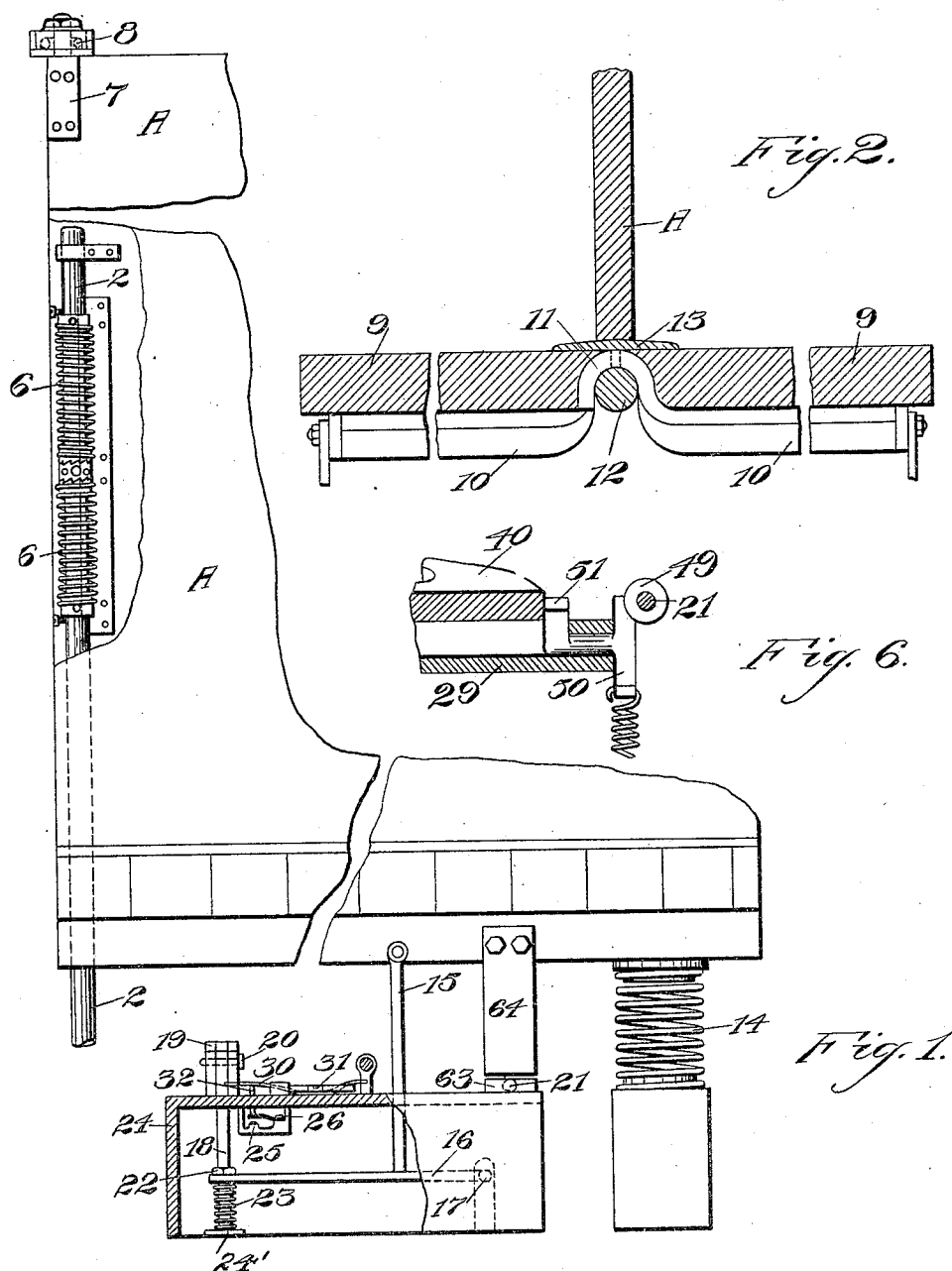
PATENTED DEC. 12, 1905.

K. NISHIMOTO.

DOOR OPENING AND CLOSING DEVICE.

APPLICATION FILED JUNE 7, 1905.

4 SHEETS—SHEET 1.



Witnesses
T. Castberg.
B. Arvise

Kenzemon Aishimoto
Geo. H. Strong. Inventor
By Attorney

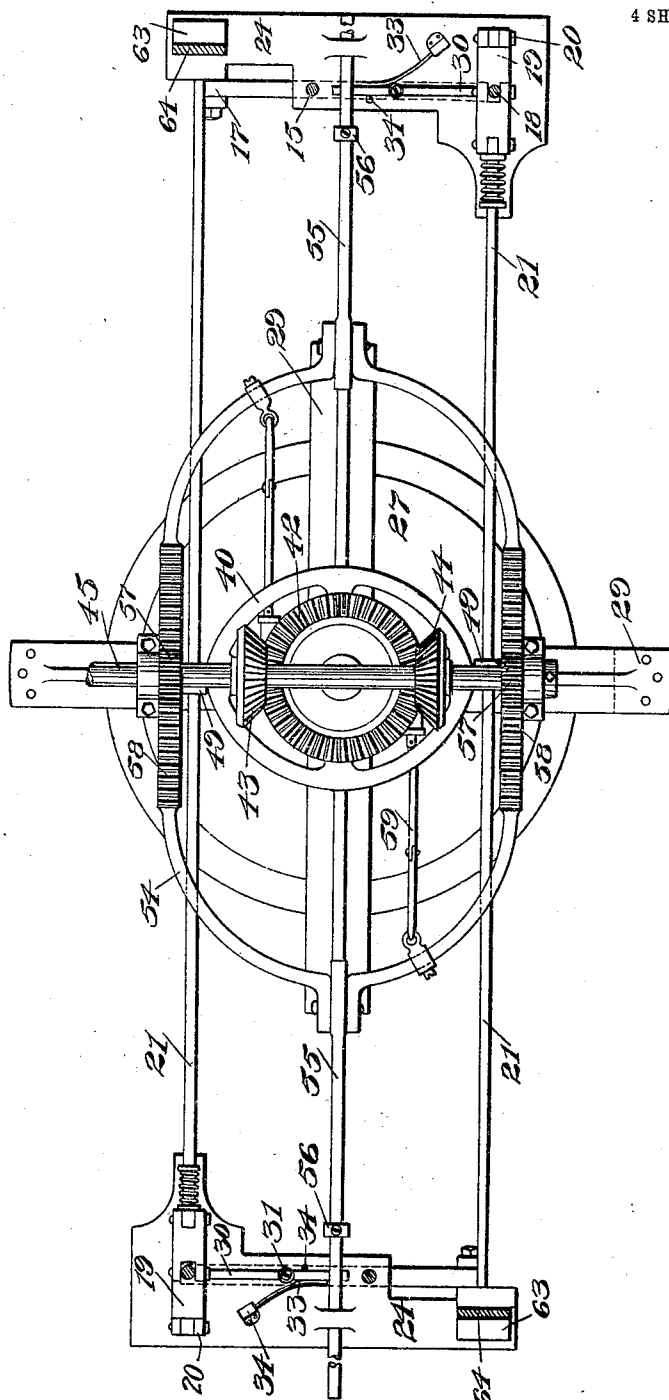
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4 SHEETS—SHEET 2.

Fig. 3.



Witnesses
T. Eastberg.
J. J. J. J.

Inventor
Kenzemon Nishimoto
By Attorney
Geo H. Strong.

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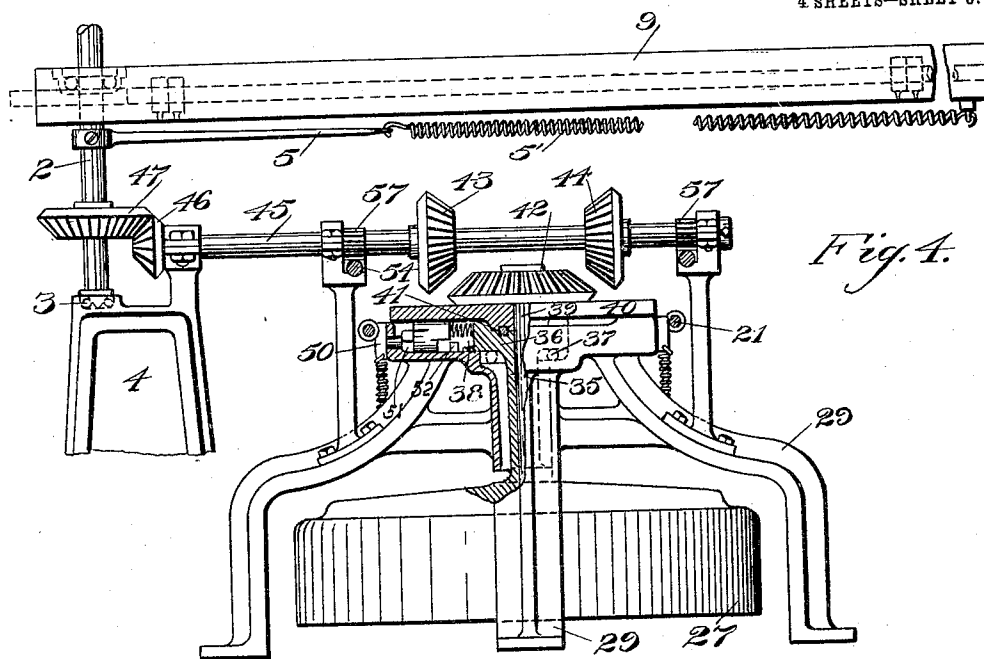
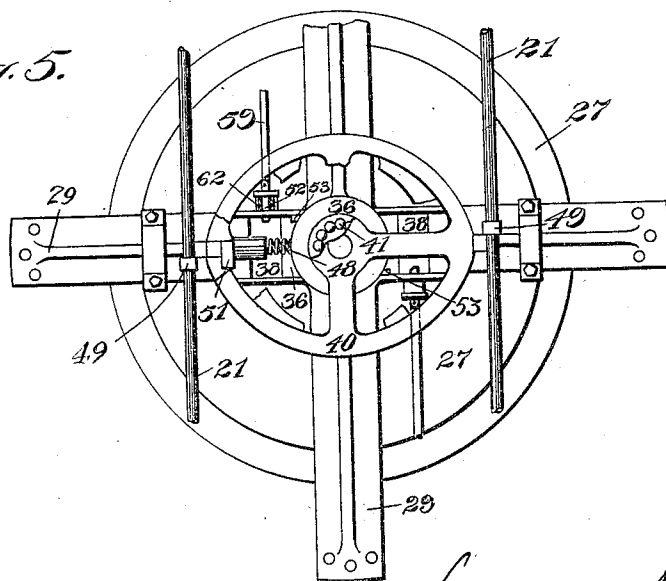


Fig. 4.

Fig. 5.



Witnesses
E. C. Berg
C. A. M. R.

Kengemon Nishimoto
Inventor
Geo. H. Strong
Attorney
By

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4 SHEETS-SHEET 4.

Fig. 8.

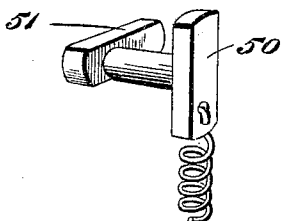


Fig. 9.

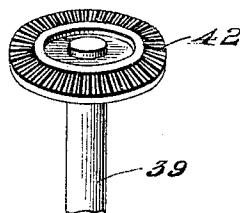


Fig. 10.

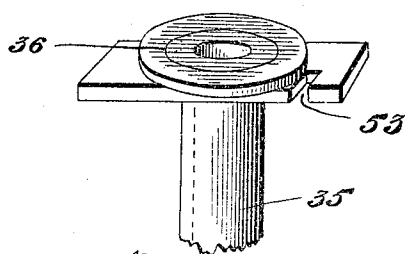
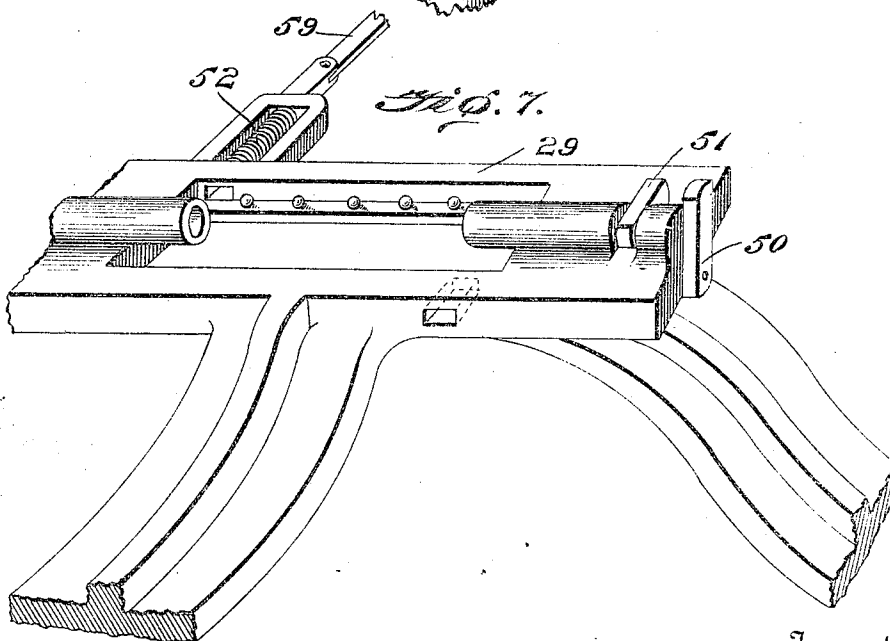


Fig. 7.



Inventor

Kenzaemon Nishimoto

by Geo. H. Strong
his Attorney

Witnesses
B. M. Offutt
J. E. Howell

UNITED STATES PATENT OFFICE.

KENZAEMON NISHIMOTO, OF FRESNO, CALIFORNIA.

DOOR OPENING AND CLOSING DEVICE.

No. 807,043.

Specification of Letters Patent.

Patented Dec. 12, 1905.

Application filed June 7, 1905. Serial No. 264,105.

To all whom it may concern:

Be it known that I, KENZAEMON NISHIMOTO, a citizen of Japan, residing at Fresno, in the county of Fresno and State of California, have invented new and useful Improvements in Door Opening and Closing Devices, of which the following is a specification.

My invention relates to an improved device for automatically opening and closing doors. Its object is to provide a device whereby a door hung to swing in either direction may be opened and closed automatically by the weight of a person and without any need of touching the door in any way by the one desiring to pass or passing through the door in either direction.

The invention consists of the parts and the construction and combination of parts, as hereinafter more fully described and claimed, and having reference to the accompanying drawings, in which—

Figure 1 is an elevation of a fragment of a door in partial section, showing circuit-closing mechanism. Fig. 2 is a detail in section of the platforms and means of hanging them. Fig. 3 is a plan of the door-opening mechanism beneath the platforms. Fig. 4 is an elevation in partial section of the motor and its connections with the door. Fig. 5 is a plan of the elliptical cam and subjacent mechanism. Fig. 6 is a detail in perspective of the cam-shifting means. Fig. 7 is a perspective view of a portion of the casting 29, showing particularly the construction and arrangement of the members 50 and spring-latches 52. Fig. 8 is a detail of a member 50 and spring-latch 51. Fig. 9 is a perspective view of the gear 42 and portion of the motor-shaft. Fig. 10 is a perspective view of the carriage 36, showing the tubular projections 35 and 53.

A represents a door hung to swing in either direction and adapted normally to remain closed. As here shown, the door is provided with a pivot-shaft 2, forming part of the lower hinge and capable of a slight rotative movement in the door and having its lower end projecting below the door and through the floor and provided with a suitable ball-bearing step 3 in the casting 4. Attached to the shaft and to the door are two oppositely-coiled springs 6, operating to limit the rotative movement of the door and designed to relieve the strain on the parts when the door is opened by my mechanism. The upper bearing or hinge for the door is shown as a plate 7, having a part extending up-

wardly above the door and supported in a ball-bearing step 8 in the door-frame. The door is held normally closed by suitable means, as the arm 5 on shaft 2, and the spring 5', attached to the arm and to a fixed support, both the arm and spring being below the floor and adapted normally to stand in line with one another. On each side of the door is a hinged floor-section or platform 9, adapted, through suitable mechanism connecting it with the door, to open the door away from the operator whenever the latter happens to step upon a platform. These platforms may be of any suitable construction and may be hung in any approved manner to produce the desired oscillatory movement. I have shown them as constructed of ordinary floor-pieces attached to metal arms 10, said arms having their ends made hook-fashion, as at 11, to hang on the fulcrum-bar 12, disposed beneath the threshold-plate 13. The bars 10 and flooring of the platform are constructed to form a rigid structure. The free end of the platform is resiliently supported, as by the springs 14, in such a manner that the platform is ordinarily on the same or about the same level as the rest of the floor or sidewalk. From the under side of each platform and at the front end thereof depends a link 15, which bears on a lever 16, having one end suitably fulcrumed at 17 on a fixed support and the other held up by a bolt 18, which latter is supported from the central joint of a toggle 19. The toggle 19 has one member fulcrumed, as at 20, to a fixed support and the other connected to a sliding bar 21, which latter operates the door-opening mechanism, as will be explained shortly. The lever 16 is supported on the bolt 18 by the nut 22, and a spring 23, surrounding the bolt 18, is interposed between the lever 16 and a fixed support 24'. Pressing down on the platform 9 causes the lever 16 to be depressed and the toggle 19 to be elongated. The downward movement of the bolt 18 closes an electric circuit between two contacts 25 26, which sets in motion a motor 27, which is suspended from the frame-casting 29, disposed beneath the door and platform. The closing of the circuit at the points 25 26 is done by means of a leaf-spring 30, pivoted intermediate of its ends, as at 31, on the casting 24 and having an end engageable in a notch in the bolt 18. When the bolt 18 is depressed, the spring 30 pushes down on an insulated plug 32 to press the spring-contact

26 against the contact 25. The spring 30 is held in normal operative position with the bolt 18 by means of the spring 33 and stop 34. The purpose of pivoting the spring in the manner shown will be apparent later on.

Referring to Fig. 4, the casing of the motor 27 has a central vertical tubular projection 35, provided with a cross-head portion 36, supported on balls or rollers 37 in the top of the casting 29. The latter is slotted transversely of the door, as indicated at 38, and the balls 37 are arranged on each side of this opening and bear on suitable tracks on the under side of the cross-head or carriage 36, so that the latter and the motor may be shifted bodily in either direction in said slot. The motor-shaft 39 extends up through the sleeve 35 and cross-head and carries an elliptical plate 40, which turns on ball-bearings 41 on the cross-head and supports the motor-shaft and armature. The shaft 39 also carries above the plate 40 the beveled gear 42. The beveled gear 42 is arranged in suitable relation to and between the two opposed miter-gears 43 44, fixed on the shaft 45, which runs beneath the threshold 13 and parallel with it. The shaft 45 is shown as suitably journaled in bearings carried by the frame-casting 29. The shaft 45 carries a beveled gear 46, engaging a pinion 47 on the vertical door-shaft 2, so that it will be seen that if the gear 42 is moved up against the gear 43 and the motor set in motion the door will be opened in one direction, while if the gear 42 is moved against the gear 44 and the parts revolved the door will open in the other direction. The direction in which the door opens is determined by the direction in which an operator approaches the door and which platform is depressed. As will be seen later, suitable mechanism is provided to prevent both platforms being depressed at the same time. Springs 48 are arranged to bear on opposite ends of the cross-head or carriage 36 in such manner as to tend always to bring the gear 42 into normal inoperative position between the two gears 43 44. The reciprocation of the carriage parallel with shaft 45 to carry the gear 42 into contact with one or the other of the gears 43 44 is done in the present instance by the following means: Beneath each platform is arranged a corresponding toggle 19, which, as before described, connects with a rod 21. These toggles are arranged diagonally opposite one another, so that the rods 21 extend parallel with each other, with a rod on either side of the elliptical plate 40. These rods each carry a stop or a lug 49, which engages a rockable normally spring-retracted angular member 50, fulcrumed in the casting 29, and each member 50 having an arm 51, which is adapted when the member is engaged by a stop 49 and rocked in one direction to be lifted up-right when the shortest diameter of the ellip-

tical plate or cam 40 is opposite this particular arm 51, since the shortest radius of the elliptical cam does not exceed the distance between arm 51 and the center of the shaft 39.

In practice the operation of the device will be as follows: An operator steps on the platform, depressing the latter, closing the circuit between the contacts 25 26, and setting the motor in operation. This setting of the motor in operation causes the elliptical cam 40 and the gear 42 to revolve. At the same time the toggle 19 under this particular platform is straightened out, pushing the rod 21 forward and causing the lug 49 to rock the member 50 and raise the arm 51 up along-side of the cam as soon as the contracted diameter of the latter will allow. The arm 51 being sufficiently resistant, the gear 42 and the motor are pushed away from this arm by reason of the elliptical shape of the cam and the sliding movement afforded by the carriage 36, so that the gear 42 is carried over against the opposite gear on shaft 45 to revolve the latter in the desired direction. Inasmuch as it takes a longer period of time to completely open the door than cam 40 and arms 51 can be depended on alone to keep the two gears in mesh, some means must be provided to prevent the gear 42 moving back when the shorter diameter of the cam again approaches the uplifted arm 51. I have shown a spring-latch 52 carried in the casting 29 and engageable in a notch 53 in the carriage or cross-head 36, whenever the latter is moved in the proper direction. There are two of these latches 52 on opposite sides and at opposite ends of the path traversable by the carriage or cross-head 36. When the carriage 36 is moved in one direction to carry gear 42 into contact with gear 43, the latch 52 on that side will engage in the corresponding notch 53, and when the carriage and cam are moved in the opposite direction to carry the gear 42 into mesh with gear 44 the other latch is engaged. So long as the carriage is thus held by a latch so long will gear 42 remain in mesh with gear 43 or 44. As it is not desired that the power should remain on longer than is sufficient to open the door, the following mechanism is employed to automatically cut off the current and release either of the engaged latches 52 and allow the springs 48 to return the gear 42 into inoperative position. An oval frame 54 is disposed below the shaft 45 and incloses the gears 43 44. Each end of this frame is provided with a rod 55, one rod being intended to operate the spring 30 under one platform and the other rod to operate the other spring under the other platform. Each one of these rods 55 carries a stop 56, which when moved in one direction will engage a corresponding spring 30 to turn the latter on its fulcrum and in opposition to the spring 33, thus moving the spring 30 out of the notch

in the bolt 18, which allows the plug 32 to spring up and break the motor-circuit between the contacts 25 26. The reciprocation of the rods 55 to effect this automatic cutting out of the motor-circuit at the right time is done by means of the pinions 57 on the shaft 45 engaging the rack-surfaces 58 on the opposite sides of the frame 54. When the operator has stepped on the platform and set the motor in motion, which causes the gear 42 to be moved over into engagement with the appropriate gears 43-44, the shaft 45 is made to turn to open the door in the direction away from the platform on which the pressure has been brought to bear. The setting in motion of the shaft 45 also sets in motion the frame 54, and just at the moment that the door is fully opened a stop 56 operates a spring 30 to cut out the motor-circuit in the manner just described. At the same moment that the door is fully opened the latch 52, which happened to have been engaged by the carriage 36 and which is connected by a flexible or jointed member 59 with the adjacent end of the frame 54, will be retracted to release the carriage 36, which moves back into central normal position by reason of the springs 48. The gear 42 thus being carried out of contact with both of the gears 43 44, the spring 5', which has one end connected to the arm 5 on shaft 2 and the other connected with a fixed point of support, will operate to turn the shaft 2, bringing spring 5' and arm 5 into a straight line, thus closing the door. This backward rotative movement of the shaft 45 causes the frame 54 to move into its normal position, carrying the stop 56 away from the spring 30, which once more by virtue of the spring 33, resumes its engagement with the notch in bolt 18, when pressure on the platform is released to allow the toggle 19 to shorten. The return movement of the frame 54 allows the connection 59 to slacken and let the spring 62 push the latch 52 once more into the path of the carriage 36 in readiness for the next operation.

Since means must be employed to prevent both platforms being operated in case two persons approaching from opposite directions come upon both platforms simultaneously or in case one person is on a platform and the door is opening away from him and another person should come upon the platform before the door is fully opened, I provide each rod 21 with a block 63, sliding on a casting 24 and adapted to be projected underneath a projection 64, carried by the platform. If both parties step on the platform at the same time and both platforms are simultaneously depressed, the projections 64 are moved across the path of the blocks 63 and rods 21, and the straightening movements of the toggles 19 are arrested before they could move far enough to rock

the arms 51. Consequently gear 42 remains in inoperative position between the gears 43 44 and the door can be turned either way by hand. If one platform should have been operated in advance of the other, so that its rod should have been pushed far enough to carry its block 63 underneath the projection 64 under the opposite platform, this opposite platform cannot be moved and the door will be opened toward this last-named platform by the mechanism described.

It is possible that various modifications in my invention may be made without departing from the principle thereof, and I do not wish to be understood as limiting myself to the specific construction as herein shown and described.

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

1. In apparatus of the character described, the combination of a door, a gear-shaft connected with the door, and means to operate the shaft to open the door, said last-named means including a motor mounted on a shiftable carriage.

2. In apparatus of the character described, the combination of a door, a gear-shaft connected with the door, and means to operate the shaft to open the door, said last-named means including a motor mounted on a shiftable carriage, a gear carried by the motor, and engageable by the gear on said shaft.

3. The combination of a door, a hinged platform, a motor, a shiftable carriage for the latter, a gear on the motor-shaft above the carriage, a second shaft having gears engageable with but normally out of contact with the motor-gear, and connection between the shaft and the door to open the latter when the shaft is rotated.

4. The combination of a door, an operating-shaft and connections between the latter and the door to turn the latter in unison with the operating-shaft, a gear on said shaft, a gear to engage said shaft-gear, a motor to operate said gear, a shiftable carriage for said motor and its gear, and means to operate said carriage to carry said gears into and out of engagement with each other.

5. The combination of a door, an operating-shaft connected with the door and turnable in unison therewith, a motor, a carriage supporting the motor and shiftable in the line of said shaft, interruptible connections between the motor and said shaft to rotate the latter, and means to control the movements of said carriage.

6. In apparatus of the character described, the combination of a door, an operating-shaft connected therewith, a gear on the latter, a motor-driven gear to engage the first-named gear, a carriage shiftable in the line of the shaft and supporting the motor-driven

gear, and means to operate the carriage to move said gears into and out of engagement with one another.

7. In apparatus of the character described, the combination of a door, an operating-shaft connected therewith, a gear on the latter, a motor-driven gear to engage the first-named gear, a carriage shiftable in the line of the shaft and supporting the motor-driven gear, and means to operate the carriage to move said gears into and out of engagement with one another, said last-named means including an elliptical cam.

8. In an apparatus of the character described, the combination of a door, an operating-shaft connected therewith, a gear on the latter, a motor-driven gear to engage the first-named gear, a carriage shiftable in the line of the shaft and supporting the motor-driven gear, and means to operate the carriage to move said gears into and out of engagement with one another, said last-named means including an elliptical cam connected with said motor-driven gear and carried by the carriage.

9. In an apparatus of the character described, the combination of a door, an operating-shaft connected therewith, a gear on the latter, a motor-driven gear to engage the first-named gear, a carriage shiftable in the line of the shaft and supporting the motor-driven gear, and means to operate the carriage to move said gears into and out of engagement with one another, said last-named means including an elliptical cam connected with said motor-driven gear and carried by the carriage, a motor connected to and movable with the carriage.

10. The combination of a door, an operating-shaft therefor, a carriage slidable in the line of the shaft and carrying a gear to engage a corresponding part on the shaft to rotate the latter, a motor carried by the carriage to rotate said gear, and means to reciprocate the carriage.

11. The combination of a door, an operating-shaft therefor, a gear on said shaft, a second gear, a shiftable carriage supporting said second gear, a motor carried by the carriage to operate said second gear, means to shift said carriage to move said gears into and out of engagement with one another, said last-named means including an elliptical cam, a hinged floor-section, and means operable by the floor-section and interposable in the path of said cam.

12. The combination of a door, an operating-shaft therefor, a gear on said shaft, a second gear, a shiftable carriage supporting said second gear, a motor carried by the carriage to operate said second gear, means to shift said carriage to move said gears into and out of engagement with one another, said last-named means including an elliptical cam, a hinged floor-section, means operable by the

floor-section and interposable in the path of said cam, and means operated by the floor-section controlling the operation of the motor.

13. The combination of a door, an operating-shaft connected therewith, means for operating said shaft, said means including a gear on the shaft, a second gear engageable with said gear on the shaft, a shiftable support for said second gear, a hinged floor-section, and means controlled by the floor-section to operate said second gear, means operated by the floor-section to move said shiftable support to carry said gears into engagement and independent means for disengaging said gears.

14. The combination of a door, an operating-shaft therefor, a gear on said shaft, a second gear engageable therewith, a shiftable support for the second gear, a hinged floor-section, means controlled by the floor-section to operate said second gear, an elliptical cam rigid with said gear, and stop mechanism operated by the floor-section to engage said cam to shift said support and move said gears into engagement.

15. The combination of a door, an operating-shaft therefor, a gear on said shaft, a second gear engageable therewith, a shiftable support for the second gear, a hinged floor-section, means controlled by the floor-section to operate said second gear, an elliptical cam rigid with said gear, a stop mechanism operated by the floor-section to engage said cam to shift said support and move said gears into engagement, means engaging said support to maintain the engagement of said gears during the door-opening movement, and means to release said support the moment the door is opened and disengage the gears.

16. The combination of a door, a hinged platform, a door-opening mechanism operated by the platform and connected with the door, said means including an operating-shaft a gear on the shaft, a second gear engageable with said shaft-gear, a sliding carriage for said second gear, a motor supported by said carriage to operate said second gear, means actuated by the hinged platform to control the motor, an elliptical cam rigid with the second gear, a toggle member operable by the floor-platform, a rod connected with said toggle member, and means operable by said rod to engage said elliptical cam to move the carriage to carry said gears into engagement.

17. The combination of a door, a hinged platform, a door-opening mechanism operated by the platform and connected with the door, said means including an operating-shaft, a gear on the shaft, a second gear engageable with said shaft-gear, a sliding carriage for said second gear, a motor supported by said carriage to operate said second gear, means actuated by the hinged platform to control the motor, an elliptical cam rigid with

the second gear, a toggle member operable
by the floor-platform, a rod connected with
said toggle member, and means operable by
said rod to engage said elliptical cam to move
5 the carriage to carry said gears into engage-
ment, and means controlled by the rotative
movements of the operating-shaft to disen-
gage said gears.

In testimony whereof I have hereunto set
my hand in presence of two subscribing wit- 10
nesses.

KENZAEMON NISHIMOTO.

Witnesses:

S. K. MIKUSE,
CHARLES D. O'CONNOR.