

P. R. FORMAN.
 DOOR OPERATING MECHANISM.
 APPLICATION FILED SEPT. 16, 1909.

Patented Aug. 29, 1911.

3 SHEETS—SHEET 1.

1,001,944.

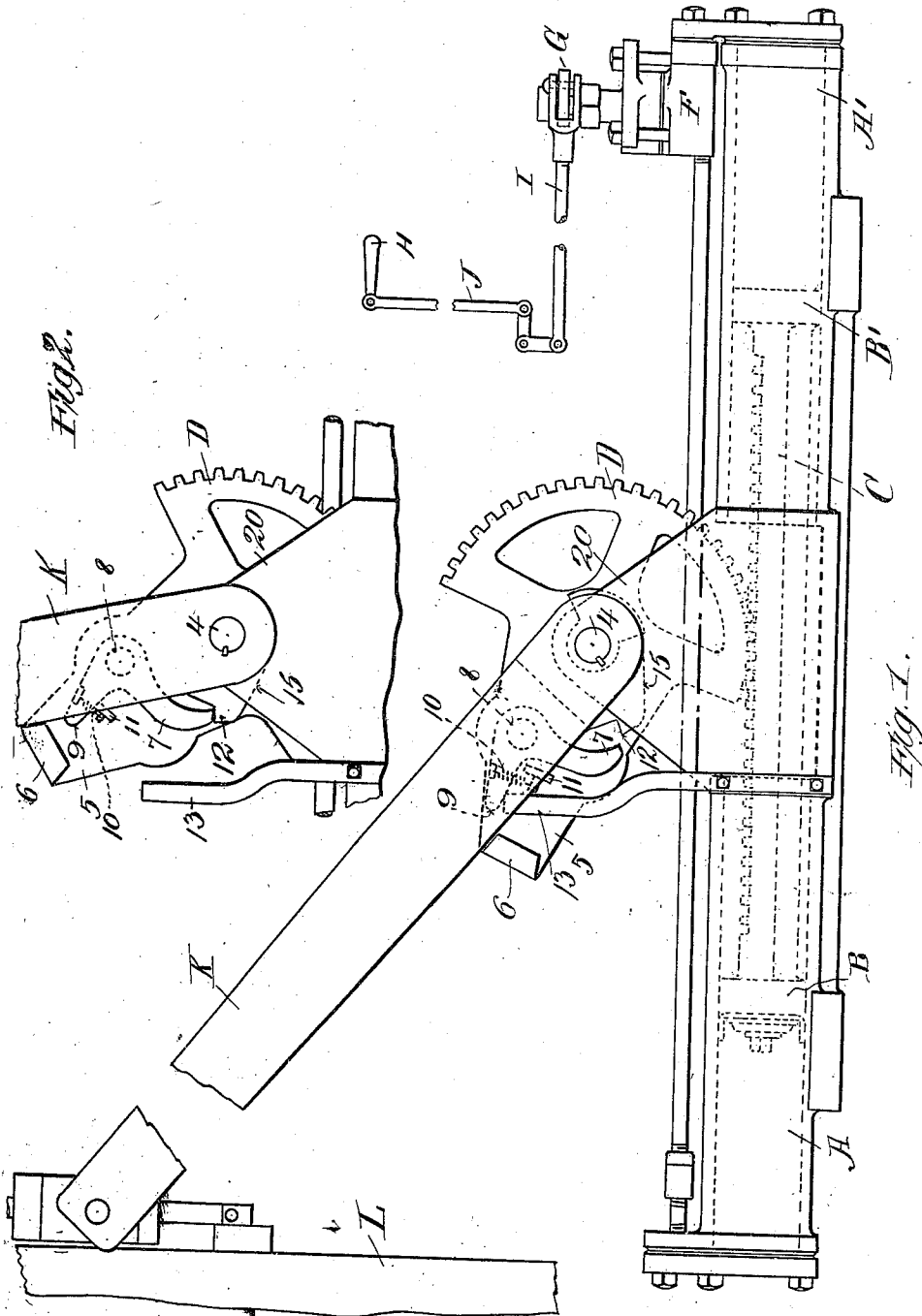


Fig. 2.

Fig. 1.

Witnesses:

J. Klein

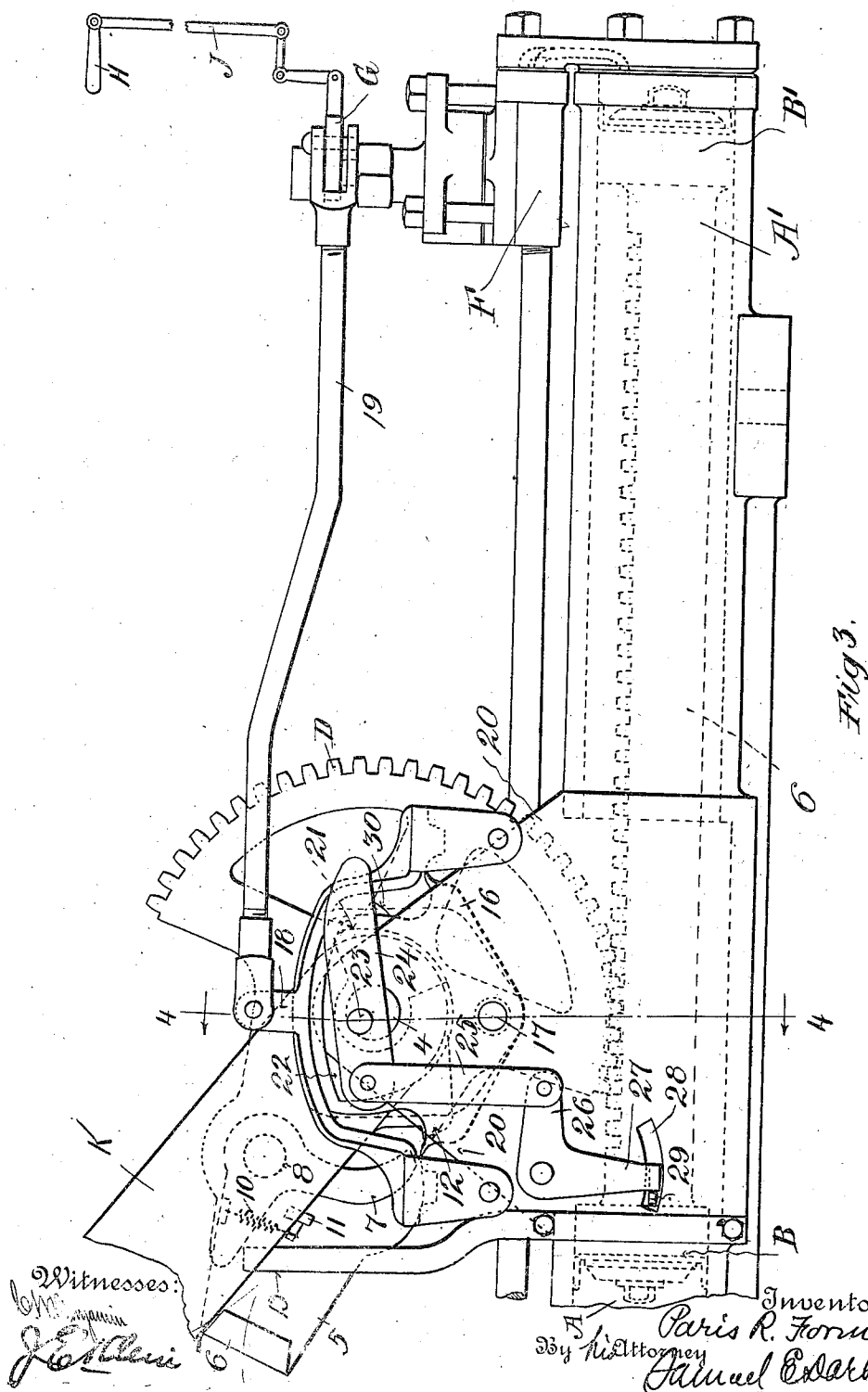
Paris R. Forman Inventor
 By his Attorney
Samuel E. Parby

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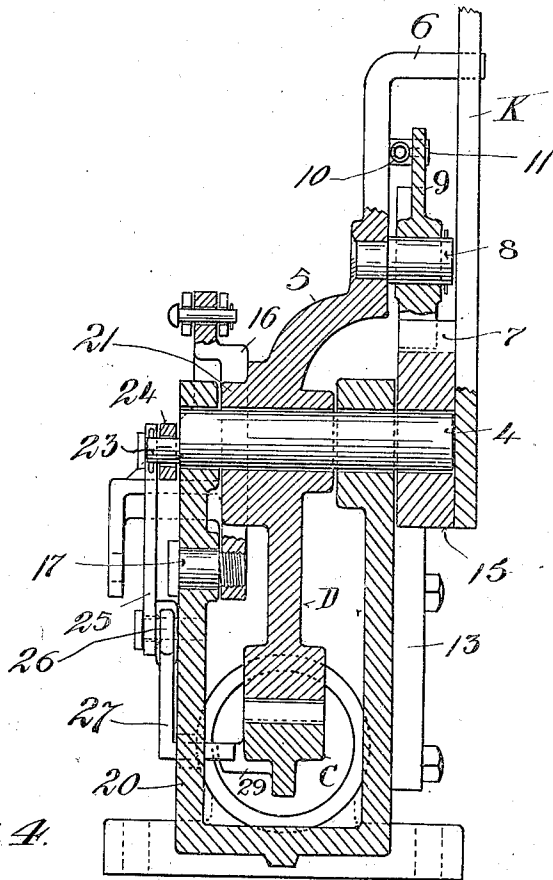


Fig. 4.

Witnesses:
C. C. Humicke

Inventor
Paris R. Forman
By his Attorney
Samuel C. Parby

UNITED STATES PATENT OFFICE.

PARIS R. FORMAN, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO
NATIONAL PNEUMATIC COMPANY, A CORPORATION OF WEST VIRGINIA.

DOOR-OPERATING MECHANISM.

1,001,944.

Specification of Letters Patent. Patented Aug. 29, 1911.

Application filed September 16, 1909. Serial No. 517,973.

To all whom it may concern:

Be it known that I, PARIS R. FORMAN, a citizen of the United States, residing in the city of Chicago, county of Cook, and State of Illinois, have made a certain new and useful Invention in Door-Operating Mechanism, of which the following is a specification.

This invention relates to door operating mechanism.

The object of the invention is to provide power mechanism for operating doors, and means whereby the door can be moved by hand independently of the power operating mechanism.

A further object of the invention is to provide door operating mechanism embodying power devices for moving the door, and automatic releasing means to enable the door to be moved by hand independently of the power devices.

A further object of the invention is to provide door operating mechanism, including power devices for operating the door, and automatic controlling devices whereby when the door is wide open, it can be closed either by hand or by the power devices as desired.

A further object of the invention is to provide a door operating mechanism including power operated devices for moving the door and means whereby the door can be moved by hand, independently of the power operated devices, the power operated devices following up the door movements and effecting the final movement of the door, if desired, and ready to accomplish the power actuation of the door.

Other objects of the invention will appear more fully hereinafter.

The invention consists substantially in the construction, combination, location and relative arrangement of parts, all as will be more fully hereinafter set forth, as shown in the accompanying drawings, and finally pointed out in the appended claims.

In the accompanying drawings,—Figure 1 is a view in side elevation of a construction embodying the principles of my invention. Fig. 2 is a detail view, showing a displaced position of the parts. Fig. 3 is a similar view showing means for causing the power operated devices to follow up the movements of the door when effected by

hand independently of the power devices. 55

Fig. 4 is a view in vertical transverse section on the line 4, 4, Fig. 3, through the pivot of the door operating arm or lever.

In carrying out my invention, I provide power operated devices, which, under suitable control, effects the opening and closing movements of the door. I also provide means whereby the door may be detached from its power operated devices so as to be capable of movement by hand independently of such devices. I also provide means whereby, when desired, the door movements, when effected by hand independently of the power devices, may be followed up by the power devices, and the latter automatically engaged with the door so as to complete, if necessary, the final movements of the door and to hold or lock the door in the limit of its movement, or whereby further movement of the door may be effected in either direction by the power devices. 60 65 70 75

In Figs. 1 and 2, I have shown a door operating mechanism embodying power devices for effecting the operation of the door, with automatic detachable devices whereby the door may be moved by hand independently of its power mechanism, and in Fig. 3, I have shown applied to such mechanism, means for enabling the power devices to follow up and to automatically engage or lock with the door moving devices, whereby the door movements are again under control of the power devices. 80 85

Referring particularly to Figs. 1 and 2, the operating cylinder of the power devices is formed of two portions A, A', arranged in line with each other, in each of which operates a piston B, B', these pistons being connected together through a rack C. The proximate ends of the portions A, A', of the power cylinder are open to the atmosphere and, subject to suitable control, pressure medium is supplied to the remote ends of the portions A, A', from a valve chest F, through the operation of a suitable valve, of which G is the operating arm, the movements of which being controlled in any convenient or suitable manner, or from any desired point, as for instance, by means of a control handle H, and intermediate connections J. The rack C, meshes with and rotatively actuates a segment gear D, for operating the door moving lever K. 90 95 100 105

The parts so far described, in the specific details of construction or operation thereof, form no part of my present invention, and they operate in the usual manner of such devices. The arm K, being connected to the door L for operating the same in the usual or any ordinary or well known manner, so that when the lever K is rocked in one direction or the other, the door is correspondingly moved into open or closed position. In this form of my invention, the door moving lever K, is mounted upon and rocks with a shaft 4, journaled in a standard 20, which is shown as part of the cylinder casting. The segment gear D is loosely hinged or pivoted to rock on the shaft 4, and is provided with an arm 5, having a lug or projection 6, arranged to engage against one edge of the door operating lever K. A pawl 7 is pivoted as at 8, upon the arm or extension 5, of the segment gear, said pawl having an arm 9, normally held by the spring 10, or otherwise, against a stop 11, and in position for the end of the pawl 7 to engage a shoulder 12, formed on or secured to the door operating lever K, and shaft 4. A fixed stop 13, is arranged to engage the arm 9, of the pawl 7, when the door is in its wide open position, whereby the pawl is rocked about its pivot 8, to disengage the pawl from engagement with shoulder 12.

From the description, it will be seen that if the valve control handle H, is moved to operate the valve to admit pressure to the closed end of portion A', of the cylinder, so as to cause the pistons B, B', to move toward the left hand end of the power cylinder, the rack gear D, will be rotatively moved, and with it the arm 5, and the lug or projection 6, in the same direction as that of the hands of a clock, the lug or projection 6, engaging against the rear edge of the door operating lever K, and consequently moving the door. The moment this motion is inaugurated, the arm 9 of pawl 7, will be carried out of engagement with stop 13, thereby enabling spring 10 to move pawl 7 into engagement with the shoulder 12, thereby securely locking the door operating lever K, to the arm 5, and gear D, so that any further motion of the power mechanism, in either direction, will cause a corresponding movement of the door operating lever K, and therefore of the door. If, however, when the door is wide open, this being the position of the parts shown in Fig. 1, and it is desired to close the door by hand, and without the intervention of the power devices, the door can be easily and readily moved toward closed position, since the door operating lever K, and the locking shoulder 12, are movable entirely independently of the arm 5 and pawl 7, said pawl being disengaged from the locking shoulder

12, when the door operating lever is in its extreme position of throw to completely open the door. In other words, by completely opening the door, the power mechanism through which the door operating lever K, may be operated, is entirely disconnected from the door operating lever, leaving the door operating lever free to rock or swing independently of the power devices, and hence enabling the door to be moved by hand toward closed position, the operating mechanism being left in the position corresponding to that occupied by it when the door is wide open. In this manner, the door may be, if desired, completely closed or opened by hand, and independently of its power operating mechanism. Whatever position into which the door is moved, by hand, whether it is partially closed or completely closed, after being detached or disconnected from its power operating devices, said power operating devices are left in condition to be again coupled operatively with the door moving lever K. This is accomplished by manipulating the valve control handle H, or the valve arm G, in such manner as to admit the pressure medium to the closed end of portion A' of the cylinder, thereby causing the rack bar C, connecting the pistons B, B', to move toward the left, and through the engagement of said rack bar with segment gear D, causing the latter to rock freely about its pivot shaft 4, and in a direction to cause the lug 6 of arm 5, to approach or follow up the door operating lever K. When the door was moved by hand from its wide open position, and after the pawl 7 has been disengaged from shoulder 12, said shoulder moved freely past the engaging end of pawl 7. Therefore, when the segment gear D is rocked to cause lug 6 to follow up or approach the door operating lever K, and effect a reengagement of the pawl mechanism with the door operating lever K, the engaging end of pawl 7 rides over the surface 15, until said engaging end snaps again into engaging relation with respect to shoulder 12, under the influence of the tension of spring 10, thereby again locking the power operating mechanism to the door operating lever, the pawl 7 engaging the shoulder 12, in one direction, and the lug 6, engaging the door operating lever K, in the other direction so as to compel coincident movement of the power mechanism and the door operating lever K. Thereafter, the power mechanism may complete the closing movement of the door, if the door has not already been completely closed by hand, and also securely holds the door closed by the pressure of the operating medium in the power cylinder.

In practice, I prefer to so arrange the parts that when the door is closed, the door

moving lever K, will occupy substantially or approximately a horizontal position, thereby affording a lock to hold the door securely in its closed position, even if the pressure medium in the power cylinder be entirely exhausted from such cylinder, through accident or otherwise.

It may sometimes be desired to cause the power operating mechanism to automatically follow up and be reengaged or recoupled to the door operating lever after the power mechanism has been disconnected from the door operating lever, by moving the door into completely opened position, as above explained, to permit the door to be moved by hand, independently of the power mechanism. It may also be desired to provide means for automatically operating the valve in the valve chest so as to secure a cushioning effect of the door as it approaches the limits of its movement. In Fig. 3, I have shown means for accomplishing these purposes, as one particular embodiment of devices for accomplishing said results, and wherein a casting 16, is pivotally mounted as at 17, upon the standard 20. This casting 16, is provided with a lug 18, connected through a rod 19, with the valve operating lever G, so that by rocking casting 16, in one direction or the other, the valve lever G is automatically rocked to actuate the valve. A cam, indicated in dotted lines at 21, is attached to the side of the segment gear D, and works through an opening or seat, indicated at 22, in the casting 16, whereby the valve controlling lever G, may be automatically operated, as the power mechanism approaches the limits of its stroke in either direction to effect a cushioning of the door movements, in a well known manner, as the door approaches the limits of its movements. Attached to the end of shaft 4, upon which the door operating lever K is mounted, and which rocks with said lever, is a pin or stud 23, said pin or stud being mounted in eccentric relation with respect to said shaft 4. An arm 24, is pivotally mounted intermediate its ends upon the stud 23. To one end of arm 24, is pivotally connected a link 25, the other end of said link being pivotally connected to an arm 26, of a bell crank lever, the other arm 27 of which projects at its end through a slot 28, in casting 20, or in the cylinder casting, or otherwise, into the path of a lug 29, connected or mounted to move with the rack C. The free end of the arm 24, is free to move upwardly when rocked about its pivot stud 23, but when rocked downwardly, said free end of arm 24, brings up against a lug 30, formed on casting 20. It will be noticed that since the pin 23, is mounted in eccentric relation with respect to the axis of shaft 4, therefore, when the door operating lever K, is moved from the position occupied by it when the door is in

completely opened position, this being the position shown in Fig. 3, the shaft 4, is also axially rotated in the direction of the hands of a clock. Consequently, the eccentric stud 23, will be moved around the axis of rotation of shaft 4. If, at the time the door operating lever K is thus moved to cause the door to move toward closed position, and the eccentric stud 23, correspondingly moved, as above stated, the power operating mechanism is moving with said lever K, the pistons B, B', and rack bar C are coincidentally moved, the lug 29, will be immediately withdrawn from proximity to the bell crank lever arm 27, and therefore the movement of eccentric stud 23, about the axis of shaft 4, will merely result in freely moving or rocking the bell crank 26, 27, and the valve controlling mechanism will not be in any way affected. So long, therefore, as the power operating mechanism is coupled or connected to the door operating lever K, so as to move together, the valve controlling lever G, will not be affected by the position of eccentric stud 23. If, however, the door operating lever K, is disconnected from the power operating mechanism, and is moved by hand in the direction to close the door, so that the eccentric stud 23 is moved around the axis of shaft 4, the pistons and rack C, not being moved, the lug 29, will serve as a stop to prevent the free rocking movement of the arm 27 of the bell crank lever, and therefore the movement of eccentric stud 23, referred to, will be imparted to the free end of arm 24, which free end will consequently be forced against lug 30, thereby rocking the casting 16, about the pivot 17, and causing the valve lever connecting rod 19, to be moved toward the right. These various connections are so proportioned, that just as the door approaches and nearly reaches its closed position, the valve lever connecting rod 19 will have been sufficiently moved to place the valve lever G in such a position that the operating medium in the power cylinder will be reversed, thereupon causing the pistons and rack C, and consequently, the segment gear D, to move in the reverse direction, or in a direction to follow up automatically the door closing movement of the lever K, thereby completing the closing movement of the door, if such movement has not already been completed, and securing the door in closed position, the power mechanism automatically attaching itself, as above explained, to the door operating lever, and hence again placing the door operating lever under the control of its power operating devices.

It will be noticed that as soon as the pistons and connected rack begin to move in a direction to cause the rack arm 5, to follow after, or to follow up the movement of the door operating lever K, the lug 29 will be withdrawn from engaging relation with re-

spect to the bell crank arm 27, thereby releasing the lock which previously had held the free end of arm 24 against the shoulder 30, of casting 16, and consequently enabling the casting 16, thereafter to be freely rocked, as, for instance, by manipulating the valve control lever G, by the actuations of hand lever H, and thereby enabling the power mechanism under control of the hand lever H, to be brought into action to move the door to open position. It will be seen therefore, that the final closing movement of the door, not only automatically moves the valve to cause the power mechanism to follow up the door closing movement of lever K, the follow up movement of the power mechanism being initiated just as the door approaches its closed position, but also the mechanism which automatically moves the valve lever, in the manner just described, is automatically released, as soon as the power mechanism has started on its follow up travel, so as to permit thereafter the manual control of valve lever G, from the hand lever H.

From the foregoing description, taken in connection with the drawings, it will be seen that I provide a simple and efficient door operating mechanism, having power devices for moving the door, which is capable of being detached to permit movements of the door by hand, when desired, and wherein the power devices are permitted to follow up the manual movements of the door, and to again become automatically coupled thereto. It will also be seen that, when desired, the follow up movement of the power mechanism will be accomplished automatically.

A construction of door operating mechanism possessing the characteristics hereinabove referred to, is applicable for use upon elevated, subway and surface street cars, elevators and the like, where door operating mechanisms are employed, and the construction affords special advantages in the handling of large crowds in entering and leaving the cars, and which crowds are sometimes so great as to require attendants or guards on the platforms or stations, or where the closing of the doors by a motor, in case of passengers crowding on the car, might be dangerous and result in injury or damage to the passengers. It will be seen that a structure embodying my invention, enables the guard on the platform or on the car to close the door easily by hand, thereby avoiding danger of injury to passengers and after the door is closed or nearly closed, the power mechanism is manipulated so as to follow up the door, and fasten it securely in its closed position.

While I have shown and described specific structures embodying the principles of my invention, my invention, as defined in

the claims, is not to be limited or restricted to the specific details of structure and arrangements shown.

Having now set forth the object and nature of my invention, and a construction embodying the principles thereof, what I claim as new and useful, and of my own invention, and desire to secure by Letters Patent is:—

1. The combination with power operated devices having detachable engaging connections adapted to be connected to a door for moving the latter in both directions, of means independent of the power operated devices for moving the door by hand independently of the power operated devices.

2. The combination with power operated devices having detachable engaging connection with a door to move the same, of automatic means for disconnecting the door from its power operating means, and means independent of the power devices for moving the door by hand.

3. The combination with a door, of power operated devices for moving the same, detachable devices for disconnecting the power operated devices and door, whereby the door may be moved manually, and means for automatically causing the power devices to follow up the manual movements of the door.

4. The combination with a door, of power operated devices for moving the same, means for automatically disconnecting the power devices from the door when the door is in its opened position, whereby the door may be moved manually toward closed position, and means for automatically coupling the power devices and door.

5. The combination with a door, of power devices for moving the same, means for disconnecting the power devices from the door, whereby the door movements may be effected manually, means for causing the power devices to follow up the manually operated door movements, said means operating to automatically connect the power devices and door.

6. The combination with a door, of a power cylinder and piston, gearing actuated by said piston for moving the door, and means for detachably connecting said gearing and door when the latter is in opened position.

7. The combination with a door, of an operating lever therefor, power devices for moving said lever, and means for detachably connecting said power devices and lever.

8. The combination with a door, of an operating lever therefor, a rocking arm, said lever and arm being mounted for independent movement, said arm arranged to engage said lever to be moved in one direction, a pawl to lock said arm and lever, when said arm is moved in the other direc-

tion, power devices for rocking said arm, and means for automatically disconnecting said pawl.

9. The combination with a door, of an operating lever therefor, a power driven arm arranged to engage said lever to move the same in one direction, and a detachable pawl arranged to engage the lever to move the same in the other direction, and means for automatically releasing said pawl when the door is in its opened position.

10. The combination with a door, of an operating lever therefor, a movable arm arranged to engage said lever to move the door toward closed position, a pawl arranged to engage said lever to move the same in the opposite direction to open the door, power devices for moving said arm, and means for automatically detaching said pawl when the door is in its completely opened position.

11. The combination with a door, of an operating lever therefor, a movable arm arranged to engage said lever, to move the same into a direction to close the door, a detachable pawl to engage the lever to move the door toward opened position, power devices for moving said arm, means for automatically detaching said pawl when the door is in its opened position, whereby the door may be moved manually and independently of the power devices, and means for moving said arm and pawl into engaging relation with said lever when the door is partially closed.

12. The combination with a door, of a rocking lever for moving the same to opened or closed position, power devices for rocking said lever, means for detachably connecting said power devices and lever to permit manual operation of the door, and means for automatically connecting said power mechanism and lever, as the door moves toward closed position.

13. The combination with a door, of an operating lever therefor to move the same into opened or closed position, power operated devices for moving said lever, including a movable arm, said arm being mounted

for independent movement for connecting and disconnecting said arm and lever.

14. The combination with a door, of an operating lever therefor, a power driven arm mounted independently with reference to said lever, detachable connections between said arm and lever, such parts being disconnected automatically when the door is in opened position, whereby the door may be moved manually, independently of the power driven arm, and means for causing said arm to follow up the door movements and automatically engage said lever.

15. The combination with a door, of a power cylinder having a piston, a rack operated thereby, a gear operated by said rack, an arm connected to said gear to move therewith, an independently mounted door operating lever arranged to be engaged by said arm when the latter is moved in one direction, a pawl carried by said arm, and engaging said lever to move the same in the other direction, and a stop to automatically disengage said pawl when the door is in its opened position.

16. The combination with a door, of an operating lever therefor, a power driven arm, said arm and lever being mounted for independent movement, said arm arranged to engage said lever to move the same in one direction, a pawl carried by said arm and arranged to engage said lever in another direction, a stop to automatically disengage said pawl when the lever is in one limit of its movement, whereby the door and its operating lever may be operated independently of the power driven arm, and means operated by the independent movement of said lever to cause said arm to follow up said lever and automatically engage and lock with the same.

In testimony whereof I have hereunto set my hand in the presence of the subscribing witnesses, on this fourth day of September A. D., 1909.

PARIS R. FORMAN.

Witnesses:

E. REILLY,
FRANK JOHNSON.