No. 795,897. PATENTED AUG. 1, 1905.

C. A. CRIQUI.

DOOR RELEASING APPARATUS.

APPLICATION FILED MAR. 28, 1904.

4 SHEETS—SHEET 1.

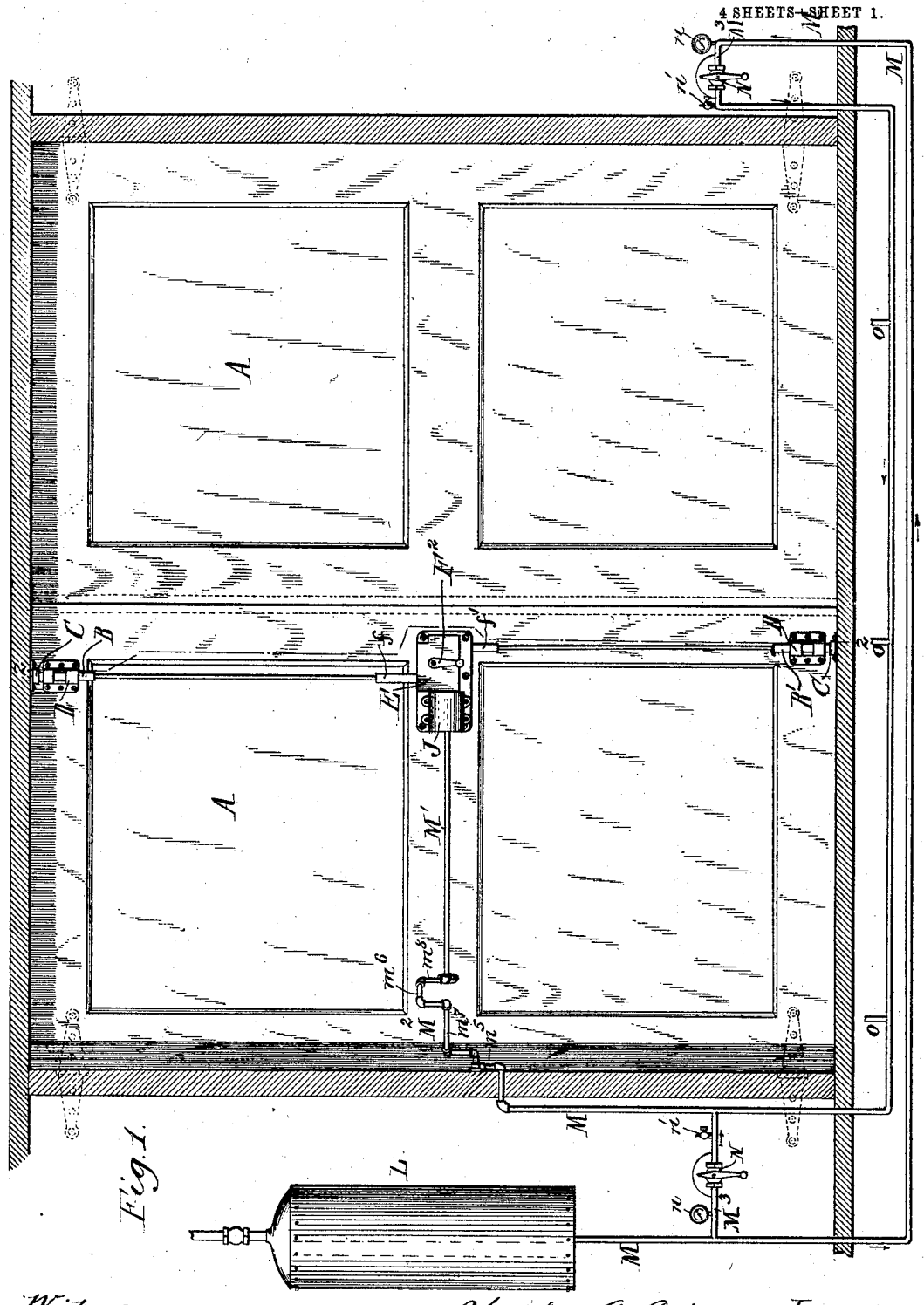


Fig. 1.

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4 SHEETS—SHEET 2.

Fig. 2.

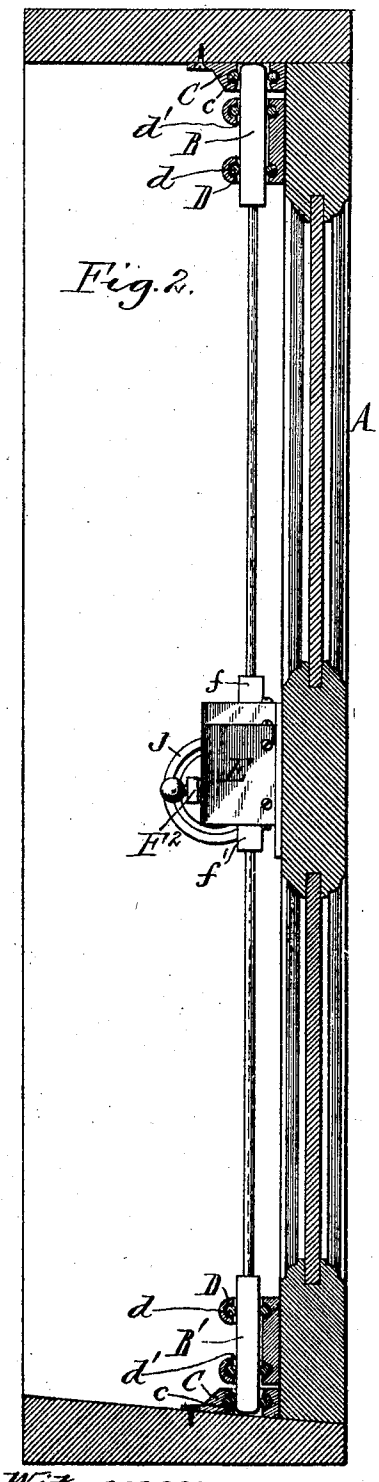


Fig. 3.

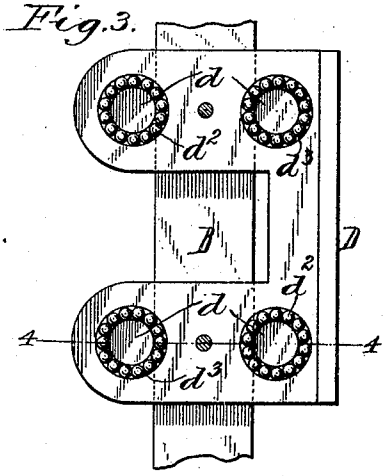


Fig. 4.

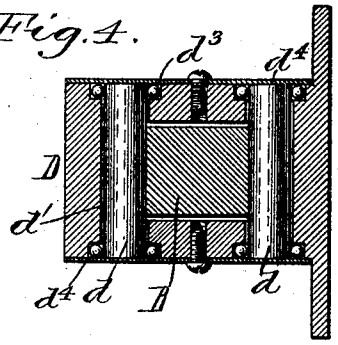
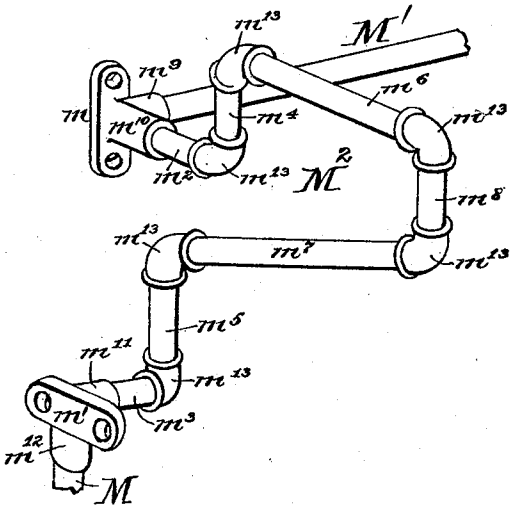


Fig. 5.



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4 SHEETS—SHEET 3.

Fig. 6.

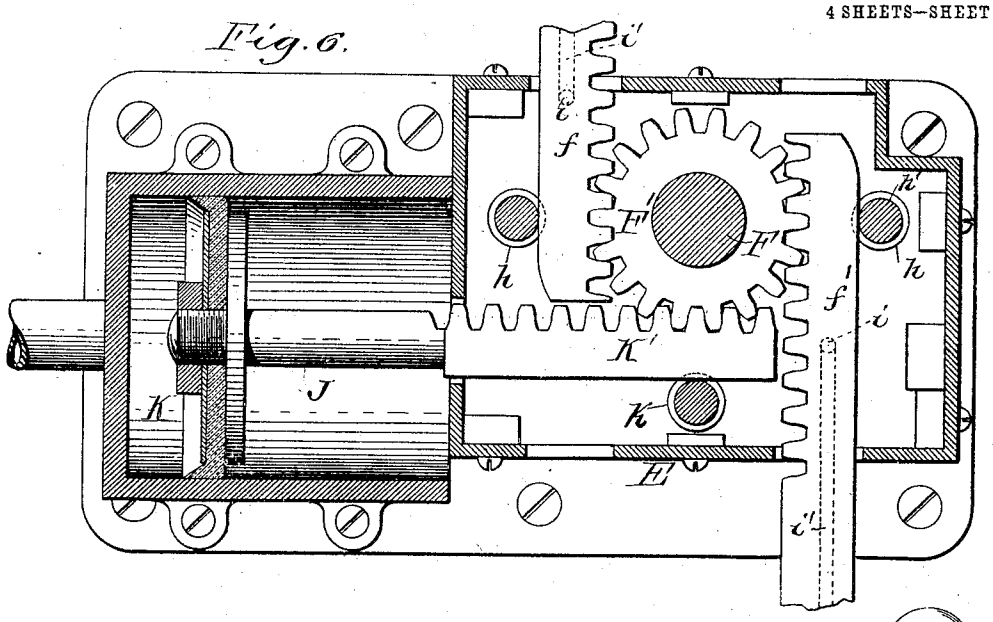


Fig. 7.

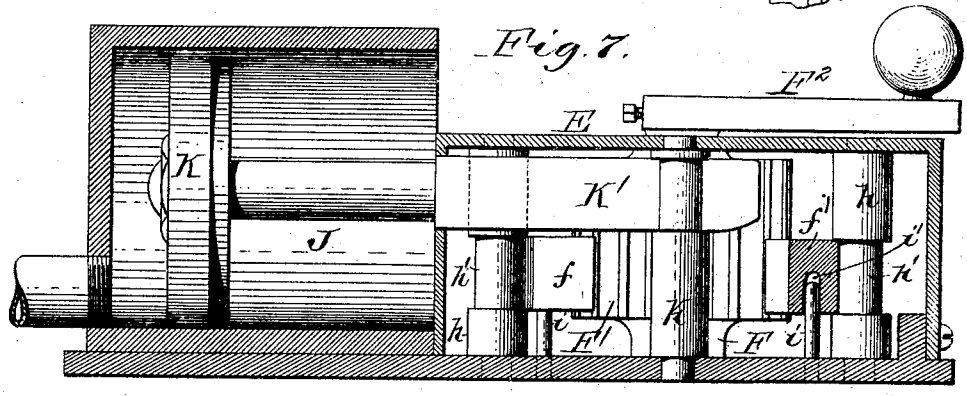


Fig. 8.

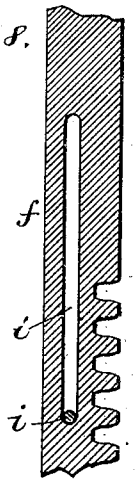


Fig. 10.

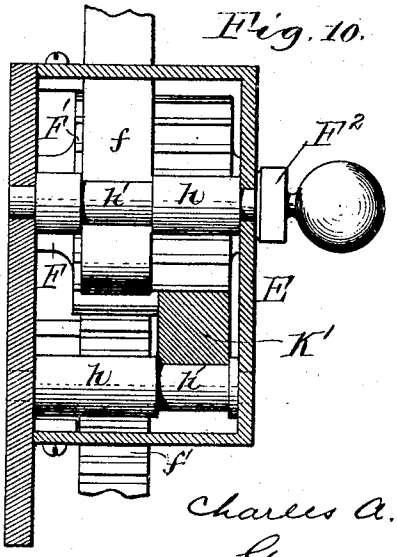


Fig. 9.



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APPLICATION FILED MAR. 28, 1904.

4 SHEETS—SHEET 4.

Fig. 11.

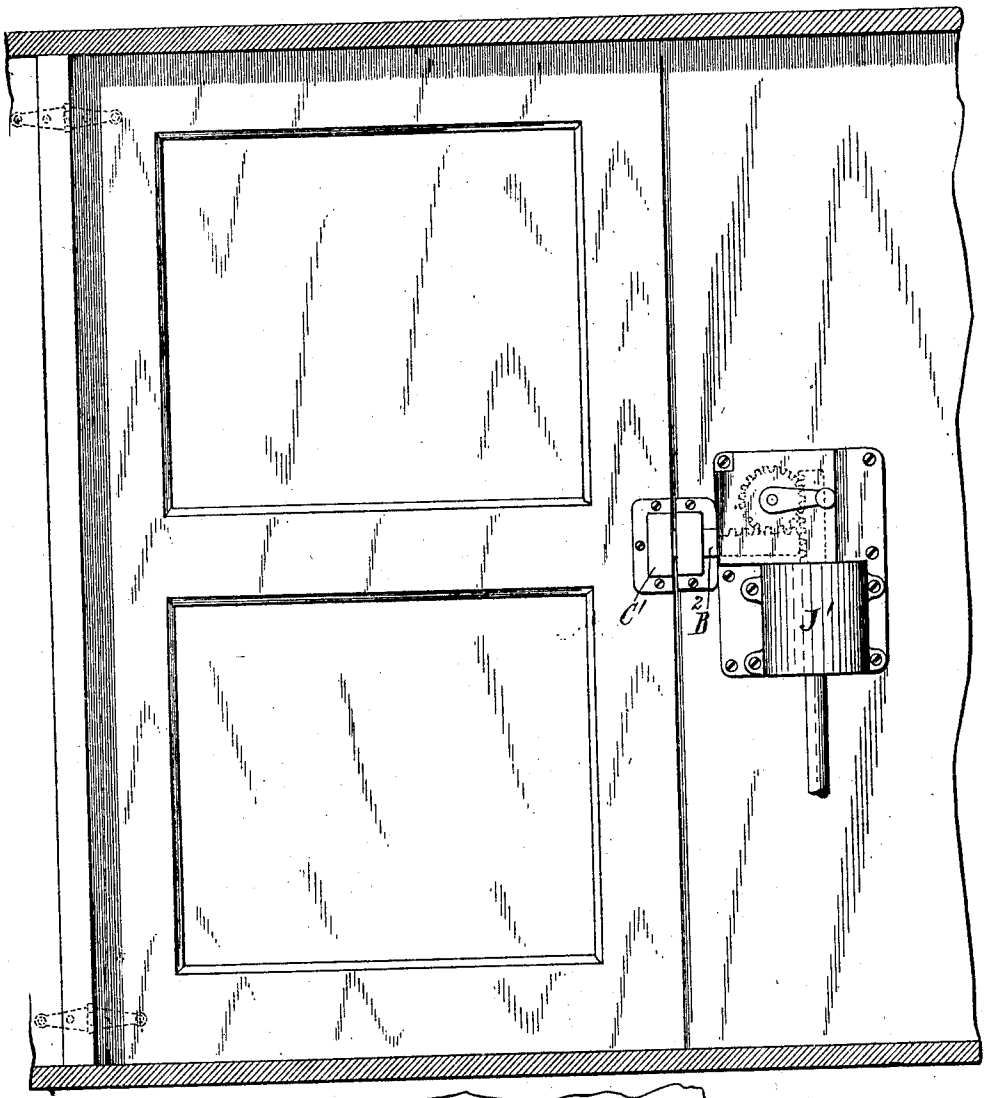
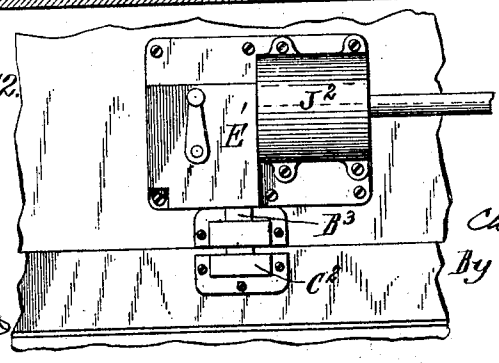


Fig. 12.



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UNITED STATES PATENT OFFICE.

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DOOR-RELEASING APPARATUS.

No. 795,897. Specification of Letters Patent. Patented Aug. 1, 1905.

Application filed March 28, 1904. Serial No. 200,265.

To all whom it may concern:

Be it known that I, CHARLES A. CRIQUI, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Door-Releasing Apparatus, of which the following is a specification.

This invention relates to a door-opening apparatus designed more especially for simultaneously releasing or unbolting the various exits of a theater, school, factory, or similar building in which persons gather in large numbers in order to permit the ready escape of the occupants in case of a fire or other mishap liable to cause a panic.

The object of my invention is the provision of a reliable apparatus of this character which shall be simple in construction and which can be controlled from different parts of the theater or other building, so that in case of emergency the various exits can be promptly opened.

In the accompanying drawings, consisting of four sheets, Figure 1 is a fragmentary vertical section of a building, showing my improved apparatus applied to hinged double doors. Fig. 2 is a transverse vertical section in line 2 2, Fig. 1, on an enlarged scale. Fig. 3 is an enlarged sectional side elevation of one of the bolt-guides with the near side plate removed. Fig. 4 is a horizontal section in line 4 4, Fig. 3, with both side plates applied to the guide. Fig. 5 is a perspective view of the hinge-joint connecting the section of the air-pipe mounted on the door with the adjacent stationary section. Fig. 6 is a longitudinal sectional elevation of the pressure-cylinder and piston and the bolt-shifting mechanism on an enlarged scale. Fig. 7 is a similar section at right angles to Fig. 6. Figs. 8 and 9 are fragmentary longitudinal sections of the toothed portions of the sliding bolts. Fig. 10 is a transverse section in line 10 10, Fig. 6. Fig. 11 is a view similar to Fig. 1, showing the apparatus modified to suit a single hinged door. Fig. 12 is a similar view showing the apparatus applied to a sliding door.

Similar letters of reference indicate corresponding parts throughout the several views.

Referring to the embodiment of the invention shown in Figs. 1 to 10, A A indicate a pair of doors forming the exit of a theater or other building and preferably hinged to swing outward. One of these doors is provided with vertically-sliding bolts B B′, which enter sockets or keepers C, secured to the floor and the lintel, respectively. The end portion of each bolt slides in a guide D, which may be of any suitable construction, but which preferably consists of a casing secured to the face of the door and having upper and lower pairs of antifriction-rollers d, arranged to bear against the front and rear sides of the bolt, as shown in Figs. 2, 3, and 4. These rollers pass loosely through openings d', formed in the side walls of the casing D and are supported at their ends in ball-bearings to reduce the friction to a minimum. Each of the bearings shown in the drawings consists of an annular row of balls d^2, seated in a corresponding groove d^3, formed in the side of the casing. The open sides of the several ball-grooves are closed by cap-plates d^4, secured to opposite sides of the casing, as shown in Fig. 4.

The keepers C are preferably provided with antifriction-rollers c similar to those of the guides D, as shown in Fig. 2.

The two door-bolts B B′ are simultaneously retracted for releasing the door by the following mechanism: E is a casing secured to the door about midway of its height and in line with the bolts. F is a horizontal shaft journaled transversely in said casing and provided within the latter with a gear-wheel F′, which meshes with toothed bars or gear-racks $f\,f'$, formed on or secured to the inner ends of the bolts B B′ and arranged on opposite sides of the gear-wheel, so that the turning of the shaft F causes both bolts to be either retracted or projected in an obvious manner. The front end of the shaft extends through the casing and is provided with a crank F^2, by which it may be turned by hand. The gear-racks $f\,f'$ pass through openings formed in the top and bottom of the casing E and are held in engagement with the gear-wheel F′ by rollers h, journaled in the casing and bearing against the rear sides of the racks, these rollers having annular grooves h', which receive the racks and hold the same against lateral displacement. The gear-racks may be further steadied in their movements by guide pins or projections i, secured to the front wall of the casing E and entering longitudinal grooves i', formed in the sides of the racks, as shown in Fig. 7.

J is a pressure-cylinder preferably mounted on the same base-plate as the casing E, and K is a piston or plunger arranged therein and carrying a gear-rack K′, which extends for-

wardly through the adjacent end of the casing E and meshes with the gear-wheel F′, so that when the piston is forced forwardly by admitting compressed air or other suitable fluid to the cylinder the shaft F is turned in the proper direction to withdraw the bolts B B′ and release the door. In the construction illustrated in the drawings, Figs. 6, 7, and 8, the rack of the piston engages with the under side of the gear-wheel F′ and is arranged on one side of the gear-racks *f f′* of the bolts, the gear-wheel being made wide enough for this purpose. The gear-rack K′ of the piston is steadied by a grooved guide-roller *k*, similar to the rollers *h*.

L is a pressure-tank which is adapted to contain compressed air or other fluid under pressure and from which the cylinder J is supplied by a suitable conduit. Compressed air is preferable for this purpose, and the conduit shown in the drawings consists of a main stationary pipe-line M, extending from the tank to the door jamb or frame and a movable pipe-section M′, carried by the door. One end of this movable section is connected with the cylinder J, while its opposite end is connected with the adjacent end of the main line by a flexible or hinge joint M^2 of any suitable construction which permits the door to open and close without disturbing the connection between the cylinder and the supply-tank. This flexible connection may consist of an ordinary rubber hose; but I prefer to employ the jointed pipe connection shown in the drawings. This connection, which is best shown in Fig. 5, consists of upper and lower bracket-fittings *m m′*, secured to the door-jamb and the inner edge of the door, respectively, short horizontal pipe-sections m^2 m^3 projecting from said fittings, upright pipe-sections m^4 m^5, connected with the outer ends of said horizontal sections, and horizontal pipe sections or arms m^6 m^7, extending outwardly from the upper ends of said upright pipe-sections and connected at their outer ends by a vertical pipe-section m^8. The upper fitting *m* is provided with communicating branches m^9 m^{10}, which receive the pipe-sections M′ m^2, and the lower fitting *m′* has similar communicating branches m^{11} m^{12}, which receive the pipe-sections M m^3. The several pipe-sections forming this hollow hinge-joint are connected by elbows m^{13}, and the sections are screwed into these elbows with sufficient looseness to permit the pipe-arms m^6 m^7 to swing laterally upon each other at their outer ends and on the short horizontal sections m^4 m^5 at their inner ends when the doors are opened or closed.

The main pipe-line M extends to various parts of the building and is provided at different points with branch or connecting pipes M^3, having stop-cocks or hand-valves N for controlling the passage of the compressed air to the cylinder J. A pressure-gage *n* and a petcock *n′* may also be located adjacent to each of these hand-valves, as shown. Other doors of the building may be provided with bolts and bolt-retracting devices like the doors shown in the drawings, the pressure-cylinders of such other doors being supplied by branch pipes *o*, connected with the main line M. When the apparatus is used in a theater, the hand-valves N may be located on the stage and in the ticket-office or foyer, and similar valves can be placed in different parts of the auditorium.

Upon opening any one of the hand-valves N compressed air is admitted to the cylinders J of the various exit-doors, driving the pistons K forwardly and simultaneously withdrawing the bolts of the several doors, as hereinbefore described. The doors are thus free to be thrown open by the attendants or occupants, who can make a hasty exit. After closing the doors their bolts are projected for securing them and the pistons K returned to their initial position by turning the cranks F in the proper direction. The air behind the piston K escapes through the hinged joint in the main line M, which permits the necessary leakage. If desired, however, the petcocks *n′* may be temporarily opened for this purpose.

My improved apparatus is also applicable to a single hinged door having a horizontally-sliding bolt B^2, as shown in Fig. 11. In this case the keeper C′, which receives the bolt, is arranged at the free edge of the door, and the pressure-cylinder J′ is secured to the wall or door-jamb and arranged at right angles to the position shown in Fig. 1. The gear connections between the bolt and the piston of the cylinder are the same as those of the first-described construction and are shown by dotted lines.

The bolts of sliding doors may also be operated by this apparatus. For example, when the same is applied to a horizontally-sliding door, as shown in Fig. 12, the cylinder J^2 and gear-casing E′ are secured horizontally to the lintel of the door and a single locking-bolt B^3 is employed which enters a socket or keeper C^2 in the upper edge of the door.

I claim as my invention—

1. In an apparatus of the character described, the combination of a door, a locking-bolt for the same having a gear-rack, a pressure-cylinder, a piston arranged in the cylinder and having a gear-rack, a shaft having a gear-wheel which meshes with the gear-racks of the bolt and piston, guide-rollers bearing against the rear sides of said gear-racks, and a pressure-supply pipe leading to said cylinder and having a controlling-valve, substantially as set forth.

2. In an apparatus of the character described, the combination of a door, a locking-bolt for the same having a gear-rack, a

pressure-cylinder, a piston arranged in the cylinder and having a gear-rack, a shaft having a gear-wheel which meshes with the gear-racks of the bolt and piston, guide-rollers having annular grooves which receive said gear-racks, and a pressure-supply pipe leading to said cylinder and having a controlling-valve, substantially as set forth.

3. In an apparatus of the character described, the combination of a door, a locking-bolt for the same having a gear-rack, a pressure-cylinder, a piston arranged in said cylinder and having a gear-rack, a shaft having a hand-crank and a gear-wheel which meshes with the gear-racks of the bolt and the piston, and a pressure-supply pipe connected with said cylinder and having a controlling-valve, substantially as set forth.

4. In an apparatus of the character described, the combination of a door, a locking-bolt carried by the same, a pressure-cylinder and piston also mounted on the door, shifting means for the bolt operated by said piston, and a pressure-supply pipe leading to said cylinder and consisting of a stationary section, a movable section carried by the door and a flexible connection between said stationary and movable sections, substantially as set forth.

5. In an apparatus of the character described, the combination of a hinged door, a locking-bolt carried by the same, a pressure-cylinder and piston also mounted on the door, shifting means for the bolt operated by said piston, and a pressure-supply pipe leading to said cylinder and consisting of a stationary section, a movable section carried by the door and a flexible connection between said stationary and movable sections located at the hinged edge of the door and consisting of bracket-fittings secured to the door and the jamb, upper and lower horizontally-swinging pipe-sections having their inner ends connected with said bracket-fittings, respectively, and a vertical pipe-section connecting the outer ends of said swinging sections, substantially as set forth.

6. In an apparatus of the character described, the combination of a hinged door, a locking-bolt carried by the same, a pressure-cylinder and piston also mounted on the door, shifting means for the bolt operated by said piston, and a pressure-supply pipe leading to said cylinder and consisting of a stationary section, a movable section carried by the door and a flexible connection between said stationary and movable sections located at the hinged edge of the door and consisting of a bracket-fitting secured to the door and connected with said movable pipe-section, a similar bracket-fitting secured to the jamb below the plane of the first-named bracket-fitting and connected with said stationary pipe-section, fixed horizontal pipe-sections projecting forwardly from said bracket-fittings and provided at their outer ends with upright pipe-sections, horizontally-swinging pipe-sections connected at their inner ends to said upright sections, and a vertical pipe-section connecting the outer ends of the horizontally-swinging sections, substantially as set forth.

Witness my hand this 25th day of March, 1904.

CHARLES A. CRIQUI.

Witnesses:
C. F. GEYER,
E. M. GRAHAM.