No. 606,640. Patented July 5, 1898.

H. BENNIK.

DOOR OPERATING APPLIANCE.

(Application filed Feb. 21, 1898.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

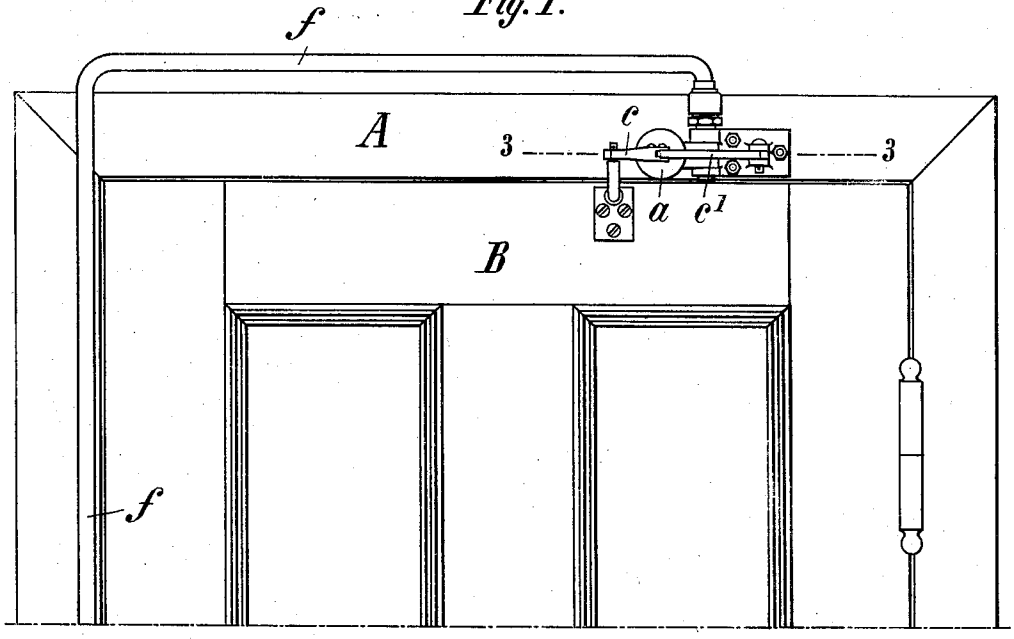


Fig. 4.

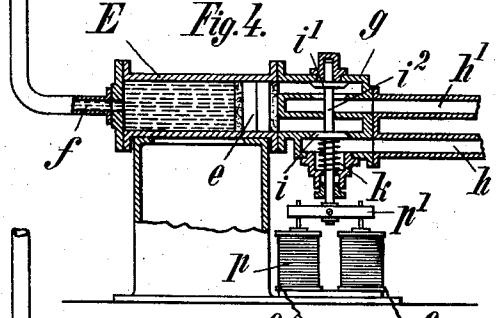


Fig. 5.

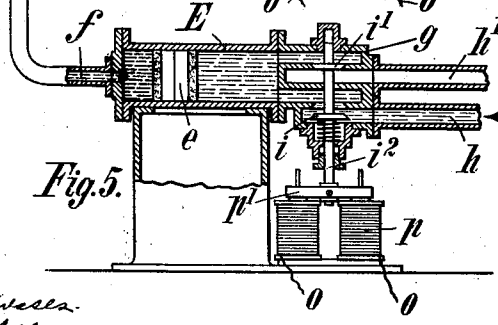


Fig. 7.

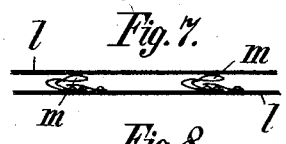
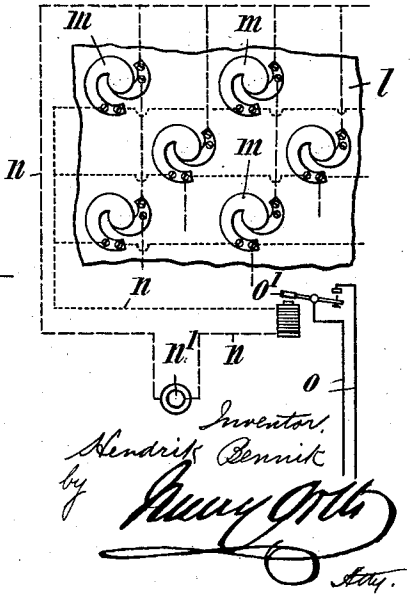


Fig. 8.



Witnesses.
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DOOR OPERATING APPLIANCE.

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(No Model.) 3 Sheets—Sheet 2.

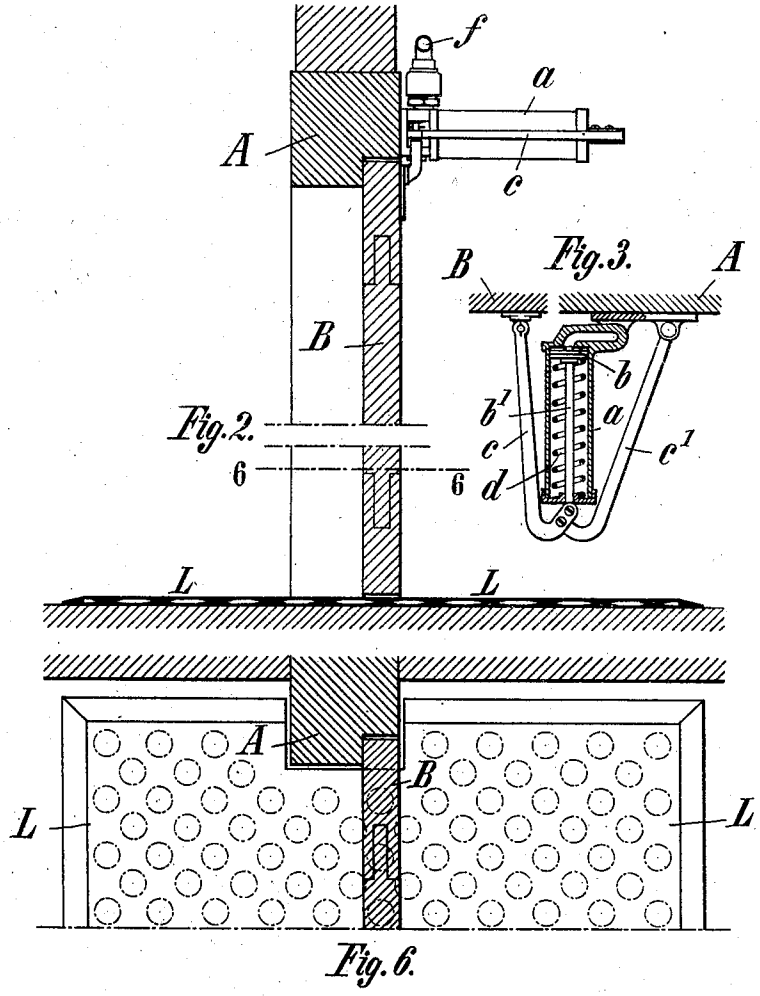


Fig.3.

Fig.6.

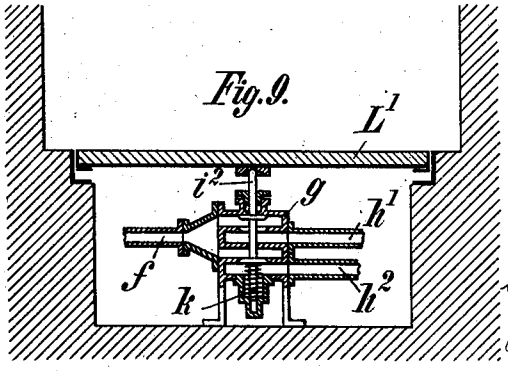


Fig.9.

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DOOR OPERATING APPLIANCE.

(Application filed Feb. 21, 1898.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 10.

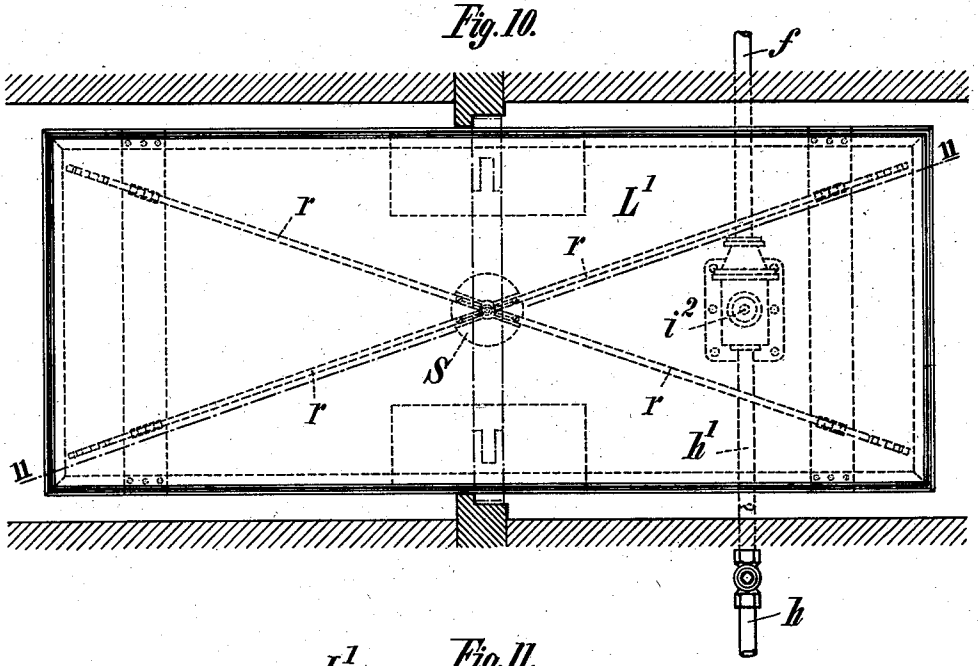


Fig. 11.

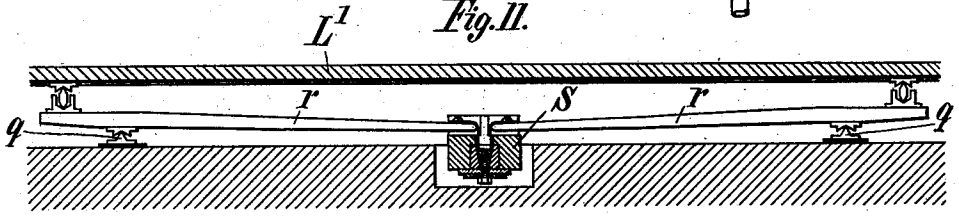
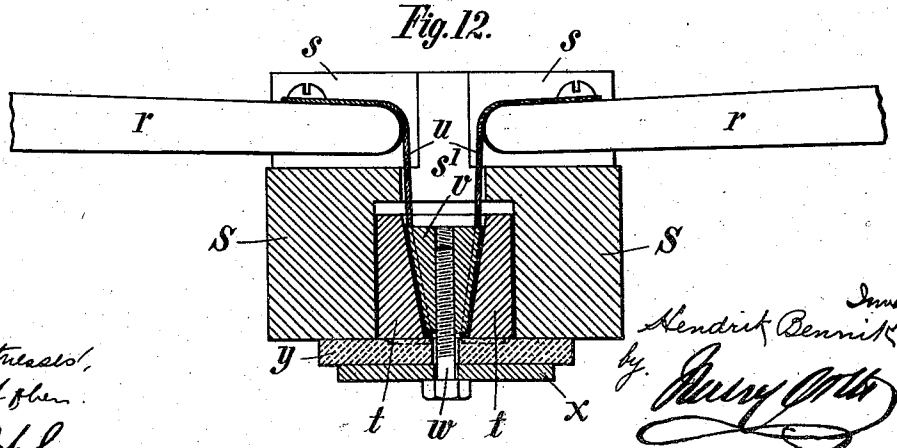


Fig. 12.



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UNITED STATES PATENT OFFICE.

HENDRIK BENNIK, OF HAMBURG, GERMANY.

DOOR-OPERATING APPLIANCE.

SPECIFICATION forming part of Letters Patent No. 606,640, dated July 5, 1898.

Application filed February 21, 1898. Serial No. 671,211. (No model.)

To all whom it may concern:

Be it known that I, HENDRIK BENNIK, a subject of the Queen of the Netherlands, and a resident of Hamburg, in the German Empire, have invented certain new and useful Improvements in Door-Operating Appliances, of which the following is a specification.

This invention has relation to door-operating appliances; and it has for its object the provision of means whereby a door is opened and closed by the weight of a person approaching and leaving the door and whereby the violent closing or slamming thereof is avoided.

In the accompanying drawings, Figure 1 is an elevation of the upper part of a door and door-framing, illustrating the mechanism for opening and closing the door. Fig. 2 is a vertical section of a door and its framing, illustrating the door opening and closing mechanism in side elevation and a contact-plate in the form of a door-mat. Fig. 3 is a section on the line 3 3 of Fig. 1, illustrating in plan view the levers operated by the cylinder-piston and adapted to open and close the door. Figs. 4 and 5 are longitudinal sectional views of the compressing-cylinder, showing the controlling-valves in the different positions they assume. Fig. 6 is a sectional fragmentary top plan view of Fig. 2. Figs. 7 and 8 are fragmentary sectional views, at right angles to each other, of the contact door-mat, said Fig. 8 also illustrating schematically the electric circuit and the leads for the electromagnet that controls the valves for the compressing-cylinder. Fig. 9 is a vertical sectional view of a modified construction of appliances for controlling the valves of the compressing-cylinder directly by the weight of a person approaching or leaving a door. Fig. 10 is a sectional plan of Fig. 9. Fig. 11 is a section taken on line 11 11 of Fig. 10; and Fig. 12 is a detail sectional view, on an enlarged scale, of the arrangement of the levers that support the platform or stepping-plate shown in Figs. 9 to 11.

Referring more particularly to Figs. 1 to 3, *a* indicates a power-cylinder which may be rigidly secured to the upper cross-piece of the door-framing A, but is preferably pivotally connected therewith, so as to swing in a horizontal plane, and is thus adapted to yield to or partake of the movements of the door-operating levers, whereby the opening and closing of the door B is more effectually accomplished than would be the case otherwise. This power-cylinder *a*, as shown in Fig. 1, is arranged some distance from the pivotal axis of the door, so as to reduce the power to be exerted by the operating-levers as much as possible. The cylinder *a* is closed at both ends and contains a piston *b*, that works fluid-tight therein, said piston being secured to a rod *b'*, that extends through the outer cylinder-head, and on said rod *b'*, between the piston and outer cylinder-head, is a power-spring *d*, that normally holds the piston *b* at the inner end of its cylinder *a* and serves to close the door as soon as said piston is relieved from pressure.

To the outer end of the piston-rod *b'* is pivoted one end of a lever *c*, suitably bent for the purpose, the other end of said lever being pivotally connected with the door B, and to said lever *c*, near the point of its connection with the piston-rod *b'*, is pivoted one end of a lever *c'*, whose opposite end is pivoted to the upper cross-piece of the door-frame A. The inner end of the power-cylinder *a* is connected with a conduit *f* for a fluid under pressure, means hereinafter referred to being provided whereby under the weight of a person approaching the door B a fluid is forced into the power-cylinder *a* to drive the piston *b* outwardly, thereby causing the lever *c* to swing outwardly, also to open the door, the lever *c'* acting here as a shifting-fulcrum for the lever *c* and as a brace and guide for the cylinder *a*, which partakes of the movements of the levers *c c'* by swinging on its pivot.

As the piston *b* moves outward to open the door the power-spring *d* is brought under tension, so that when the said piston is released from pressure the said spring will return the piston to its normal position, thereby closing the door. It is obvious that if the conduit *f* is supplied with a fluid under sufficient pressure to move the piston against the stress of the power-spring *d* and the proper means are provided to again relieve said piston from such pressure the door will first be opened by the pressure of the fluid and then closed by the power-spring *d*. It is furthermore obvious that as soon as the piston *b* is relieved from fluid-pressure the fluid will cushion the

piston *b* and thus prevent the door from being too violently shut under the action of the power-spring *d*. Hence the door-operating appliances also perform the function of a door-check.

The devices which control the door-operating appliances and which are themselves controlled by the weight of a person approaching and leaving the door to be opened and closed may be operated electrically or mechanically.

I will first describe the electrically-controlled devices, reference being had to Figs. 4 to 8, inclusive, wherein E indicates a compressing-cylinder in which works fluid-tight a piston *e*, said cylinder being located at any convenient point in the building, preferably in a part thereof protected from severe cold, so as to prevent the liquid, if such be used as a means for actuating the piston *e*, from freezing. The cylinder E is open at one end, and to its opposite end is connected the pipe *f*, both the latter and the cylinder E being filled with preferably a non-congealable liquid, as glycerin, when said pipe is exposed to freezing temperatures, the piston *e* being normally located in said open end of the cylinder, to which is secured a valve chest or casing *g*, which forms practically an extension of cylinder E. Axially within the valve-casing *g* is formed an exhaust-passage connected with an exhaust-pipe *h'*, the closed end of which passage proximate to the open cylinder end forms an abutment for the piston *e*, and in said passage is formed a port and valve-seat for a valve *i'*. The casing *g* is provided with a second or supply passage, which is connected by a pipe *h* to a source of supply of a liquid under pressure, and in said supply-passage is likewise formed a port for a valve *i* on a line with the port for the exhaust-valve *i'*, said admission-port leading into the annular space around the exhaust-passage within the valve-casing. The two valves *i* and *i'* are secured to a valve-spindle i^2, which passes through the aforesaid exhaust-passage and through a suitable stuffing-box, while the upper end of the valve-spindle has motion in a suitably-packed cap. On the spindle i^2, between the valve *i* and stuffing-box, is mounted a coiled spring *k*, that holds the admission-valve *i* normally to its seat and the exhaust-valve *i'* off its seat, Fig. 4. The valve-spindle i^2 projects from the stuffing-box and is connected with the armature *p'* of an electromagnet *p*.

It is obvious that when the electromagnet *p* is energized and its armature attracted the valve *i* will be unseated and the valve *i'* seated, thereby opening the admission-port and closing the exhaust-port. Liquid under pressure or under a sufficient head will thus be admitted to the valve-casing *g*, and acting upon the piston *e* will force the same outwardly, Fig. 5, thereby compressing the liquid in pipe *f*, which liquid will force the piston *b* in the power-cylinder *a* outwardly against the stress of its power-spring *d* to open the door B. As soon as the electromagnet *p* is demagnetized the spring *k* will move the valve-spindle back to its normal position, thereby closing the admission-port and opening the exhaust-port, Fig. 4, and as the piston *e* in cylinder E as well as the piston *b* in power-cylinder *a* are now relieved from pressure the power-spring *d* will drive the said piston *b* inwardly to close the door, thereby forcing the liquid in said power-cylinder back into the pipe *f* and cylinder E, thus causing the piston *e* in the latter cylinder to also move back to its normal position, the liquid between the two pistons acting as a cushion for piston *b*, thereby preventing the door from being violently closed.

The electromagnet *p* is included in an electric circuit or in a shunt thereof, which circuit is closed and interrupted by the weight of a person approaching and leaving the door to be operated, the main circuit-closing device being preferably in the form of a double mat L, Figs. 6, 7, and 8, extending across the door-sill to opposite sides of the door, though two such mats, one on each side of the door, may be employed. This mat L is made of two layers *l l* of electrically non-conductive material, as rubber, and between said layers are arranged a number of circuit-closing devices in such manner that the circuit will remain closed so long as a person stands on the mat on either side of the door. These circuit-closing devices are of a well-known construction and consist of contact-springs *m*, Figs. 7 and 8, similar to the well-known bell contact-springs, adapted to automatically break contact as soon as relieved from the weight of a person stepping on the mat. These contact-springs are included in parallel in the circuit *n* of a suitable generator of electricity, as a battery *n'*, Fig. 8, in which circuit is included a relay *o'*, connected by wires *o* with the aforementioned electromagnet *p*, so that when a person steps upon the mat at either side of the door B the electric circuit will be closed and a current of sufficient amperage sent through the relay *o'* to the electromagnet *p* for the purposes herein-above stated.

Instead of operating the controlling-valves *i* and *i'* electrically, the said valves may be controlled mechanically or directly by the weight of a person approaching a door, and instead of maintaining the pipe *f* and cylinder E constantly filled with a liquid such liquid may be completely exhausted from said pipe and cylinder at each reversal of the valves. This arrangement I have shown in Figs. 9 to 12, inclusive, so that in fact the compressing-cylinder E and its piston *e* can be dispensed with, the valve-casing *g* alone being used and provided, preferably, with a conical head, to which the pipe *f* is connected, as shown in Fig. 9. The mat L is here replaced by a rigid platform L', resting directly on the valve-spindle i^2, so that a person stepping on said platform from either side of the

door will depress the same, thereby seating the exhaust-valve and unseating the admission-valve, as can readily be seen from the construction shown in Fig. 9, the platform L' being provided with a conical seat for the conical upper end of the valve-spindle i^2, so that said platform is free to oscillate on said spindle, as is necessary for the proper operation of the valves. The operation of the door in this arrangement is precisely the same as in the arrangement described in relation to Figs. 1 to 8, except, as stated, that all of the liquid is exhausted from pipe f at each reversal of the controlling-valves i i', the liquid here also acting as a cushion for the piston b in the power-cylinder a, as will be readily understood.

In order that the platform L' may be automatically returned to a normal position corresponding with the normal position of the controlling-valves i and i', (shown and described in connection with Fig. 4,) the said platform is supported from knife-edge bearings at the outer ends of four levers r, extending from the center of the platform to its corners, said levers having their fulcra on similar bearings q, Fig. 11. The inner ends of the four levers r are weighted, so as to tilt the outer ends thereof and support the platform L' in a normal elevated position. The manner of weighting or loading the inner ends of the levers is shown in Fig. 12, a single weight S, common to all the converging inner ends of said levers, being employed. The weight S, which may be a block of lead or other sufficiently ponderous body, has four intersecting notches or recesses s formed in its upper face, one for the end of each of the four levers r, and centrally of the weight is an aperture s', leading from the point of intersection of the recesses into a socket of the weight, in which is fitted a block t, held in place by a clamping-plate x, a washer y of a flexible or elastic material, as rubber, and a screw-bolt w, as follows: In the block t is formed a central downwardly-tapering or conical opening, into which fits a correspondingly-shaped block v, that has a central screw-threaded hole for the aforementioned screw-bolt, which passes freely through the clamping-plate x and washer y. To the inner end of each of the four levers r is secured a wire cable u or the like of such a length as to extend down into the conical or tapering aperture in block v, by means of which and the bolt w said cables are firmly wedged in said block, the clamping-plate x and washer y being of such dimensions as to form a support for the weight S.

To prevent any possibility of slipping of the cables u, they may be made sufficiently long as to admit of their being bent under the block t and become embedded in the rubber washer y when the parts t v y x are secured together by the bolt w, as shown in dotted lines in Fig. 12.

Of course instead of a liquid any other fluid under pressure may be used.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination with a door, a power-cylinder on the door-framing, a spring-controlled actuating-piston in said cylinder and the levers c c' operated by the piston and adapted to open or close the door according to the direction of motion of said piston; of means for admitting a fluid under pressure to said cylinder to move the piston against the stress of its spring, means for exhausting the fluid from said cylinder, and appliances controlling the admission and exhaust of the fluid to and from said cylinder, said appliances adapted to be operated by the weight of a person approaching the door, and means operating automatically to return the controlling appliances to a normal position, for the purpose set forth.

2. The combination with a door, a power-cylinder on the door-frame, a spring-controlled piston in said cylinder, and the levers c c' operated by the piston to open or close the door according to the direction of motion of said piston; of a fluid-conduit connected with the cylinder to move the piston by fluid-pressure against the stress of its spring, a supply-pipe adapted to be connected with a source of fluid-supply under pressure, an exhaust-pipe, each of said pipes provided with a valve-port in communication with the fluid-conduit, valves for said ports adapted to move together to open one port and close the other or vice versa, and appliances for operating said valves by the weight of a person approaching the door and to automatically return the valves to a normal position when said appliances are relieved of such weight, for the purpose set forth.

3. The combination with a door, a power-cylinder on the door-frame, a spring-controlled piston in said cylinder, and the levers c c' operated by the piston to open or close the door according to the direction of motion of said piston, of a compressing-cylinder, a conduit containing a liquid connected with one end of the power and compressing cylinders respectively, a supply and exhaust pipe each provided with a valve-port in communication with the other end of said compressing-cylinder, a valve for each of said ports, said valves adapted to move together, and appliances operated by the weight of a person approaching the door to open the supply-port and close the exhaust-port and to automatically close said supply-port and open the exhaust-port when said appliances are relieved of such weight, for the purpose set forth.

4. The combination with a door, a power-cylinder, a fixed support therefor, a spring-actuated piston in said cylinder levers operated by the piston to open or close the door according to the direction of motion of the piston, a conduit for conducting a fluid under pressure to said cylinder to move said piston

against the stress of its spring, a supply and exhaust pipe each provided with a port in communication with said conduit, and a valve for each of the ports, said valves having motion together to open one port and close the other or vice versa; of an electromagnet, its armature connected with said valves, an electric circuit, spring-controlled circuit-closing devices at the approaches to the door adapted to be operated by the weight of a person to close the electric circuit, and a relay in said circuit electrically connected with the aforesaid electromagnet, for the purpose set forth.

5. The combination with a door, a power-cylinder, a fixed support therefor, a spring-actuated piston in said cylinder, levers operated by the piston to open or close the door according to the direction of motion of said piston, a conduit containing a substantially non-congealable liquid connected with one end of said cylinder to move its piston by the pressure of such fluid against the stress of its spring, a compression-cylinder having one end connected with said conduit, a piston in the last-named cylinder, a supply and exhaust pipe provided each with a valve-port in communication with the other end of the compression-cylinder, and a valve for each of said ports, said valves having motion together to open one port and close the other or vice versa; of an electromagnet, its armature connected with said valves, an electric circuit, spring-controlled circuit-closing devices at the approaches to the door adapted to be operated by the weight of a person to close the electric circuit, and a relay in said circuit electrically connected with the aforesaid electromagnet, for the purpose set forth.

6. The combination with the cylinder E, the supply and exhaust pipes, each having a valve-port in communication with one end of said cylinder, the valves for said ports adapted to move together to close one port and open the other or vice versa, an electromagnet, its armature connected with said valves an electric circuit, the door-mat made of two superposed mats of non-conductive material, a plurality of spring-contacts on the lower mat included in said electric circuit in series, coöperating contact-springs on said lower mat adapted to support the upper mat, and a relay in said electric circuit electrically connected with the aforesaid electromagnet, for the purpose set forth.

7. The combination with a door and its framing, of a power-cylinder connected with said framing a spring-controlled piston in said cylinder, a pair of levers having one of their ends pivotally connected with the framing and door respectively, and having their opposite ends pivotally connected together and to said piston respectively, and means for applying fluid-pressure to the piston and relieving the same of such pressure to open and close the door, substantially as set forth.

8. The combination with a door and its framing, of a power-cylinder pivotally secured to said framing to swing in a horizontal plane, a spring-controlled piston in said cylinder a pair of levers having one of their ends pivotally connected with the framing and door respectively, the other ends of said levers pivotally connected together and to said piston respectively, and means for applying fluid-pressure to the piston and relieving the same of such pressure to open and close the door, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two witnesses.

HENDRIK BENNIK.

Witnesses:
MAX LEMCKE,
MAX KAEMPFF.