L. C. NORTON.

DOOR CHECK.

APPLICATION FILED SEPT. 10, 1915.

1,211,337.

Patented Jan. 2, 1917.

3 SHEETS—SHEET 1.

Fig. 1.

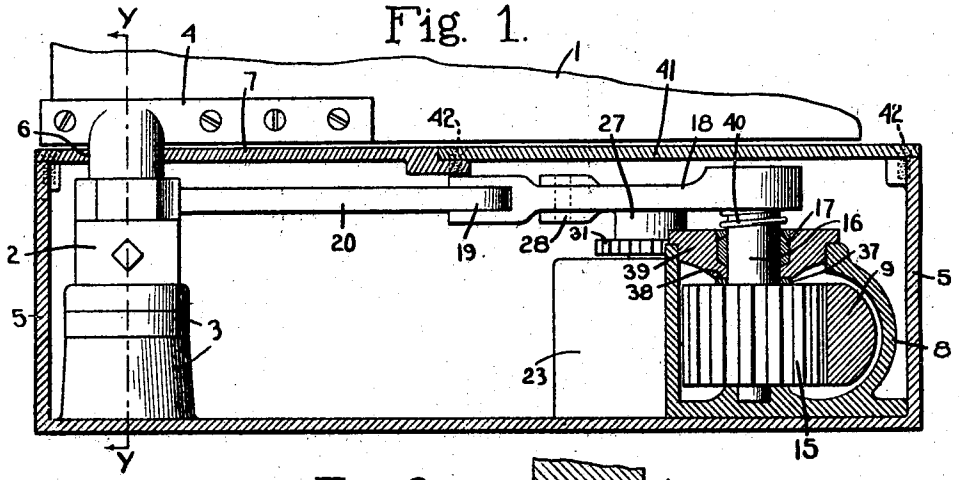


Fig. 2.

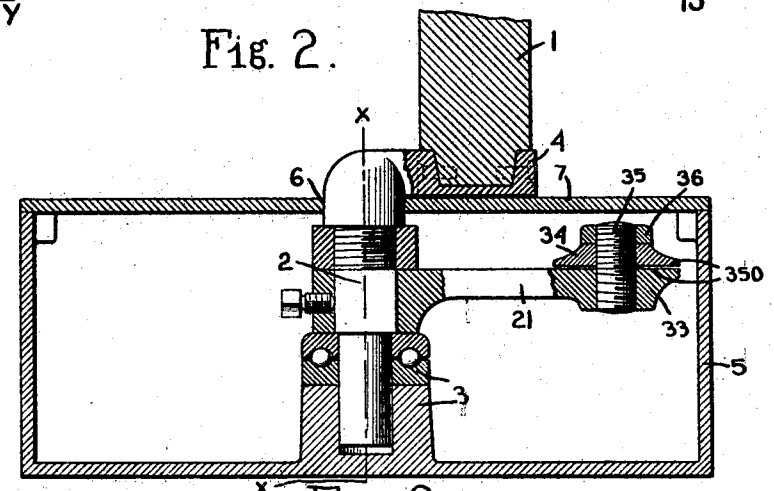
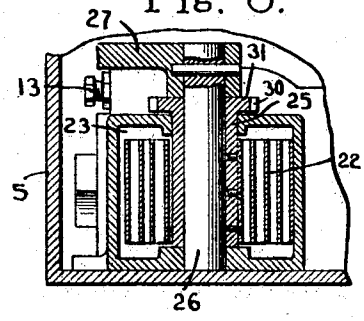


Fig. 3.



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3 SHEETS—SHEET 2.

Fig. 4.

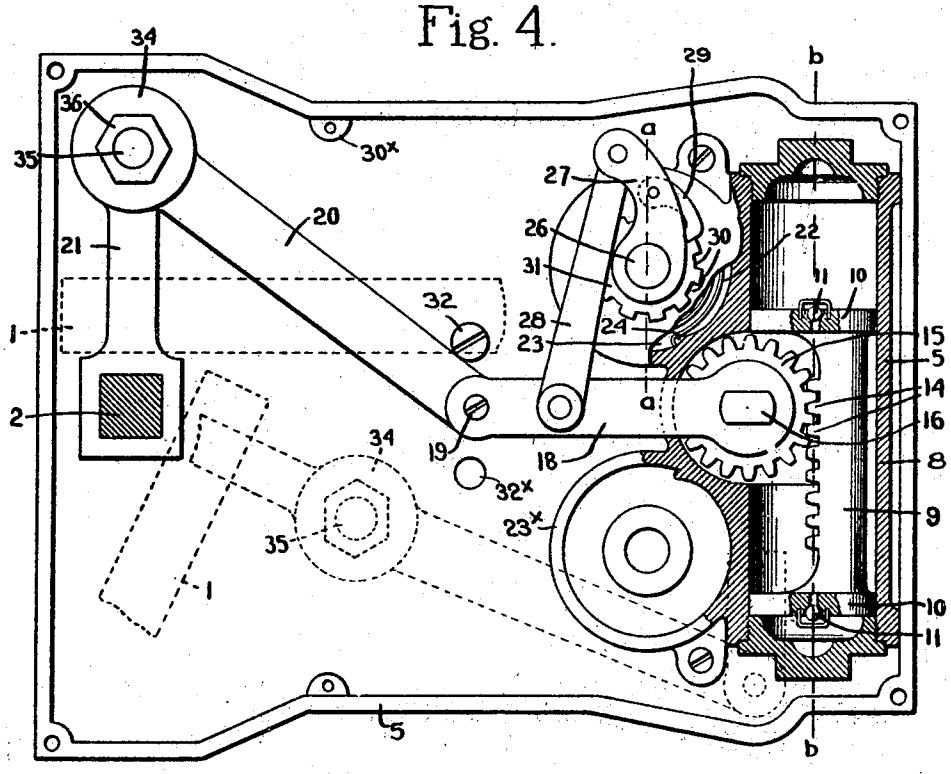
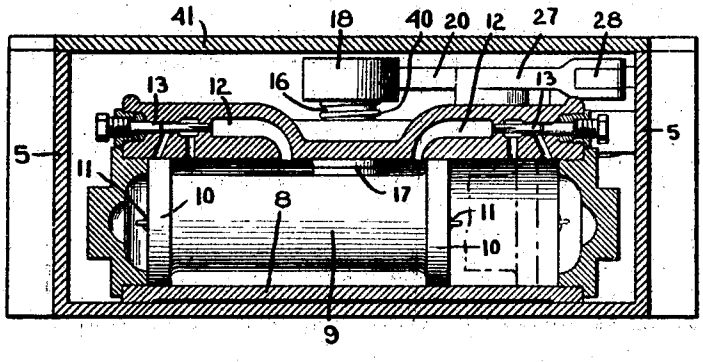


Fig. 5



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3 SHEETS—SHEET 3.

Fig. 6.

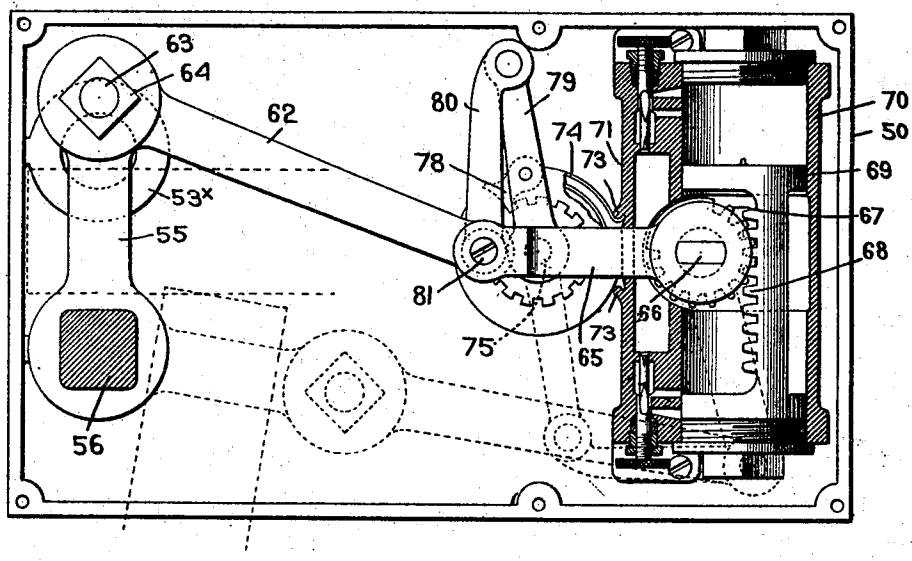


Fig. 7.

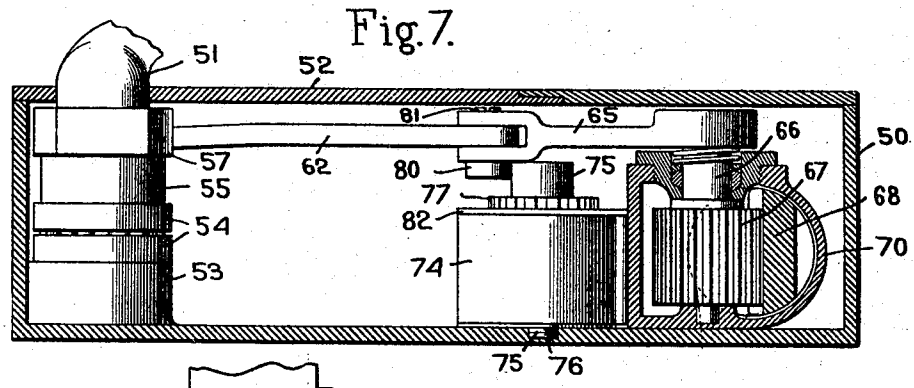
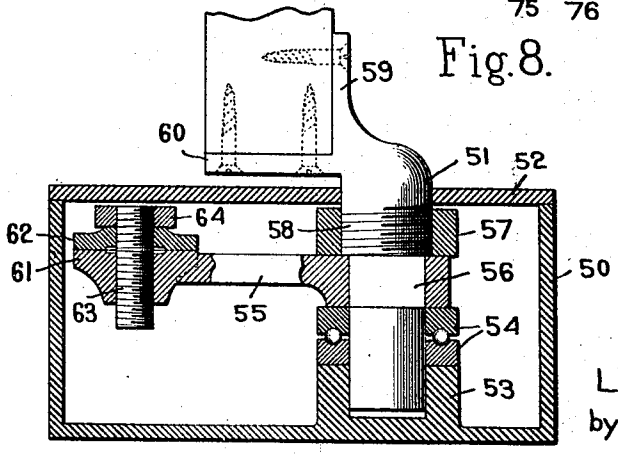


Fig. 8.



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Ally's.

UNITED STATES PATENT OFFICE.

LEWIS C. NORTON, OF CHICAGO, ILLINOIS, ASSIGNOR TO NORTON DOOR CHECK COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF WEST VIRGINIA.

DOOR-CHECK.

1,211,337. Specification of Letters Patent. Patented Jan. 2, 1917.

Application filed September 10, 1915. Serial No. 50,022.

To all whom it may concern:

Be it known that I, LEWIS C. NORTON, a citizen of the United States, residing at Chicago, county of Cook, State of Illinois, have invented an Improvement in Door-Checks, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention relates to door checks of that type which are adapted to be located either beneath the door in the floor or above the door in the door frame, thereby being concealed from view and the objects of the invention are to provide a novel door check of this type which is simple in construction, which is capable of being altered in such a manner as to be applicable to doors opening in either direction and in which the mechanism is so constructed that the closing power applied to the door is increased as the door nears the latch when the door is being closed a specially heavy pull being applied at the latching point, so that when the door is opened the spring power is greatest at the latch, decreasing as the door opens until the same is about at right angles to its closed position and from such partially open position the spring power again increases to give the door a start to close or pull against the wind, mechanism also being so designed as not only to limit the opening movement of the door but to hold the door open at any predetermined point and which has other advantages all as will be more fully described hereinafter.

In order to give an understanding of my invention I have illustrated in the drawings certain selected embodiments thereof which will now be described.

Referring to the drawings, Figure 1 is a vertical sectional view through a door check embodying my invention taken on substantially the line *x*—*x*, Fig. 2, a portion of the door being shown; Fig. 2 is a section on the line *y*—*y*, Fig. 1; Fig. 3 is a section on the line *a*—*a*, Fig. 4, showing the door-closing spring; Fig. 4 is a plan view partly in section of my improved door check; Fig. 5 is a section on the line *b*—*b*, Fig. 4, Fig. 6 is a plan view partly in section of a modified form of door check embodying my invention, Fig. 7 is a vertical longitudinal sectional view of the same, and, Fig. 8 is a transverse sectional view on lines *x*—*x* similar to Fig. 2 but showing a different means for engaging the bottom of the door.

I have shown at 1 a portion of a swinging door which is herein shown as sustained at its lower end on a vertically-arranged door supporting shaft 2 that is journaled in suitable bearings 3, said shaft having at its upper end a head 4 offset from the axis thereof and to which the door 1 is secured. It will be understood, of course, that the door will have a suitable hinge support and connection at its upper end which may be similar to that above described.

My improved door closer and check is adapted to be placed either in the floor directly beneath the door or in the door frame above the door, and is thus entirely concealed from view. In the drawings I have shown it as placed beneath the door and as contained within a suitable box or casing 5 which is set into the floor. The bearing 3 for the door supporting spindle or trunnion 2 is illustrated as situated within the box or casing 5, the spindle 2 extending down through an opening 6 in the cover 7 of the box or casing.

My improved door check comprises a cylinder 8 adapted to contain liquid and situated within the housing or casing 5 and within which operates a piston element 9 herein shown as provided with a valved piston head 10 at each end, each piston head being provided with a check valve 11 which will permit the liquid to pass freely therethrough when the piston head is moving in one direction, but will prevent the passage of the liquid when the piston head is moving in the opposite direction. The cylinder 8 is provided at each end with a by-pass 12 which is controlled by a valve 13, said valves being for the purpose of controlling the speed at which the piston can move. The particular form of valve 13 is similar to that illustrated and described in my Patent No. 1,152,339, dated August 31, 1915, and as it forms no part of the present invention, it is not necessary to further describe it herein. It will be understood, however, that by means of these valves 13, the speed of the piston in each direction can be controlled independently.

In the embodiment of the invention disclosed in Figs. 1 to 5 inclusive the piston is provided with rack teeth 14 which mesh with a pinion 15 mounted on a stud 16 jour-

naled in the cylinder casing, said stud projecting through a stuffing box 17 and having fixed to its upper end an arm 18. This arm 18 is pivotally connected at 19 to a link 20 which in turn is pivotally connected to an arm 21 rigid with and extending laterally from the door supporting spindle or trunnion 2. The link 20 and the piston controlled arm 18 in effect constitute a toggle connection between the spindle 16 and the end of the arm 21, power being applied to the toggle as illustrated in Fig. 4 intermediate of the spindle 16 and the connection 19 between the said arm and link 20. It will be obvious that by reason of this construction a greater amount of power is applied to the end of the arm 21 as the toggle is straightened by the mechanism which will hereinafter be described. The construction is such that when the door is closed, as shown in dotted line position Fig. 4, the arms 21, 18, link 20 and piston 9 will occupy the full line position shown in said figure. When the door is opened the arm 18 will be moved through the link 20 and arm 21 into the dotted line position, Fig. 4, thereby moving the piston, the speed of the movement being controlled by the regulating valve 13, as will be obvious. The construction is so devised that the toggle 18—20 with its actuating mechanism hereinafter to be described may be coördinated with the movement of the piston to produce a uniform checking movement to the door throughout the entire sweep. However the valve in the by-pass of the cylinder may be so adjusted as to change the speed of the door and particularly to change the speed of movement of the door at the latch thereby to insure the complete closure of the door. Furthermore the arrangement of the arms 21 and 18 and the connecting lever 20 and the spring actuating mechanism therefor is such that the spring power normally is strongest at the latch, decreasing as the door opens until about at right angles, whereupon the spring power increases so that the door is given a more rapid start to close or pull against the wind.

The device herein illustrated also comprises a door-closing spring which acts on the arm 18 and tends to close the door. This door-closing spring is herein shown as a spiral spring 22 which is situated in a spring receiving chamber 23, and one end of which is secured to the wall of the chamber, as shown at 24, and the other end of which is fastened to a sleeve 25 loosely mounted on a spindle or shaft 26. The spindle 26 has thereon an arm 27 which is connected by a link 28 with the arm 18, and said arm 27 also has a dog 29 pivotally connected thereto which is adapted to engage any one of a plurality of notches 30 forming a ratchet in the head or flange 31 of the sleeve 25. This dog 29 and the notches 30 provide for adjusting the tension of the spring 22, as will be obvious. The spring 22 is so constructed that when the arm 18 is swung from the full to the dotted line position Fig. 4, the spring will be wound up or placed under increased tension, and said spring, therefore, acts on the arm 18 to close the door when the latter is open.

32 is a stop projection rising from the bottom of the casing 5 and which is situated to engage the link 20 and thereby limit the swinging movement of the arm 18 in the position indicated in Fig. 4. This stop 32 thus acts to limit the closing movement of the door.

In order to provide mechanism which may be adapted alternatively to operate a door swinging in either direction a supplemental spring receiving chamber $23^{\times}$ similar to the chamber 23 may be provided adjacent to the opposite end of the cylinder, the same being symmetrically positioned in respect to the spindle 16. The stud 32 may be removable and adapted to be seated in a suitable screw threaded aperture $32^{\times}$ properly located to arrest the link 20 in the required position. While in the preferred embodiments of the invention disclosed herein the mechanism for actuating the toggle comprises a coiled spring operating through a lever and link in the manner described. It will be obvious that other forms of spring mechanisms may be utilized, for example where a cheap construction is desirable a spiral spring may be attached to the arm 18 or the link 20 and to an anchoring stud or lug upon the casing. As illustrated herein such a lug $30^{\times}$ is placed upon each vertical wall of the casing, having an aperture to receive one end of the spring, the other end of the spring being attached to a stud or to an aperture in the link 20 of the arm 18 in the manner aforesaid.

Means are also provided to limit the opening movement of the door, said means being constructed to hold the door in its open position. This means comprises a friction head 33 rigid with the arm 21, a coöperating friction head 34 rigid with the link 20 and a stud 35 fixed to the head 34 and having screw-threaded engagement with the head 33. The two heads 33 and 34 have coöperating frictional faces 350. When the door is opened the relative swinging movement of the arm 21 and link 20 cause the stud 35 to be screwed into the head 33 thereby bringing the friction faces 350 together and the adjustment is such that these faces will be brought into firm frictional contact when the door is fully opened. It will be obvious that such adjustment of the friction faces 350 may be made that the same will be brought into firm frictional contact and will limit the movement of the

door and hold the same open at any desired position, this being accomplished by adjusting the screw 35 in the member 34 and clamping the same in adjusted position by the set nut 36.

By providing right and left hand screw threads upon the screw 35 to coöperate with corresponding threads in the arm and link respectively and by providing a suitable check nut 36 adapted to retain the screw from rotation in one of the members a connection will be produced which is adapted to permit reversal of operation of the parts for doors swinging in different directions.

It will be obvious that when the door is swung open the screw threaded stud 35 will cause the frictional faces to engage each other so firmly as to lock the door in open position. When it is desired to shut the door the latter is given a quick movement sufficient to release the friction faces 350, after which the spring 22 will operate to effect the closing movement. The stud 35 can be adjusted in the head 34 by means of a nut 36 so as to have the friction faces 350 locked together at any desired point.

The shaft or spindle 16 is shown as provided with a washer 37 which seats against a seat 38 formed on the bottom of the gland 39 of the stuffing box 17. This washer is yieldingly held against the seat 38 by means of a spring 40 which encircles the shaft 16 and is confined between the arm 18 and the gland.

The cover 7 of the casing 5 is provided with a removable section 41 which is situated to overlie the cylinder 8, and the spring receiving chamber 23, said removable section being held in place by means of screws 42. When the door is opened the cover section 41 can be readily removed, thus providing access to the operative parts of the device and permitting of the ready adjustment of the valves 13 or of the tension of the spring 32. The construction is also such that the actuating mechanism may be removed from the casing without demounting the door by merely withdrawing the screws which secure the cylinder and spring receiving chamber to the casing and detaching the pivotal connection 19.

It will be seen that my device is very compact in its structure and can be easily installed in position. Further the operative parts are readily accessible even though the check is placed beneath the floor or within the door frame.

In Figs. 6, 7, and 8 I have illustrated a modified and simplified form of the invention in which the spindle or shaft which is surrounded by the spring is in the longitudinal vertical central plane of the casing whereby the mechanism may be readily reversed in order that it may be applied to doors swinging in either direction. I have also modified slightly the design of the mechanism illustrated in Figs. 1 to 5 with a view to simplifying the construction as will hereinafter more fully appear. As illustrated in Figs. 6, 7, and 8, the box or casing 50 is rectangular in form instead of having the somewhat irregular form illustrated in Fig. 4, thereby decreasing the cost of its manufacture as well as the cost of installation. The spindle or trunnion 51 extends down through the cover 52 of the box or casing in the same manner and is seated at its lower end in a boss 53 extending upwardly from the bottom of the box or casing, ball bearings 54 resting upon the upper end of the boss 53 and supporting the end of the arm 55 which corresponds to the arm 21 illustrated in the preceding figures. The arm is prevented from rotation upon the spindle 51 preferably by an angular or squared portion 56 upon said spindle which is seated in the corresponding aperture in the end of the arm 55. A nut 57 screwed upon an enlarged portion 58 of the spindle or trunnion 51 and resting upon the upper face of the arm 55 provides means for vertical adjustment of the trunnion so that the door may be raised or lowered from the sill. The upper end of the trunnion 51 may differ from that illustrated in Fig. 2, for example, as shown in Fig. 8 in which the end of the trunnion is provided with offset members 59—60 at right angles to each other provided with suitable screw holes whereby the said arms may be firmly secured to the bottom of the door. The arm 55 is provided at its end with a friction face 61 which is engaged by a corresponding friction face upon the end of the link 62, the pivotal connection for the arm 55 and link 62 being in the form of a screw 63 similar to the screw 35 and adapted to be retained in adjusted position by a set nut 64. The link 62 as in the preceding construction is connected to an arm 65 extending from the spindle 66 of the gear 67 which engages the rack 68 upon the piston element 69 which is slidably mounted in the cylinder 70 which corresponds in all respects to the cylinder 8 above described. The arrangement of the ports of the cylinder and valves therein in the device illustrated in Figs. 6 and 7 differs from that illustrated in the preceding figures in that the ports and by-passes are arranged at the side of the cylinder instead of at the top, thus providing a structure which is more compact. In this construction the side wall 71 of the cylinder preferably is made substantially straight and continuous from one end of the cylinder to the other and is provided with laterally extending and oppositely disposed inclined flanges or lugs 73 adapted to receive the end of a coiled spring 74. The spring 74 surrounds a stud or spindle 75 which desirably is placed in

the vertical longitudinal central plane of the casing the stud 75 being screw threaded at its lower end and seated in a screw threaded socket 76 in the bottom of the casing. The inner end of the spring 74 is desirably secured to a sleeve corresponding to the sleeve 25 as illustrated in Fig. 3, said sleeve having at its top a recessed flange 77 forming a ratchet adapted to be engaged by a pawl 78 carried upon an arm 79 mounted upon said spring, the arm 79 being pivotally connected at its end to a link 80 which in turn is connected at its opposite end to the pivotal connection 81 between the links 62 and the arm 65. A cover plate 82 may be interposed between the ratchet 77 and the top of the spring 74 to form a suitable surface for the ratchet to rotate upon and also to retain the spring from possible vertical movement. By this construction the spring box or boxes illustrated in the preceding figures may be omitted thus further simplifying the construction. The casing may be provided with an additional boss $53^{\times}$ located upon the opposite side of the longitudinal vertical central plane of the casing and symmetrically therewith in respect to the boss 53 so that the trunnion may be mounted in the boss $53^{\times}$ if the device is to be used with a door swinging in the opposite direction. In such case the arm 55 will extend in the opposite direction and consequently the link 80 and arm 79 will be reversed to extend in the opposite direction. The spiral spring will also be turned over so that its outer end engages the other flange or lug 73 as will be readily apparent.

The operation of the mechanism disclosed in Figs. 6 to 8 inclusive is substantially identical with that heretofore described and further detailed description thereof is therefore unnecessary.

It will be understood that the embodiments of the invention disclosed herein are illustrative and not restrictive and that various changes in mechanism may be made within the spirit and scope of my invention.

I claim:

1. In a door check, the combination with a cylinder, of a piston element therein having rack teeth, a pinion meshing with said rack teeth, an arm rigid with the pinion, a door-supporting trunnion, an arm rigid therewith, a link connecting said arms whereby swinging movement of the door is communicated to the piston, a spiral door-closing spring, a spindle or shaft to which said spring is connected, and an arm rigid with said shaft and connected to the piston-controlled arm.

2. In a door check, the combination with a cylinder, of a piston element therein having rack teeth, a pinion meshing with said rack teeth, an arm rigid with the pinion, a door-supporting trunnion, an arm rigid therewith, a link connecting said arms whereby swinging movement of the door is communicated to the piston, a spiral door-closing spring, and means connecting said spring to the first-named arm.

3. In a door check, the combination with a cylinder, of a piston element therein having rack teeth, a pinion meshing with said rack teeth, an arm rigid with the pinion, a door-supporting trunnion, an arm rigid therewith, a link connecting said arms whereby swinging movement of the door is communicated to the piston, and frictional means associated with one of the arms for holding the door in open position.

4. In a door check, the combination with a cylinder, of a piston element therein having rack teeth, a pinion meshing with said rack teeth, an arm rigid with the pinion, a door-supporting trunnion, an arm rigid therewith, a link connecting said arms whereby swinging movement of the door is communicated to the piston, one of said arms and said link having coöperating friction faces, and means to bring said friction faces into engagement when the door is opened to a predetermined point.

5. In a door check, the combination with a cylinder, of a piston element therein having rack teeth, a pinion meshing with said rack teeth, an arm rigid with the pinion, a door-supporting trunnion, an arm rigid therewith, a link connecting said arms whereby swinging movement of the door is communicated to the piston, one of said arms and said link having coöperating friction faces, means to bring said friction faces into engagement when the door is opened to a predetermined point and means for relatively adjusting said friction faces whereby the door may be arrested and maintained at any desired opened position.

6. In a door check, the combination with a cylinder, of a piston element therein, a pivotally-mounted arm connected to the piston to swing as the piston moves in the cylinder, a door-supporting trunnion, an arm rotatable therewith, a link connecting said arms and forming with the piston-controlled arm a toggle which approaches a straightened position as the door closes, and a spring operatively connected to said toggle to transmit therethrough the power necessary to close the door.

7. In a door check, the combination with a cylinder, of a piston element therein, an arm controlled by said piston, a door-supporting trunnion, an arm rotatable therewith, a link connecting said arms and forming with the piston-controlled arm a toggle which is buckled as the door opens and approaches a straightened position as the door closes, and a spring operatively connected to said toggle to transmit therethrough the power necessary to close the door, said link

and piston-controlled arm being so positioned relative to each other and said trunnion arm that the power applied by the spring through said link and arm to the trunnion increases as the door approaches the jamb.

8. In a door check, the combination with a cylinder, of a piston element therein having rack teeth, a pinion meshing with said rack teeth, an arm rigid with the pinion, a door-supporting trunnion, an arm rigid therewith, a link connecting said arms and forming with the first-named arm a toggle which is buckled as the door opens and approaches a straightened position as the door closes, and a spring operatively connected to said toggle.

9. In a door check the combination with a cylinder of a piston element therein, an arm controlled by said piston, a door supporting trunnion, an arm rotated therewith, a link connecting said arms and forming with said piston controlled arm a toggle and a spring connected to said piston controlled arm whereby the power applied to said trunnion arm will be increased as the door approaches the jamb.

10. In a door check the combination with a cylinder of a piston element therein, an arm controlled by said piston, a door supporting trunnion, an arm rotated therewith, a link connecting said arms and forming with said piston-controlled arm a toggle, a spring, an arm actuated thereby and a link operatively connecting said arm to said toggle, said arm and link being positioned further to increase the power applied to the trunnion arm when the door nears latching position.

11. In a door check the combination with a swinging door of a casing situated within the floor beneath the door, said casing having a bearing member, a trunnion mounted in said bearing member, means for adjusting said trunnion axially, an arm on said trunnion and controlling means connected to said arm adapted to check the movement of the door.

12. In a door check the combination with a swinging door of a casing situated within the floor beneath the door, said casing having a bearing member, a trunnion rotatably mounted therein, an arm adjustably and non-rotatably mounted on said trunnion, ball bearings between said arm and said trunnion, an adjustable member upon said trunnion, and bearing upon said arm, and controlling means connected to said arm adapted to check the movement of the door.

13. In a door check the combination with a cylinder, of a piston element therein having rack teeth, a pinion meshing with said rack teeth, an arm rigid with said pinion, a door-supporting trunnion, an arm rigid therewith, a link connecting said arms whereby swinging movement of the door is communicated to said piston, a spiral door-closing spring, means connecting said spring to the first-named arm, by-passes in said cylinder and valves in said by-passes adapted to control the flow of fluid in the cylinder whereby the action of the piston in coöperation with said arms may be caused to produce a uniform checking movement of the door throughout its entire sweep.

In testimony whereof, I have signed my name to this specification.

LEWIS C. NORTON.

Witness:
STELLA CAPRON.