R. G. STRONACH.

DOOR CHECK.

APPLICATION FILED OCT. 31, 1912.

1,178,688.

Patented Apr. 11, 1916.

2 SHEETS—SHEET 1.

Fig. 1.

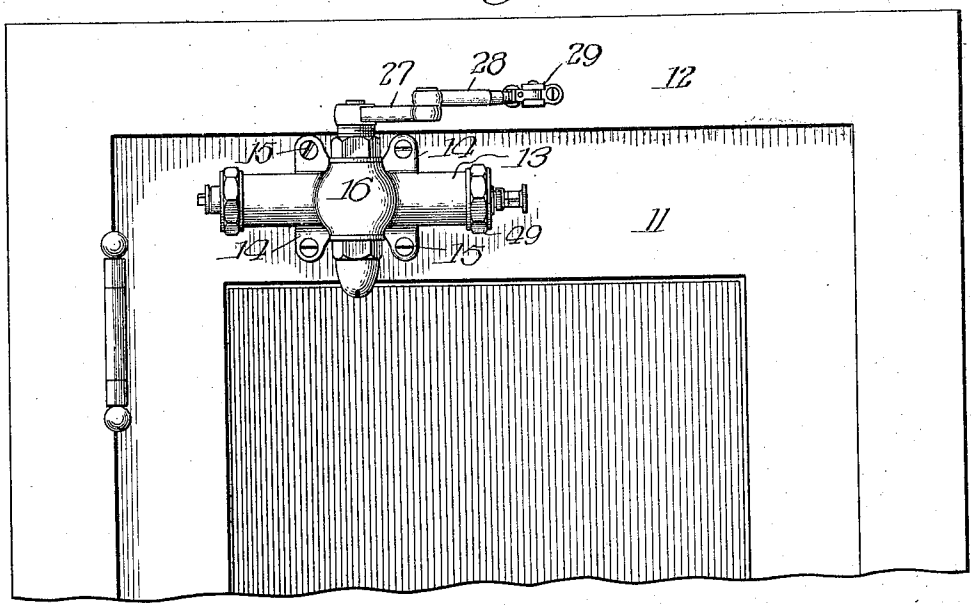
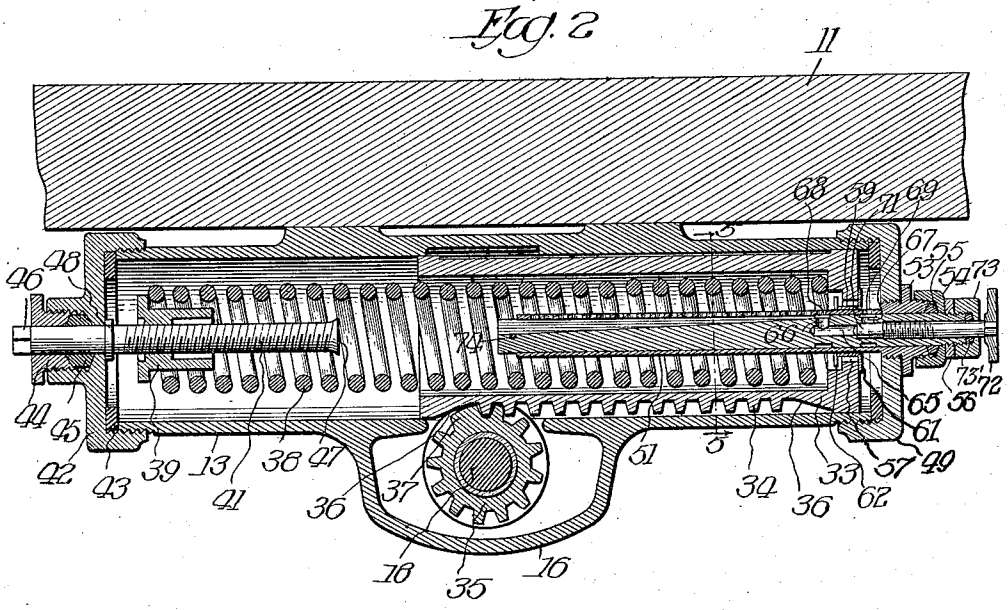


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 4

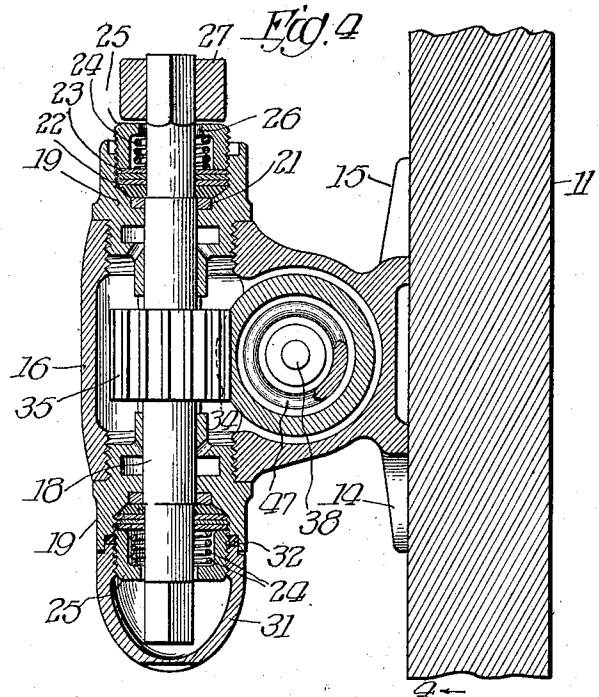


Fig. 5

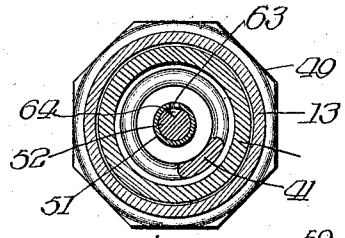


Fig. 6

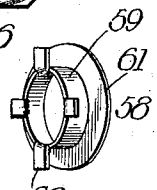


Fig. 3

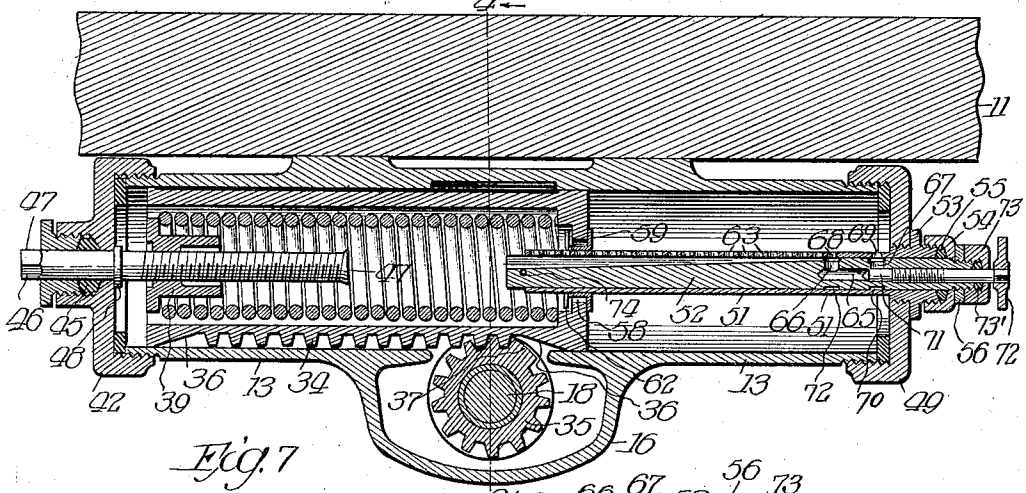


Fig. 7

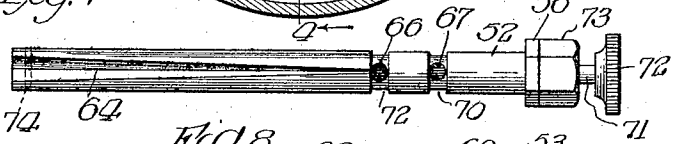
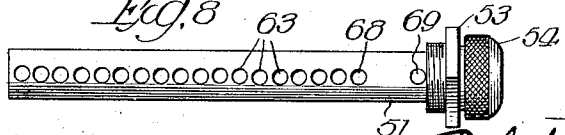


Fig. 8



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UNITED STATES PATENT OFFICE.

RUPERT G. STRONACH, OF CHICAGO, ILLINOIS, ASSIGNOR TO STRONACH DOOR CHECK COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

DOOR-CHECK.

1,178,688. Specification of Letters Patent. Patented Apr. 11, 1916.

Application filed October 31, 1912. Serial No. 728,761.

To all whom it may concern:

Be it known that I, RUPERT G. STRONACH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Door-Checks, of which the following is a specification.

My invention pertains to door checks and has more particular reference to a check which is adapted, not only to retard the closing movement of a door and prevent slamming but, to positively insure the closing of the door, these devices being sometimes designated as combined door checks and closers.

In actual practice a door check may be required to operate and control the closing of doors under any of the following conditions: First, when attached to an inside door, doors opening in off the street, etc., it is desirable to move the door quickly to a point approximately six inches from closed position and to check or retard it during the remainder of its travel so that it will move slowly and smoothly into closed position without slamming. Second, when attached to a door swinging outwardly, such as entrance doors to office buildings, schoolhouses, etc., where a strong draft tends to close the door, it is desirable to check or retard the door earlier in its travel and before it acquires very much momentum which would cause excessive strains and stresses on the door and check if the checking action were too long delayed. The point at which the checking action should be initiated varies, of course, with the strength of the draft encountered, a quicker checking action being required by a strong draft than by a weak one. Third, when attached to a door equipped with an opener having an opening spring, or when there is a friction latch, or when the door rubs or is hinge bound or there is a draft tending to open the door, it is desirable to control the movement to a point about three inches from closed position and then permit it to move quickly to closed position with sufficient force to overcome any of the above-mentioned obstacles which may tend to prevent its complete closure. Thus the door is positively closed while being at all times directly under the control of the check.

The primary object of my present invention is the provision of a door check which may, by a slight adjustment, be readily adapted to any of these conditions so that it will positively control and close the door with just the requisite speed irrespective of the conditions or difficulties encountered.

Still another object is the provision of a check which will permit the door to close in a minimum amount of time and which can be regulated so that the final closing movement of the door will be effected with any required amount of force.

A further object of this invention is the provision of a check of this general character which will be simple in construction and positive in operation and which will be so constructed as to preclude leakage of the retarding fluid.

Other objects and many of the attendant advantages of this invention will be readily apparent as the same becomes better understood by reference to the following description when considered in connection with the accompanying drawings.

Referring to the drawings—Figure 1 is a front elevation of a door check embodying my invention shown as applied in operative position to a door; Fig. 2 is a longitudinal sectional view through the check shown in Fig. 1, the plunger being shown at one extremity of its movement; Fig. 3 is a similar view showing the plunger at the opposite extremity of its movement; Fig. 4 is a transverse sectional view taken substantially on the line 4—4 of Fig. 3; Fig. 5 is a transverse sectional view taken substantially on the line 5—5 of Fig. 2; Fig. 6 is a detail perspective view of the valve which is mounted in one end of the plunger; Fig. 7 is a detail view of the grooved fluid controlling member; and Fig. 8 is a detail view of the sleeve surrounding said member.

On the drawings, reference character 11 indicates a door hinged to the frame 12 and to which my improved check is applied.

The check comprises a cylindrical casing 13 forming a fluid chamber in which the retarding fluid is contained, as will be hereinafter described, and has a flat base 14 for the reception of screws or bolts 15 by means of which the check is fastened in position on a door. The casing 13 is shaped intermediate its ends to provide a transversely extending portion 16 forming a transverse spindle chamber in which a spindle shaft 18 is mounted.

By reference to Fig. 4 it will be observed that the ends of the spindle chamber are open and interiorly threaded to receive the ends of the bearing members 19 by which the spindle shaft is supported. The outer ends of the bearing members are recessed to accommodate a bearing ring 21 and a plurality of packing rings 22. Upon the outermost packing ring I prefer to place a metal ring 23 which is urged against the packing rings to form a fluid-tight joint around the spindle shaft by means of an expansion spring 24 interposed between the metal ring and the inner face of a packing nut 25 which is threaded into the recesses in the bearing members 19. The bearing members 19 are preferably hexagonal in shape outside the spindle chamber so that they may be readily grasped by a wrench and unscrewed from the chamber when desired. The packing nuts 25 are preferably provided with sockets 26 adapted to be engaged by a spanner wrench whereby these nuts may be tightened or loosened when occasion requires.

It will be observed that both ends of the spindle shaft 18 project beyond the packing nuts 25 and are squared to fit within a square opening formed in the operating arm 27 adapted to be engaged with either end of the spindle shaft. The outer end of this arm is connected with the door frame by means of a link 28 as shown in Fig. 1 pivotally attached to the arm 27 at one end and pivotally mounted in an eye or bracket 29 at its other end, which bracket is secured to the door frame. Upon opening movement of the door, shown in Fig. 1, the spindle shaft will be rotated through the intermediary of the arm 27 and link 28 in a counter-clockwise direction viewing Fig. 2. The check mechanism with which the shaft is connected will be later described. If the door upon which it is desired to mount the check were hinged at the opposite side from that shown in Fig. 1, the check would be mounted on the door in inverted position to present the opposite end of the spindle for attachment to the arm 27. It will be observed that the packing nuts 25 are each exteriorly threaded to receive a cap 31 which is positioned over the lowermost end of the spindle shaft. Since both nuts 25 are alike it will be manifest that the cap 31 may be attached to either end of the spindle chamber thereby serving as a closure for the lower end of the chamber in either position of the check. A packing ring 32 is preferably interposed between the inner end of the cap 31 and the bearing member 19 to insure a tight closure for the lower end of the spindle chamber which will absolutely prohibit leakage of the retarding fluid.

A plunger 33 is mounted within the casing 13 to reciprocate longitudinally thereof and is provided on one side with a series of teeth 34 providing a rack adapted to mesh with the teeth of a gear 35 fixed on the spindle shaft 18. An inclined shoulder 36 is formed at each end of the rack to engage with the end of a widened tooth 37 of the gear 35, whereby the movement of the plunger within the casing is limited in both directions. This construction provides an effective stop for the plunger and prevents the plunger from striking against the ends of the fluid chamber.

The plunger is normally urged toward the right-hand end of the fluid chamber into the position shown in Fig. 2 by a coiled expansion spring 38 disposed within the chamber and bearing at one end against the plunger and at its other end against a traveling nut 39 supported on a threaded rod 41 which projects inwardly from the cap 42, closing one end of the casing 13. The cap 42 is threaded onto the end of the casing and a suitable packing ring 43 is interposed between the end of the casing and the cap to prevent escape of the retarding fluid with which the fluid chamber is filled. The threaded rod 41 is mounted within the cap 42, as shown, a packing nut 44 and a suitable packing material 45 being employed to prevent leakage around the rod. The outer end of the rod is squared as shown at 46 to receive a wrench by means of which the rod may be turned to adjust the position of the traveling nut thereon. By this construction the tension of the spring may be regulated as desired. The threaded rod 41 is preferably enlarged at its inner end as indicated at 47 to prevent the nut from being accidentally threaded off the end of the rod and a collar or rib 48 is formed on the rod to bear against the inner face of the cap 42 and hold the rod in position against the force of the expansion spring.

When the door, shown in Fig. 1, is opened the shaft 18 will be rotated in a counter-clockwise direction, viewing Fig. 2, and the plunger 33 will be moved to the left by the gear wheel 35 against the force of the expansion spring 38 and, if the door is completely opened, the plunger will assume practically the position shown in Fig. 3. Upon release of the door the expansion spring will tend to return the plunger thereby rotating the shaft 18 in a clockwise direction to close the door.

In order to retard and regulate the closing movement of the door so that the door will be positively closed in a minimum amount of time but will not be slammed shut, I have provided mechanism which will now be described. The casing cap 49 at the opposite end of the fluid chamber from the cap 42 carries a sleeve member 51 which projects longitudinally within the fluid chamber

through the head of the plunger 33 and surrounds a grooved member 52 adapted to cooperate therewith, as will be later described. The sleeve member is threaded into the cap 49 and has a nut 53 formed integrally therewith by means of which the member may be screwed tightly into the cap. A strip of packing material may be disposed between the nut 53 and the end of the cap, if preferred. The member 52 projects through the sleeve member and fits relatively loosely therein so that it may be turned or adjusted to the required position relatively to the sleeve. A packing nut 54 is threaded onto the outer end of the sleeve and suitable packing 55 is interposed between the nut and the member 52 to prevent leakage around the member and also to securely hold said member against turning movement after it has been adjusted to the desired position within the sleeve. A locking nut 56 is also provided which is adapted to be threaded against the packing nut 73 so that a wrench may be applied to both nuts to turn and adjust the grooved member without loosening the packing nut.

The plunger head is provided with an enlarged aperture 57 through which the member 52 and the surrounding sleeve 51 project and this aperture is adapted to be closed, upon movement of the plunger in one direction, by a valve 58 shown in detail in Fig. 6. This valve comprises a cylindrical sleeve 59, adapted to have a sliding fit with the sleeve member 51, a valve ring or flange 61 adapted to seat against the end of the plunger and close the opening 57, and a plurality of radially projecting fingers 62 adapted to engage the inner face of the plunger head and prevent displacement of the valve. The chamber in which the plunger is mounted contains a predetermined amount of oil or other fluid and, when the plunger is in the closed position shown in Fig. 2 (the door being in this instance closed), the fluid is disposed within the chamber at the left of the plunger head. Upon opening movement of the door the plunger will be moved to the left, as previously described, whereupon the fluid will flow through the aperture 57 of the plunger head, the valve flange 51 being moved away from the aperture by the pressure of the fluid, into the chamber in front of the plunger. When the door is released the plunger will be returned toward the right, viewing Fig. 3, by the spring 38. The initial return movement of the plunger, by reason of the pressure of the fluid in front of the plunger head, will cause the valve 58 to close the aperture 57, thereby preventing the return of the fluid through this aperture.

To furnish a means of egress for the fluid from in front of the plunger head, I have provided the sleeve member 51 with a series of apertures 63 which are adapted to register with a tapered groove 64 formed longitudinally of the member 52. The fluid is, therefore, permitted to flow from in front of the plunger to the rear thereof through these apertures and the tapered groove and it will be obvious that, as the apertures are successively covered by movement of the plunger toward the right, the flow of fluid will be correspondingly diminished because of the diminution in size of the tapered groove. A differential movement of the plunger in which the speed of the plunger is gradually decreased as the plunger approaches the shallower end of the tapered groove is, therefore, effected. The rate of speed may be controlled and regulated as desired by turning the member 52 within the sleeve to change the position of the groove 64 relatively to the apertures 63 so that the escape of the fluid will be obstructed to a greater or less degree as required. The various parts are preferably so designed and proportioned that when the plunger head reaches approximately the shallower end of the groove 64 the door will have but a few inches farther to travel.

In order that the door may be given an added impetus at the end of its movement when required, it is desirable that the completion of the closing movement be effected with considerable force. I have, therefore, provided an additional means for regulating the speed of the plunger after it passes beyond the end of the groove 64 on its return stroke. By reference to Figs. 3 and 7 it will be observed that the member 52 is provided with a central bore or passage 65 and two ports 66 and 67, spaced to register with perforations 68 and 69, respectively, formed in the sleeve member 51. The bore 65 is constructed intermediate the ports 66 and 67 to form a seat for a needle valve 71 mounted in the member 52 with its ends projecting outside the casing. When, upon the return stroke of the plunger, the valved sleeve 59 covers the aperture 68, the only escape of the fluid from in front of the plunger is through aperture 69, port 67, bore 65, port 66 and through the shallower end of the tapered groove 64. The movement of the plunger at this point will be very slow because of the restricted escape of the fluid. Continued movement of the plunger, however, will uncover the aperture 68, whereupon the fluid is permitted to flow into the aperture 69 in front of the plunger and out of the aperture 68 behind the plunger, thereby permitting the plunger to move at an increased speed and the door to close with a faster movement. The speed of the plunger and, consequently, of the door during this last part of its closing movement will be determined by the size of the open-

ing around the needle valve 71 and this opening can be regulated to permit the desired speed by adjustment of the valve.

The outer end of the valve stem is preferably provided with a thumb-nut 72 by means of which the valve may be adjusted. A packing nut 73 is threaded onto the end of the member 52 to compress a suitable packing 73′ around the valve stem whereby leakage around the stem is prevented and the lock-nut 56 prevents loosening of the packing nut during adjustment of the grooved member as previously described.

It will be manifest from the foregoing that the plunger will travel from its extreme left position, as shown in Fig. 3, to a position over the aperture 68 at a gradually diminished speed and that during the completion of its return stroke the speed will be determined by the adjustment of the needle valve 71.

In order that communication may be established between the front and rear of the cylinder head even when the member 52 is so adjusted that the ports 66 and 67 will not register with the ports 68 and 69, respectively, I have provided the member 52 with a pair of peripheral grooves 72 and 70, respectively, communicating with the ports 66 and 67, respectively. These grooves provide a passage from the aperture 69 to the port 67 and from the port 66 to the aperture 68 irrespective of the angular position of the member 52 within the sleeve. Adjustment of the member 52 to obtain the required speed of the plunger during the first part of its return stroke will not, therefore, effect its speed during the last part of its stroke, since the only obstruction to the escape of the fluid from in front of the plunger is presented by the needle valve 71. In order to prevent longitudinal displacement of the member 52 in the sleeve a pin 74 may be positioned in the member at the inner end of the sleeve, if desired.

In the operation of my improved check the opening movement of the door will move the plunger to practically the position shown in Fig. 3, compressing the spring 38. The fluid in the chamber during the rearward tarvel of the plunger will escape around the valve 58, as previously described. When the door is released the expansive action of the spring 38 will return the plunger to the position shown in Fig. 2, its return movement being retarded by the liquid in front of the plunger and the return speed being determined by the rate of escape of this liquid. When it is desirable that the door should close quickly to within a few inches of closed position and then travel slowly and smoothly into closed position without slamming, the member 52 may be adjusted within the sleeve by a wrench applied to nuts 56 and 73 so that a comparatively rapid escape of the fluid from in front of the piston may take place through the apertures in the sleeve 51 and the groove of the member 52 until the piston reaches the position over the aperture 68. The movement of the door is then checked and its speed determined by the size of the opening around the needle valve 71 and, if a slow closing is required, this valve is adjusted to provide a restricted opening which will permit only slow movement of the door. When a strong draft, tending to close the door, is encountered, the groove member 52 will be adjusted to place the groove partially or wholly out of alinement with the perforations in the sleeve member 51, thereby causing the door to be checked or retarded earlier in its travel and before it acquires very much momentum. The closing movement during the last few inches may be regulated by the needle valve, as previously described. When some obstacle is offered to the final closing movement of the door, such as a door opening spring, a friction latch, rubbing of the door, or binding of the hinges, the door may be permitted to swing to nearly closed position at a speed to be determined by the adjustment of the groove member and the needle valve is adjusted so that a relatively large passage way is provided between ports 67 and 66. This adjustment enables the final closing movement to be effected at an increased speed sufficient to overcome the obstacle and positively move the door into closed position.

It will be understood, therefore, that my improved check permits the door to be closed rapidly during the first part of its closing movement, gradually diminishes the closing speed up to a predetermined point a few inches from completely closed position and then permits the completion of the closing movement to be effected with the required amount of force. The door is under complete control of the check during its entire movement and its speed, during the early part of its movement and during the final closing movement, may be regulated and controlled by two simple adjustments, viz: the adjustment of the grooved member and the adjustment of the needle valve. By adjusting the grooved member to close the required number of apertures 63, the needle valve may be made to assume control of the door at any desired position in its travel. When the check is installed the grooved member may be adjusted to meet the existing conditions which will effect the speed of the door during the early part of its closing movement and no further adjustment of this grooved member is ordinarily required. The completion of the closing movement may be readily regulated when required by a simple adjustment of the needle valve.

It is belived that my invention will be

fully understood from the foregoing without further description and it will be obvious that that various modifications in the details of construction shown and described may be resorted to within the scope of the invention as set forth in the following claims.

I claim:

1. In a door check adapted to be connected with a door, the combination of a fluid chamber, a plunger disposed therein, connections between the plunger and said door, and adjustable means comprising rotatable valve members for gradually decreasing the speed of the door to a predetermined point during its closing movement and then permitting an accelerated completion of the movement.

2. In a door check, the combination of a fluid chamber, a plunger arranged therein, a spring for moving said plunger in one direction, means comprising a grooved solid member and a perforated sleeve coöperating therewith for retarding the movement of said plunger, and means for adjusting said grooved member and sleeve to regulate the retardation.

3. In a door check, the combination of a fluid chamber, a plunger mounted therein, a spring for moving said plunger in one direction, and means for controlling the movement of the plunger, said means comprising a member provided with a tapered groove, a perforated sleeve surrounding said member, said member and sleeve being provided with a by-pass adjacent one end of the cylinder and an adjusting valve for controlling the flow of fluid through said by-pass.

4. In a door check, the combination of a fluid chamber, a plunger mounted therein, means for moving said plunger in one direction, and mechanism for controlling the speed of movement, said mechanism comprising a member provided with a longitudinally extending tapered groove and having a by-pass communicating at one end with the groove and at its other end with the fluid chamber, a sleeve surrounding said member and having a series of perforations adapted to register with said groove and also with said by-pass, means for adjusting the relative position of said member and sleeve, and an adjustable valve for varying the size of the opening through said by-pass.

5. In a door check, the combination of a fluid chamber, a plunger mounted therein, a grooved member, and a sleeve surrounding the same carried by one end of the chamber and projecting through the plunger head, said sleeve and grooved member being relatively adjustable in the chamber and said grooved member being provided with a passageway having an opening at each end thereof exteriorly of the member, a valve disposed within said member and adapted to vary the size of said passage and having its stem extending outside the fluid chamber, and means whereby said valve may be adjusted.

6. A door check including a member provided with a pair of circumferential grooves spaced apart, and a longitudinally disposed tapered groove communicating with one of said circumferential grooves, said circumferential grooves being connected by a passage within the member.

7. A door check including a fluid chamber, a member mounted at one end of the chamber and projecting within the interior thereof, said member being provided with a plurality of circumferential grooves spaced apart and connected by a passage, and a valve disposed in the end of said member and adapted to vary the size of the opening in said passage.

8. A door check including a fluid chamber, a sleeve provided with a series of longitudinally extending perforations mounted at one end of the chamber and projecting into the interior thereof, and a member provided with a plurality of circumferential grooves connected by a passageway, disposed within said sleeve, the circumferential grooves in said member being adapted to register with corresponding perforations of the sleeve.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."