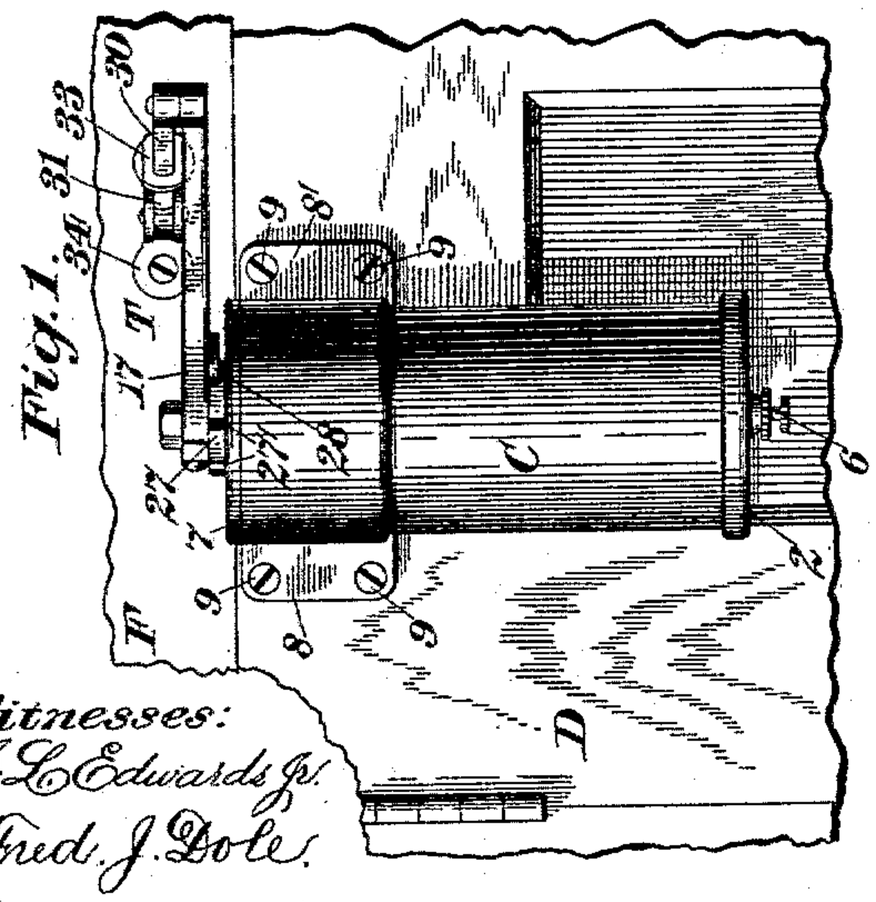
(No Model.)

W. K. HENRY.

PNEUMATIC DOOR CHECK.

No. 597,715. Patented Jan. 25, 1898.

Fig. 1.



Witnesses:
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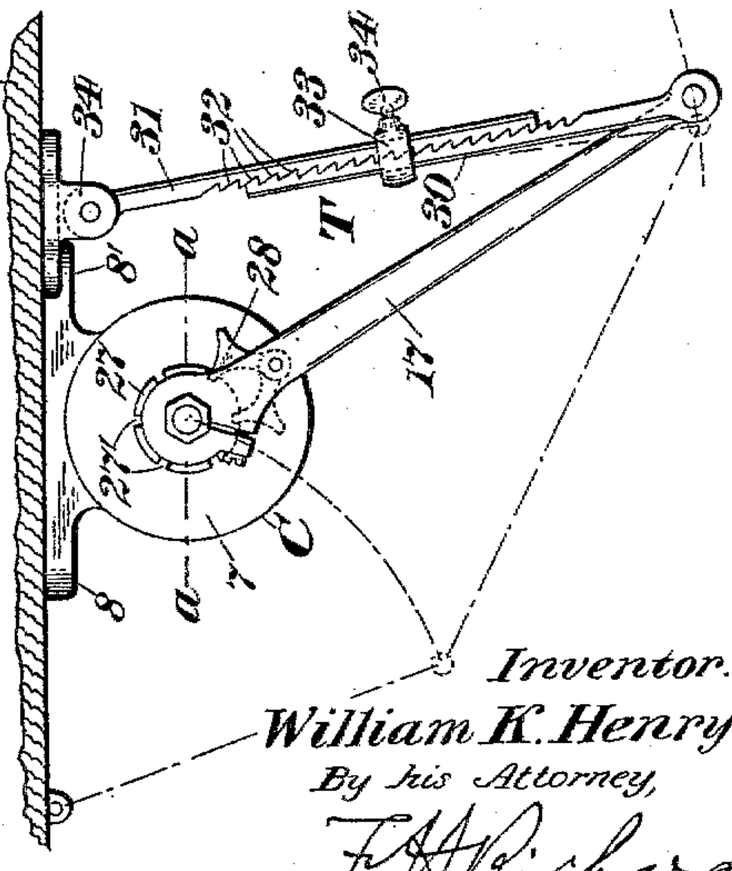
Fig. 2.



Inventor:
William K. Henry.
By his Attorney,
F. A. Richards.

Fig. 3.

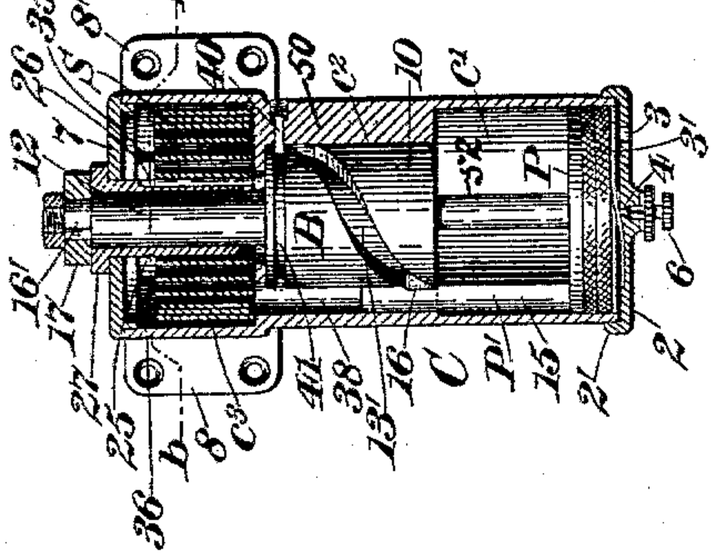


Fig. 4.

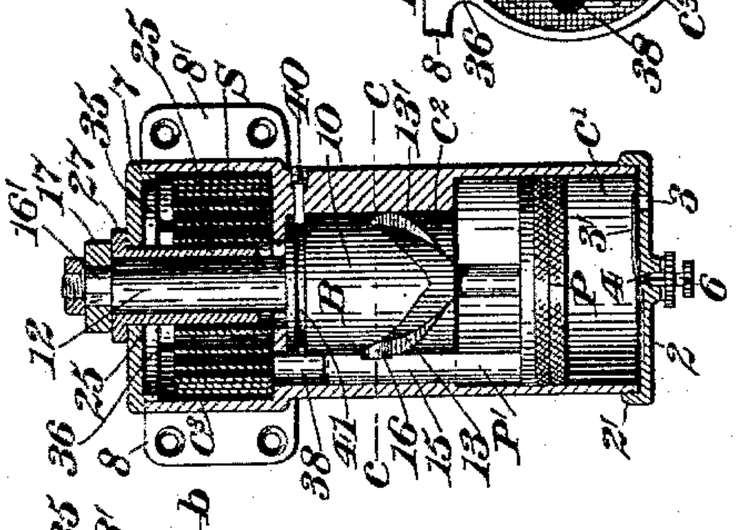


Fig. 5.

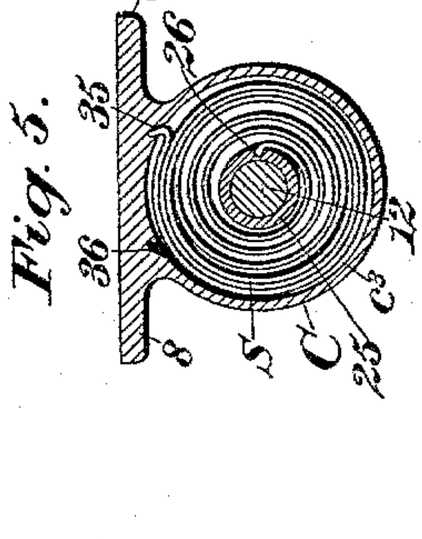


Fig. 6.

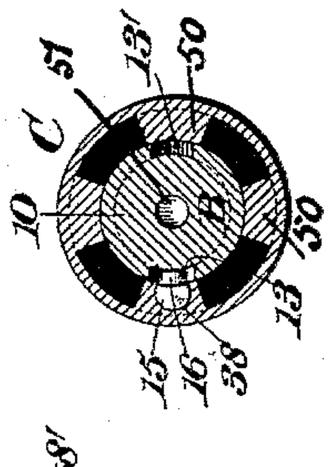


Fig. 7.

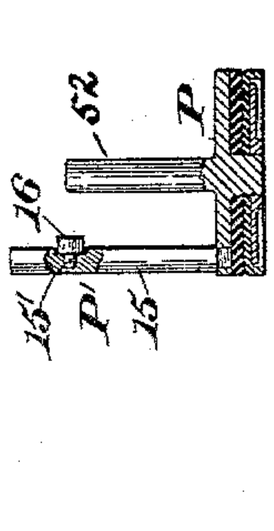


Fig. 8.

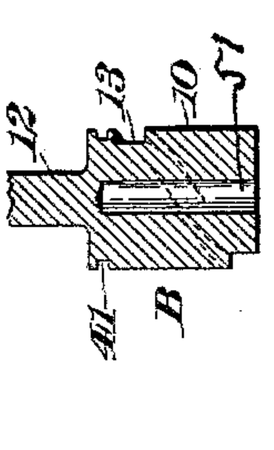


Fig. 9.

Fig. 10.

UNITED STATES PATENT OFFICE.

WILLIAM K. HENRY, OF NEW BRITAIN, CONNECTICUT.

PNEUMATIC DOOR-CHECK.

SPECIFICATION forming part of Letters Patent No. 597,715, dated January 25, 1898.

Application filed February 6, 1897. Serial No. 622,313. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM K. HENRY, a citizen of the United States, residing in New Britain, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Pneumatic Door-Checks, of which the following is a specification.

This invention relates particularly to that class of door-checks known as "pneumatic" door-checks.

One object of this invention is to furnish a simple and effective device for automatically effecting a closing movement of a door and embodying cushioning or retarding means for obviating the slamming of the door on the closing movement thereof and to so construct and organize the parts of the door-check that the same may be readily adapted for use in connection with so-called "right-hand" and "left-hand" doors.

In the drawings accompanying and forming part of this specification, Figure 1 is a front view of my improved door-check, showing the same applied to a door, a portion only of the door and door-casing being shown, and the spring-actuated crank-arm and connection with the door-casing being shown in the positions they occupy when the door is closed. Fig. 2 is a plan view of the door-check as shown from above in Fig. 1, the particircular dotted line in said figure indicating the arc described by the axis of the door-check during the opening movement of said door and the other dotted lines indicating another position of the centers of the door-check actuator during the opening movement of the door. Fig. 3 is a vertical longitudinal section of the door-check, excluding the door-check actuator, taken in dotted line corresponding with the dotted line *a a*, Fig. 2, the piston and piston-actuator being shown in the positions they occupy when the door is closed. Fig. 4 is a similar sectional view showing the piston and piston-actuator in the positions they occupy when the door is about half-way open. Fig. 5 is a cross-sectional view of a portion of the door-check, taken in a line corresponding with the dotted line *b b*, Fig. 3, and looking downward in said figure. Fig. 6 is a cross-sectional view of the lower portion of the door-check casing and associated parts, taken in a line corresponding with the dotted line *c c*, Fig. 4, and looking downward in said figure. Fig. 7 is a side elevation, partially in section, of the piston and the thrust-rod or actuating-arm that connects the piston and piston-actuator. Fig. 8 is a central longitudinal section of a portion of the piston-actuator or actuating-cam. Fig. 9 is a side view of the device that constitutes the connector between the spring piston-actuator and the actuating device that connects the piston-actuator and the door-casing. Fig. 10 is a plan view of a portion of the door-check casing with the associated elements removed. Fig. 11 is a longitudinal section of a portion of the door-check casing.

Similar characters designate like parts in all the figures of the drawings.

Briefly stated, the door-check as a whole comprises a suitable casing, (designated in a general way by C,) which is preferably cylindrical and embodies a series of superposed concentric chambers and has means whereby said casing may be secured to a door, and also has at one end thereof a suitable air-inlet and an air-outlet; a piston P, supported in the lower chamber of said casing for reciprocatory movements; a helical spring S, supported in the upper chamber of said casing and having the outer end thereof fixed thereto; a piston-actuator (designated in a general way by B) supported for rotative movements in the intermediate chamber between the piston and spring and having a stem extending through the upper end of the casing and also having two relatively-divergent cam-grooves in the periphery thereof; an actuating-connector P′, fixed to the piston at one side the axis thereof and having a projection seated in a cam-groove of the piston-actuator; a crank-arm fixed at its inner end to the outer end of the stem of the piston-actuator; a connector between the crank-arm and the inner end of the spring, and a lever pivotally connected to the outer end of said crank-arm and embodying means for attaching the same to a door-sill.

In the preferred form thereof shown most clearly in Figs. 1, 3, 10, and 11 of the drawings the casing C embodies three superposed concentric chambers, (designated by c', c^2,

and c^3, respectively,) the lower one, c', constituting the piston-chamber, the upper one, c^3, constituting the spring-receiving chamber, and the intermediate one, c^2, constituting the piston-actuator chamber. The lower chamber c' is closed at the outer end thereof preferably by means of a cap 2, having an internally-screw-threaded peripheral flange 2', screwed upon the screw-threaded lower end of the casing, said cap also having formed therethrough an air-inlet 3 and an air-outlet 4. The inlet 3 is closed preferably by a flap-valve 3', fixed to the inner face of the cap 2 in any well-known manner, a check-valve 6 being provided in connection with the air-outlet for controlling the emission of air.

The upper end of the casing C is shown provided with a cap 7, which is axially perforated for a purpose hereinafter described.

The casing C is shown furnished near the upper end thereof with outwardly-extending flanges 8 and 8', respectively, whereby the same may be attached to a door D, preferably by means of screws 9, extending through holes in said flanges, as shown in Fig. 1.

Seated in the piston-chamber c' for reciprocatory movement is the piston P, which may be of any suitable general construction, and seated in the intermediate chamber c^2 is what I have herein termed the "piston-actuator" B. This piston-actuator in the preferred form thereof shown in the drawings comprises a cylindrical body 10, supported for rotative movement in said chamber c^2 and having a stem or spindle 12 extending upward through the cylinder c^3 and through the perforation in the cap 7 of the casing C.

For the purpose of utilizing the rotative movement of the actuator to transmit a reciprocatory movement to the piston the body 10 of said actuator has formed in the periphery thereof two relatively-diverging upwardly-inclined cam-grooves 13 and 13', respectively, which merge into each other at their lower ends, as shown most clearly in Fig. 4, and which practically form together a V-shaped cam-groove adapted for effecting reciprocatory movements of the piston irrespective of the direction of rotative movement of the piston-actuator, and between the piston and piston-actuator is a connector P', comprising an arm or stem 15, which is fixed at its lower end to the piston at one side the axis thereof and is provided at its upper end with a laterally-projecting stud 15', on which is mounted a roller 16, which is seated between the two opposite faces of the V-shaped cam-groove, as shown most clearly in Figs. 3, 4, and 6 of the drawings.

The upper end of the piston-actuator stem is preferably shouldered and has an angular extension, as 16', adapted to receive the inner end of a crank-arm 17. This crank-arm constitutes one member of a toggle device, which is designated in a general way by T and one end of which may be in practice connected with the door-frame F and the other end of which may be fixed to the shouldered end of the piston-actuator stem, as shown most clearly in Figs. 1 and 2 of the drawings, as will be hereinafter more fully described.

By reference to Figs. 3, 4, and 6 of the drawings it will be seen that the middle chamber C^2 has a series of relatively remote radial flanges or ribs 50 on its interior which extend from end to end thereof and whose inner faces are concentric to a common center, and it will be further seen that the piston-actuator P is symmetrical from end to end and is of an external diameter corresponding to the diameter of the spaces between the flanges 50, said actuator having a bearing its entire length between said flanges. One of the flanges 50 has a groove 38 formed longitudinally in the inner face thereof, which constitutes a guideway for the connector of the piston-actuator and piston, as will be hereinafter described.

By supporting the piston-actuator its entire length, as shown in the drawings, said actuator is held firmly against lateral movement and is subjected to uniform wear during operation. The piston-actuator has a central bore 51, which extends upward from the lower end thereof and forms a guideway for a stem 52, fixed to and extending upward from the central portion of the piston P, said guideway and stem holding the piston against lateral vibration during the working strokes thereof.

As a means of connection between the toggle device and the spring S, I have provided a tension-adjusting sleeve 25, surrounding the upper end of a stem 12 of the piston-actuator and grooved at one side, as illustrated at 26, to receive the inner end of the spring S, as shown most clearly in Fig. 5 of the drawings. This sleeve is flanged at the upper end at 27, which flange is located between the inner face of the crank-arm 17 and the cap 7 of the casing C and is peripherally notched, as at 27', and constitutes an integral index or ratchet wheel, a two-way pawl 28, pivotally carried on the actuator-arm 17, engaging in a notch in the flange 27, whereby on an opening movement of the door D the pawl on the crank-arm will cause the sleeve 25 to move in unison with the inner end of the crank-arm and piston-actuator and thereby wind and increase the resistance of the spring S, so that when the door is released after being fully opened the force of the spring will, through the medium of the crank-arm, cause the same to close and, through the medium of the rotative piston-actuator and piston, cushion or retard the closing movement, as required, to prevent slamming.

The initial force of the crank-arm-actuating spring may be regulated by adjusting the sleeve 25 rotatably, as will be readily understood.

The toggle device T, which constitutes the connector between the piston-actuator and the door-frame, comprises, in the preferred form thereof shown most clearly in Figs. 1 and 2, the crank-arm 17, which is fixed at the

inner end thereof to the outer or upper end of the stem of the piston-actuator, and two longitudinally-adjustable arms 30 and 31, which are shown toothed or serrated at their adjacent faces, as shown at 32, and adjustably clamped together at their inner ends, preferably by a collar 33 and a set-screw 34, as shown in Fig. 2. The outer end of the member 30 is pivotally secured to the outer end of the crank-arm 17 and the outer end of the member 31 is pivotally secured to an attaching-plate 34, shown fixed to the frame of the door.

The upper end of the casing C is shown having two oppositely-disposed spring end receiving notches or grooves 35 and 36, (see Fig. 5,) located at the right and left hand sides, respectively, of the longitudinal central line of said casing. These notches provide a simple means whereby the spring S may be removed from the casing C and reinserted to operate in a reverse direction, as required when the door-check is applied to a door opening in a direction opposite to that indicated in Figs. 1 and 2.

When the device is applied to a door operating in a direction the reverse of that indicated in Figs. 1 and 2, the spring will be inverted and the pawl 28 will be shifted from the full-line position shown in Fig. 2 to the dotted-line position shown in said figure, so that the opposite tooth-engaging portion of said pawl will engage the ratchet-wheel 27 at the opposite side of the longitudinal axis of the arm 17, as will be readily understood by reference to said Figs. 1 and 2 of the drawings.

When it is desired to adjust the toggle device to increase or decrease the effective throw or movement thereof, it is simply necessary to loosen the clamping device and move the two members 30 and 31 of said toggle device longitudinally, so that the serrations or teeth of one member will engage those of the other member and reclamp the parts together in their adjustable positions.

The connector between the piston-actuator and piston will be guided in its movements in a bearing, as 38, formed in the casing C at one side of the periphery of the actuator B.

In operation when an opening movement is imparted to the door the casing C, the parts carried thereby, and the toggle device T will at one stage of said movement be shifted from the position shown in full lines in Fig. 2 to that indicated by the diagrammatic lines in said figure, thus winding the spring and shifting the piston-actuator and piston in relatively transverse planes from the positions thereof shown in Fig. 3 to those shown in Fig. 4. On the closing movement of the door, which is effected by the stress of the spring S through the medium of the crank-arm 17, the piston-actuator will be rotated in a direction opposite to that in which it is rotated during the opening movement of the door, and through the medium of the connector P′ and the cam-groove will impart an advancing movement to the piston, which advancing movement is retarded by the air contained in the piston-cylinder, the extent of retardation being governed by the valve or regulator in connection with the air-outlet. Thus it will be seen that owing to the retardation of the advancing movement of the piston the door-closing action of the spring and connected parts is correspondingly regulated.

By constructing and organizing the parts of the door-check as hereinbefore described said door-check may be applied to right and left hand doors. The initial stress of the spring that actuates the crank-arm 17 may be adjusted to render the same effective for doors of different weights, and the closing movement of the door may be retarded as required.

Suitable means are provided in connection with the casing for preventing the longitudinal movement of the rotative piston-actuator B. This means is shown in Fig. 3 as a pin 40, extending through the casing and having the inner end thereof extended into a circumferential groove 41 in the body of the actuator near the upper end thereof. This means, however, may be modified without departure from my invention.

It will be obvious that the casing C and parts carried thereby might be attached to the door-frame and the toggle device to the door, and therefore the invention is not limited to the organization thereof shown in Figs. 1 and 2.

Having described my invention, I claim—

In a door-check, the combination with a casing having three superposed concentric chambers, the middle one of which has a series of internal radial guide-flanges; of a cam-grooved piston-actuator fitting the middle chamber and having a stem extending through the casing; a piston supported in the lower chamber for movement in the plane of the axis of the actuator, and having a centrally-disposed stem extending into a central bore in said actuator; a connector seated in a guideway formed in one of the middle-chamber flanges and operatively connecting the actuator and piston; a spring-actuated arm in connection with the stem of the piston-actuator, and means for adjustably connecting the arm to a door.

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