No. 615,074. Patented Nov. 29, 1898.

P. J. LENNART.

DOOR CHECK.

(Application filed Oct. 27, 1897.)

(No Model.) 5 Sheets—Sheet 1.

Fig. 1.

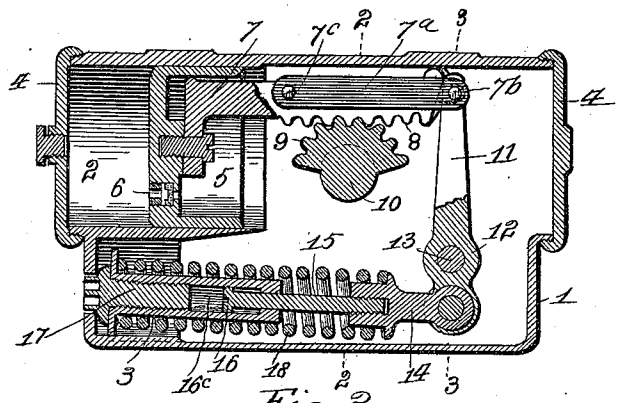


Fig. 2.

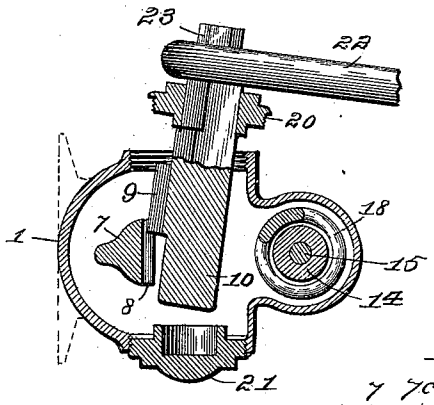


Fig. 3a

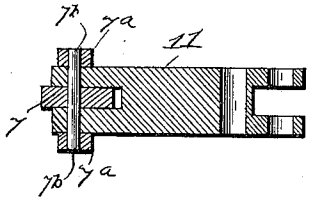


Fig. 3.

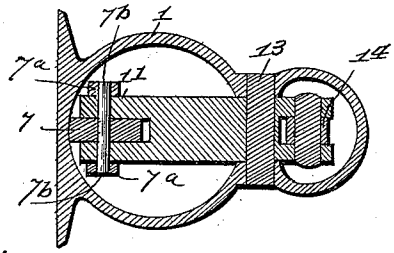
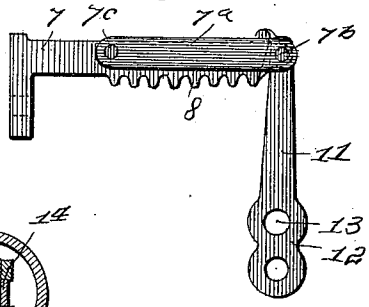


Fig. 1a.



Witnesses
Herbert Bradley.
Karl N. Fenning.

Inventor
Petr. J. Lennart.
By Knight Bros
Attorneys

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P. J. LENNART.

DOOR CHECK.

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Fig. 4.

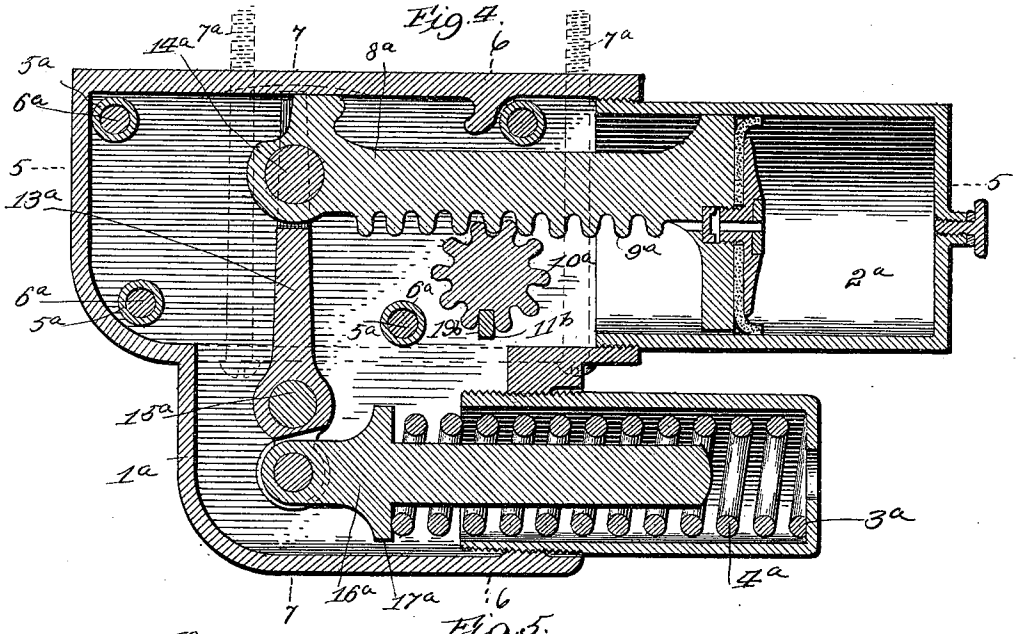


Fig. 5.

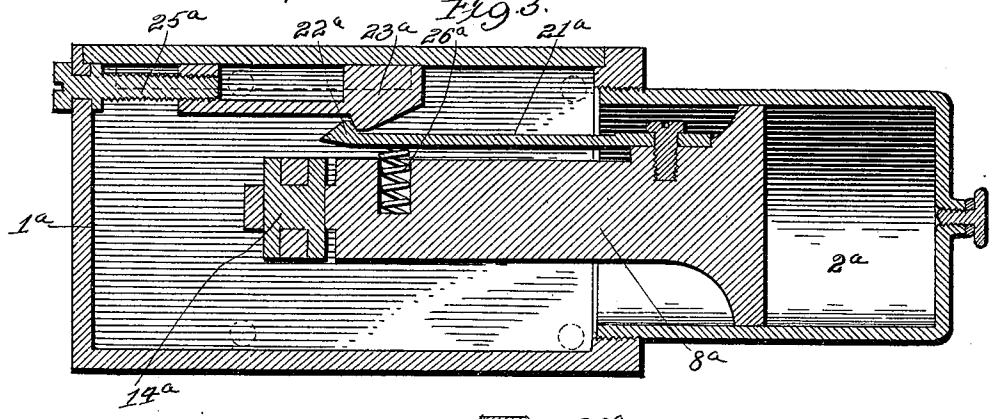
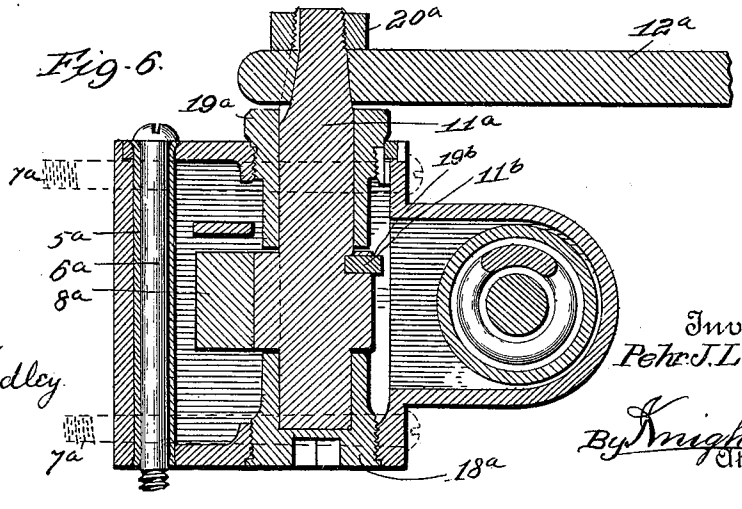


Fig. 6.



Witnesses
Herbert Bradley.
K. Fleming.

Inventor
Peter J. Lennart.
By Knight Bros
Attorneys

No. 615,074. Patented Nov. 29, 1898.

P. J. LENNART.

DOOR CHECK.

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(No Model.) 5 Sheets—Sheet 3.

Fig. 7.

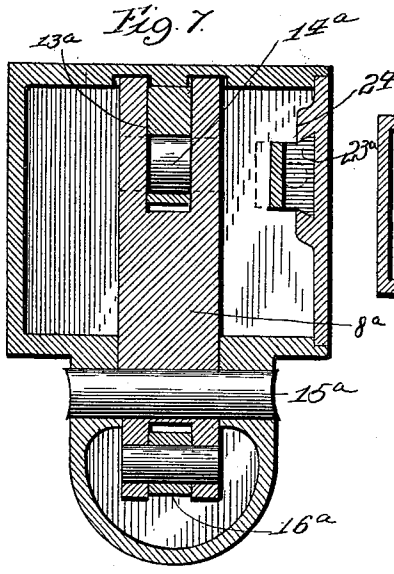


Fig. 8.

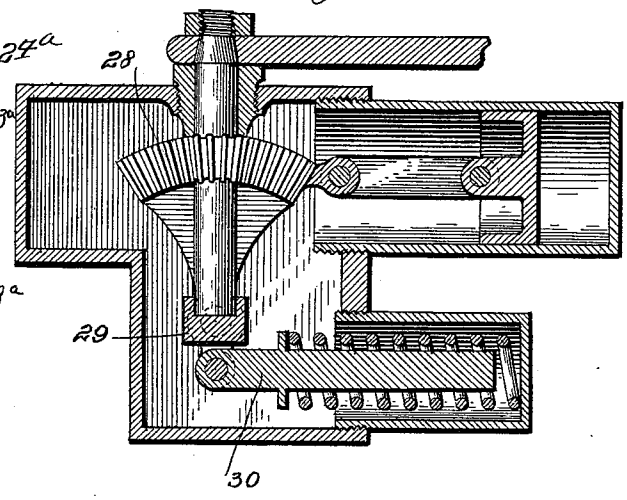


Fig. 9.

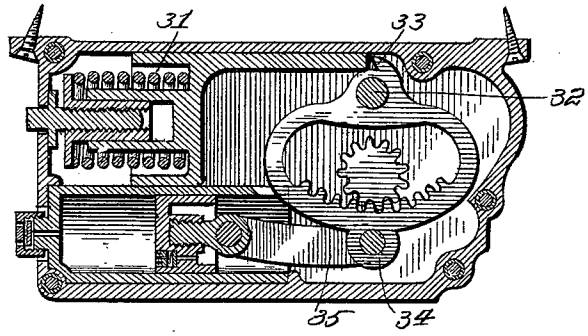
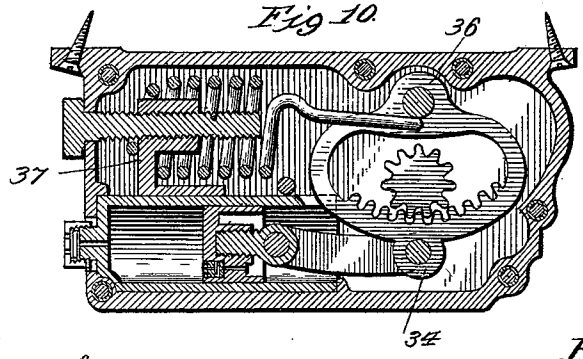


Fig. 10.



Witnesses
Herbert Bradley.
Karl H. Fenning.

Inventor
Pehr J. Lennart.
By Knight Bros.
Attorneys

No. 615,074. Patented Nov. 29, 1898.

P. J. LENNART.

DOOR CHECK.

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Fig. 11.

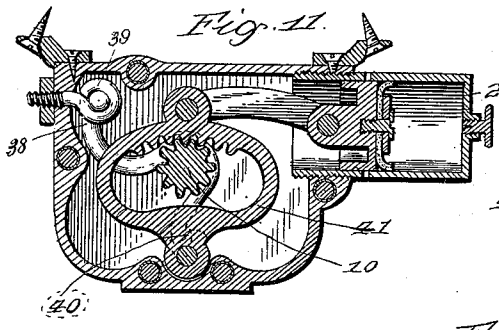


Fig. 12.

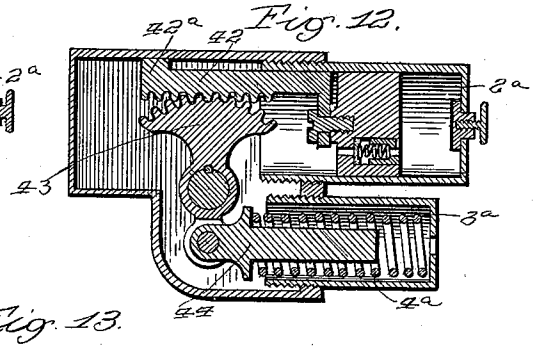


Fig. 13.

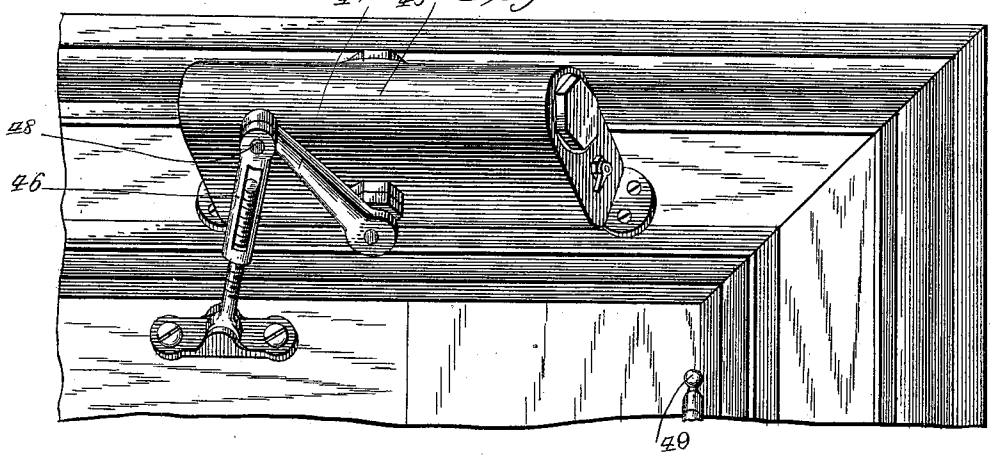
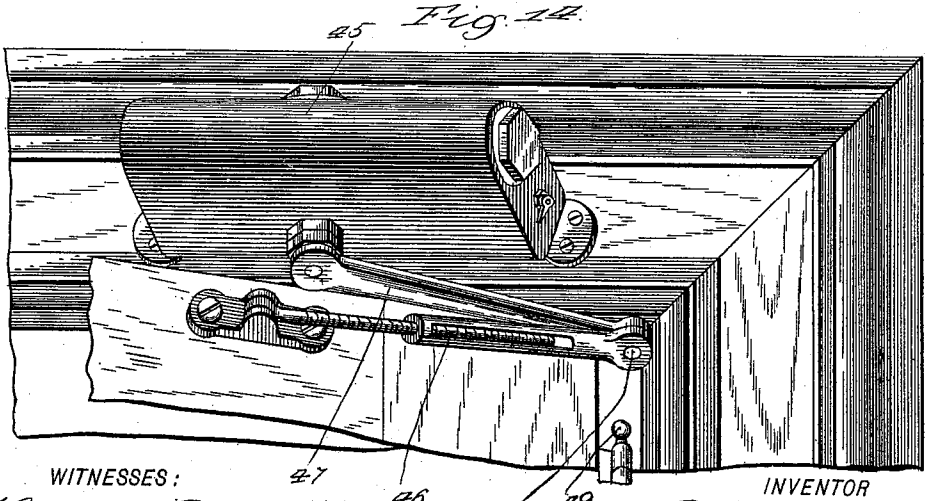


Fig. 14.



WITNESSES:

Herbert Bradley.

Edward K. Allen.

INVENTOR

Pehrt. Lennart.

BY Knight Bros

ATTORNEYS.

No. 615,074. Patented Nov. 29, 1898.

P. J. LENNART.

DOOR CHECK.

(Application filed Oct. 27, 1897.)

(No Model.) 5 Sheets—Sheet 5.

Fig. 15.

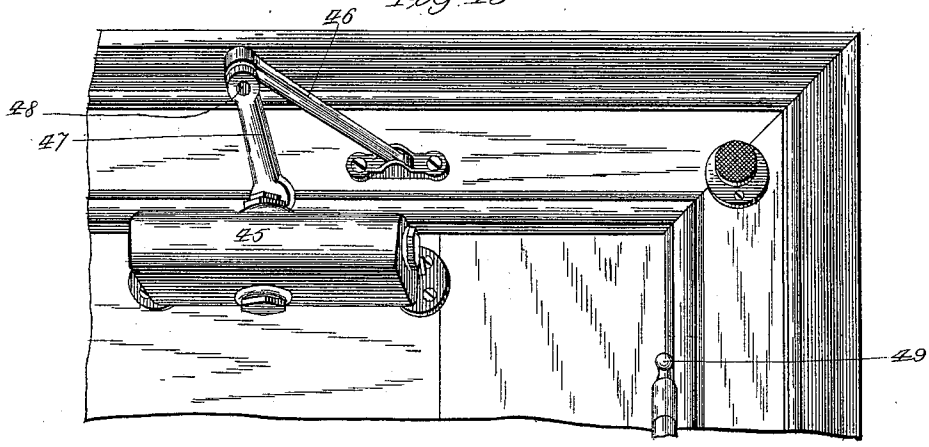


Fig. 16.

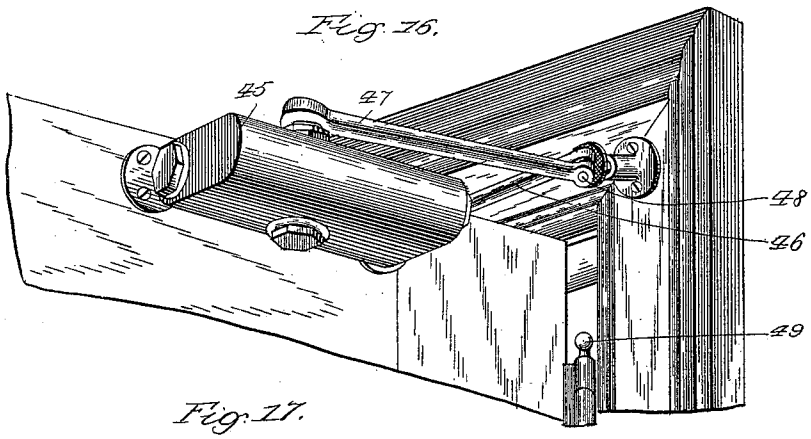
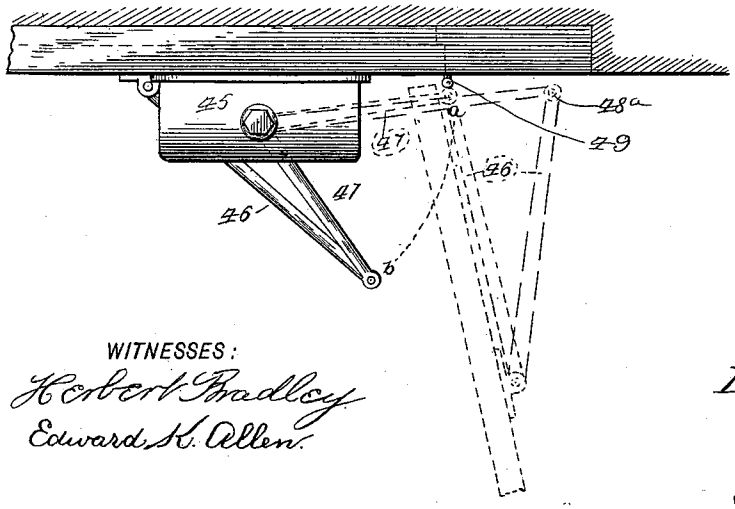


Fig. 17.



WITNESSES:
Herbert Bradley
Edward K. Allen.

INVENTOR
Petr J. Lennart.
BY Knight Bros
ATTORNEYS

UNITED STATES PATENT OFFICE.

PEHR J. LENNART, OF STAMFORD, CONNECTICUT.

DOOR-CHECK.

SPECIFICATION forming part of Letters Patent No. 615,074, dated November 29, 1898.

Application filed October 27, 1897. Serial No. 656,607. (No model.)

To all whom it may concern:

Be it known that I, PEHR J. LENNART, a citizen of the United States, residing at Stamford, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Door-Checks, of which the following is a specification.

My invention relates to that class of door-checks known as "combination-checks;" and it has for its principal object to provide a lever connection between the plunger and the closing-spring, whereby I am enabled to greatly reduce the scope of the spring's expansion, with the result that it will not become set so soon, a spring of greater strength and durability may be employed, and the door may be opened more easily.

Further objects of my invention are to provide a simple means for securing the door-check to the door jamb or soffit, to provide a stop which will engage the moving part and hold the door open against the action of the spring, while the engagement can be released by a light pull, and which means is adjustable, so that the door may be held open in different positions, and also to provide a simpler construction of the casing and arrangement of the arms. I accomplish these objects by mechanism which will be hereinafter particularly set forth.

In order that my invention may be fully understood, I will proceed to describe the same with reference to the accompanying drawings, in which—

Figure 1 is a horizontal sectional view illustrating a door-check containing the preferred embodiment of the several features of my present invention. Fig. 1ª is a detail view illustrating the connection between the lever and piston-stem. Fig. 2 is a vertical cross-section of the same, taken on the line 2 2 of Fig. 1. Fig. 3 is a vertical cross-section taken on the line 3 3 of Fig. 1. Fig. 3ª is a detached sectional view of the lever shown in Fig. 3. Fig. 4 is a horizontal sectional view showing an embodiment of the features of my invention in a door-check of modified construction. Fig. 5 is a vertical longitudinal section on the line 5 5 of Fig. 4. Fig. 6 is a vertical transverse section on the line 6 6 of Fig. 4. Fig. 7 is a vertical transverse section on the line 7 7 of Fig. 4. Figs. 8 to 12, inclusive, show by horizontal sectional views five other modifications in the construction of door-checks embodying the several features of my invention. Figs. 13 and 14 represent the arrangement of the check whereby the door will be held open by moving it beyond the angle of ninety degrees to the plane of the door-frame, the check being secured to the door-frame, Fig. 13 showing the door closed, while Fig. 14 shows the door open. Figs. 15 and 16 are views corresponding to Figs. 13 and 14, but differing therefrom in that the check is secured to the door instead of to the door-frame. Fig. 17 is a diagrammatic view illustrating more clearly the movements of the controlling-arm and connecting-rod in the self-retaining arrangement of the check.

In the said drawings, and referring more particularly to Figs. 1 to 3, 1 represents the casing, formed at one end with the piston-cylinder 2 and the spring-chamber 3 and preferably cast in a single piece with the exception of the ends 4, which are screwed on or otherwise removably secured to the piston-chamber.

5 represents a piston fitted in the piston-chamber 2, provided with the check-valve 6, and having the piston-rod or pitman 7, by which it is reciprocated in the cylinder. On one face of the piston-rod or pitman is formed a rack 8, which is normally in engagement with a segment 9, cast integrally with a vertical operating spindle or shaft 10, which is reversibly mounted in the casing, as will be hereinafter pointed out. The other end of the piston-rod or pitman is connected to the end of the longer arm 11 of a lever 12, which is pivoted at 13 within the casing and has its short arm connected with a flanged spring-plunger 14. Projecting from the plunger 14 is a rod 15, having a head 16, which works in the hollow core 16ᶜ of spring 18. The core 16ᶜ has an adjustable abutment against the end of the spring-chamber through the medium of a screw 17, which also centers the core and spring in the spring-chamber by means of the head 17ᶜ, which enters an opening in the casing. The head is also thereby presented for turning, and for this purpose it is constructed to receive a key or tool.

From the foregoing description it will be

seen that I have provided a spindle and a controlling-spring with an interposed lever as the means of imparting movement from the one to the other and that the lever is such as to greatly simplify the movement of the spring, so that a strong spring may be employed, and the movement required of it will be light and tendency to set reduced. It will also be seen that I have connected the checking-piston to the long end of the spring-lever, so as to better control the action. By turning the screw 17 the core 16^c may be set up and the tension on the spring 18 increased at will.

The operating-spindle or vertical shaft 10 is held or journaled in the casing by means of the nut 20 and step-bearing, which is preferably formed in a nut 21, similar in construction to the nut 20, thereby adapting the nuts to be interchanged, so that the spindle 10 can be made to protrude from either side of the casing and the check changed from right to left, or vice versa. 22 represents the arm which connects the vertical spindle to the door, and 23 represents a nut for holding the arm on said spindle.

As shown in Figs. 1^a, 3, and 3^a, the ends of the lever 11 are bifurcated to receive the parts 7 and 14, and the rack 7 is connected to said lever by links 7^a, so as to avoid drawing the rack out of its line of travel.

Referring now to Figs. 4 to 7, which show a modification of the casing and a slightly-different operating mechanism, 1^a represents the main portion of the casing of the door-check, which is formed with a pair of interiorly-screw-threaded openings, in which are fitted the ends of a piston-cylinder 2^a and a spring-chamber 3^a. The spring-chamber 3^a contains and forms the abutment for the closing-spring 4^a, and being screw-threaded for a considerable portion of its length may be adjusted relatively to the main portion of the casing and in this manner regulate the tension of said closing-spring. The top of the casing is separate from the body portion, as shown in Fig. 6, and is secured thereto by the elongated rivets 5^a, which form a casing or jacket for the attaching-screws 6^a. Openings are also provided in the vertical sides of the main portion, as shown in dotted lines in Fig. 5, to accommodate the attaching-screws 7^a. (Shown in dotted lines in Figs. 4 and 6.)

The piston 8^a, working in the cylinder 2^a, is provided with a rack 9^a, which acts as its stem, and said rack is normally in engagement with a pinion 10^a, carried on the spindle 11^a, so that when the door is opened and the spindle turned through the medium of the arm 12^a the piston will be drawn back. The end of the stem is held by a pin 14^a in the bifurcated end of the lever 13^a, which is pivoted in the main portion of the casing by means of a bolt 15^a, while the other bifurcated end of the lever 13^a is connected to the spring-plunger 16^a. This plunger projects into the spring-chamber 3^a and forms a core for the closing-spring 4^a, one end of which abuts against the shoulder 17^a on the plunger, while the other end of the spring abuts against the end of the cylinder 3^a. With this arrangement of the piston and spring and the connecting-lever it will be seen that the door can be easily opened and the spring will be only slightly compressed in the opening of the door, thereby permitting of a stronger spring being employed and obtaining a more elastic and uniform pressure at any position of the door in opening or closing than heretofore.

The vertical spindle 11^a is journaled in the main portion 1^a by the set-nut 18^a at the bottom thereof and by the set-nut 19^a at the top of the casing. These nuts are of the same size and are constructed alike, so that they may be interchanged, as in Fig. 2. By this simple arrangement the check can be reversed from right to left hand, or vice versa, which is done by turning the vertical spindle end for end and applying the nuts 18^a and 19^a in the usual manner. The arm 12^a is held on the spindle by the nut 20^a. To compel introduction of the spindle in the proper position in the casing, I provide the fin or projection 11^b, which when the shaft is placed in the casing must pass through a slot 19^b, provided in the casing. With this arrangement the arm 12^a will project in the proper direction and the spindle always turn the same way.

In Figs. 5 and 7 of the drawings I show a means within the casing for holding the door open in any position against the action of the closing-spring. This means consists of a spring-arm 21^a, secured at one end to the stem of the piston and provided at its free end with a shouldered head 22^a. A stop 23^a engages the shoulder 22^a sufficiently to oppose the movement of the piston by the closing-spring, and thereby holds the door open. This engagement is not, however, sufficient to hold against a slight pull applied manually to the door, and the latter may therefore be readily released at will. The stop 23^a is held to the casing in the guide 24^a and is adjusted in the guide by means of the screw 25^a, preferably of the form shown, which is held at one end in the casing and has its other end threaded in the stop. By adjusting the stop to any desired position the point at which the shouldered head of the spring-arm will engage with it is determined, and in this manner the door is held open to any desired degree. A spring 26^a, fitted in a socket in the stem of the piston, holds the spring-arm in engagement with the stop. When it is desired not to use the stop, it is simply moved to the end of the casing, so as to be free from engagement with the spring-arm.

The operation of the check will be readily understood. As the door is opened the piston is moved back and the spring compressed through the medium of the lever. When the door is released, the spring acts to close it, and the regulating medium employed in the

cylinder tends to allow the door to gradually close.

In Figs. 8 to 12, inclusive, I have shown several modifications in the form of connecting-lever between the spring and piston and also in the general arrangement of parts.

In Fig. 8 the stem of the piston is connected with a pivoted toothed segment 28, in engagement with the pinion carried by the vertical spindle, while below the pivot-point 29 of the segment the spring-plunger 30 is connected.

In Fig. 9 the spring-plunger 31 is in the form of a casting, providing both a core for the spring and guides for the plunger working in the spring-cylinder, while the lever between the spring and piston is an ellipse, the central portion of which is cut out to accommodate the vertical spindle and pinion and is provided with the rack-teeth in engagement with the latter. The lever is pivoted at 32, and it is provided near its pivot with a heel 33, which engages with the plunger 31 when the lever is moved to compress the spring. A lug 34, provided on the lever, affords means for connection to the piston through the medium of link 35.

In Fig. 10 substantially the same form is used as shown in Fig. 9, with the exception that one end of the spring is held by an adjustable abutment 37, and the spindle may be so arranged that when the door is opened the spring is distended instead of compressed.

In Fig. 11 substantially the same form of lever is also used as shown in Figs. 9 and 10; but instead of employing a special spring-chamber the closing-spring 38 is in the form of an **S** and arranged in the main casing, one end being secured to an eye 39, while the other end is bent so as to be in the path of a heel or lug 40, carried by the lever 41, near its pivotal point.

In Fig. 12 the piston is provided with a detachable rack 42, held in engagement with the teeth on the segment 43 by the projection 42^a, traveling against the casing. The segment-lever 43 is fixed on the vertical spindle 10, so as to turn with it, and it carries the plunger 44, on which the spring is coiled. In this form the piston-cylinder and spring-chamber are detachable.

The operation of the several forms is substantially the same as described in connection with the first form.

In Figs. 13 to 17 I have shown the arrangement of a check in use, whereby the door may be held open by the check after it is moved to a position beyond a right angle to the plane of the door-frame, but will retain all its effectiveness for closing the door as soon as the latter is moved from its extreme position to a point within the right angle; also, means whereby the relations of the arms may be changed, so that they cannot assume a position which will admit of the door remaining open. In brief, the explanation of the self-retaining arrangement of the arms is that the swinging connection of the connecting-rod is secured at a point distant from the hinge-pintle equal to the length of that arm, or, in other words, the arm is adjusted in length so that its hinging connection with the controlling-arm of the check will swing in an arc intersecting the vertical line of the hinge-pintle of the door, and the door-check is so located on the jamb or on the door, as the case may be, that its controlling-arm will likewise swing in an arc passing through the vertical line of the hinge-pintle. With the parts so adjusted it follows that when the door is opened to a position at right angles to the plane of the doorway the hinging connection between the controlling-arm and the connecting-rod will assume a position over the hinge-pintle, and further movement of the door may thereafter take place without movement of the controlling-arm and connecting-rod relative to the parts to which they are attached, and when the door passes beyond a right-angle position the push or thrust of the controlling-arm of the check is in such a direction that it will tend to push the door open rather than shut. Thus in Fig. 13 it will be seen that the check is secured to the lintel, and the controlling-arm and connecting-rod are in effective position to retain the door in its closed position. When, however, the parts have moved to the position illustrated by Fig. 14, the controlling-arm and connecting-rod have moved against the parts to which they are respectively attached, and their hinging connection 48 is in the vertical line of the hinge-pintle 49. The door may thereafter continue its movement without further movement of the arm 47 and connecting-rod 46 relative to the parts to which they are attached, as the hinge between them is in the axis about which the door is moving. The same is true of the arrangement shown in Figs. 15 and 16.

The movements of the parts can probably be best understood upon reference to the diagram Fig. 17, wherein the parts are shown in closed position in full lines and by dotted lines in the various positions which they assume after the door passes the right-angle point. It will be noticed that since the arm 47 swings in the arc *a b* its tendency to swing when the parts are in their extreme right-hand position tends to hold the door open rather than shut; but so long as the door remains within the right-angle position the closing effect of the check remains unimpaired. This diagram likewise illustrates the fact that should the arm 47 be lengthened or, what is the equivalent, should the check be moved until said arm occupies the position indicated by broken lines the hinge connection 48 would occupy the position 48^a when the door is all the way open, and the thrust upon the connecting-rod 46 could at no time be in a direction other than one which would tend to close the door. If the check is mounted on the door and the connecting-rod 46 is attached to the lintel, then the self-opening effect may be counteracted by lengthening the rod 46,

as shown in Fig. 17. To provide for conveniently changing the length of the arm 47 or the rod 46, according to which of them is attached to the lintel, a screw-threaded sleeve is introduced into the part to be changed in length. This affords ready means for changing the check from the self-opening arrangement into an arrangement of the parts whereby the door will be self-closing under all conditions.

A number of other advantages arise from the particular arrangement of controlling-arm and connecting-rod described. The arm and connecting-rod swing toward the hinge instead of away from the hinge, as in checks heretofore constructed—that is to say, said parts travel in the same direction as the door, so that the controlling-arm will push the door closed rather than pull it shut, and the check may be mounted above the door, so as to avoid restricting the opening of the door, as when the check is mounted on the door near a partition. At the same time the arm does not have to travel through as great an arc as the door in its movement, and a smaller check may thus be used for accomplishing the work. Moreover, the movement of the check-arm increases inversely to the degree of opening of the door, which presents an advantage in that the greater movement of the check-arm takes place as the door reaches its closed position.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. In a door-check; the combination of a suitable casing, the piston and closing-spring located therein, and a lever fulcrumed in said casing and connected at one end to the piston and at a less distance from its fulcrum to the spring, and operating to amplify in the piston the movement imparted by the spring, substantially as described.

2. In a door-check, the combination of a suitable casing, a piston and a closing-spring suitably located in said casing, a lever eccentrically fulcrumed between its ends so as to provide a long arm and a short arm, and having its long arm connected with the piston and its short arm connected with the spring, a spindle through which movement is imparted to the door, and a rack-and-pinion connection between the lever and spindle; substantially as and for the purposes set forth.

3. In a door-check; the combination of a suitable casing, a piston and a closing-spring suitably located in said casing, a lever fulcrumed in said casing, a suitable connection between said lever and the spring, a piston-rod provided with a rack and serving to connect the lever with the piston, and a spindle having teeth engaged by the rack of the piston-rod, substantially as and for the purposes set forth.

4. In a door-check; the combination of a suitable casing, the piston and closing-springs located therein, an adjustable stop provided in said casing, and a spring-arm carried by the piston having a head for engagement with said stop to hold the piston from movement in the closing direction, substantially as shown and described.

5. In a door-check, the combination of a suitable casing, a closing-spring and a piston located in said casing and respectively connected with the door whereby the spring closes the door and the piston controls the closing effect of the spring, a spring-arm attached at one of its ends to one of the said parts and having a supporting-spring beneath its free end, and a stop secured to the casing and having an angularly-arranged face by which it engages the end of the spring-arm and by which said spring-arm is displaced under the influence of an abnormal closing force applied to the door; substantially as and for the purposes set forth.

6. In a door-check; the combination of a suitable casing, the plunger and closing-spring located therein, an adjustable stop provided in said casing and a yielding part carried by the plunger and engaging the stop to prevent the closing of the door; said engagement being by angularly-arranged faces which cause displacement of the yielding engaging part upon application of increased closing force to the door, substantially as shown and described.

7. In a door-check; the combination of a suitable casing, a closing-spring and a retarding-piston suitably located in said casing, a spindle formed with bearings at its respective ends and with a toothed gearing at an intermediate point forming a connection with the controlling mechanism within the casing; said casing being provided on opposite sides with openings and with interchangeable nuts closing said opening, and formed respectively with a cup or step bearing for one end of the spindle and with a through-bearing for the opposite end of the spindle forming the projection of said opposite end through the bearing, substantially as and for the purposes set forth.

PEHR J. LENNART.

Witnesses:
JOHN E. KEELER,
HENRY B. MOREHOUSE.