

(No Model.)

3 Sheets—Sheet 1.

C. E. BRUNTHAVER.
DOOR CHECK AND CLOSER.

No. 565,377.

Patented Aug. 4, 1896.

Fig. 1.

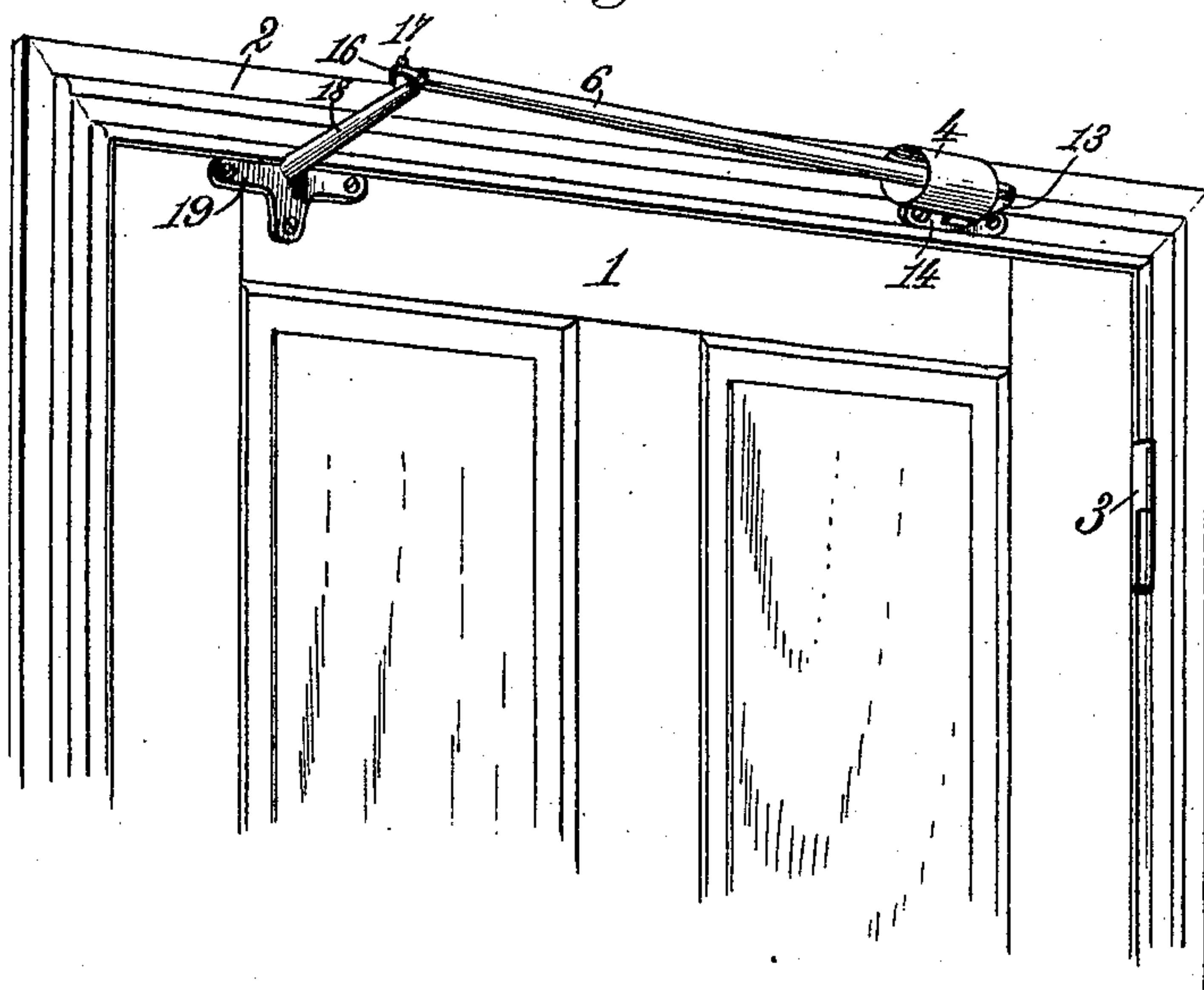
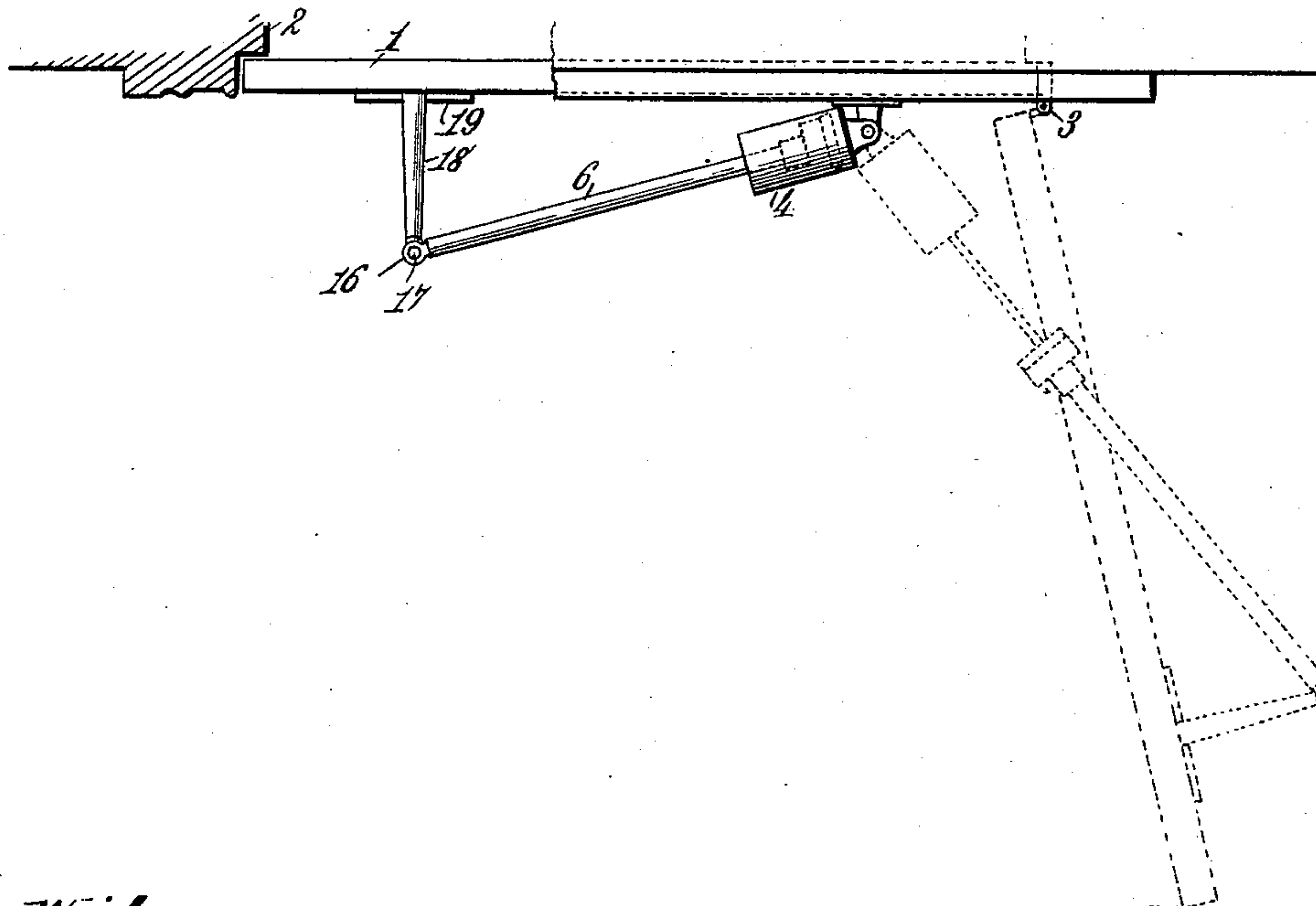


Fig. 2.



Witnesses.
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By *James L. Norris.*
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3 Sheets—Sheet 2.

No. 565,377.

Patented Aug. 4, 1896.

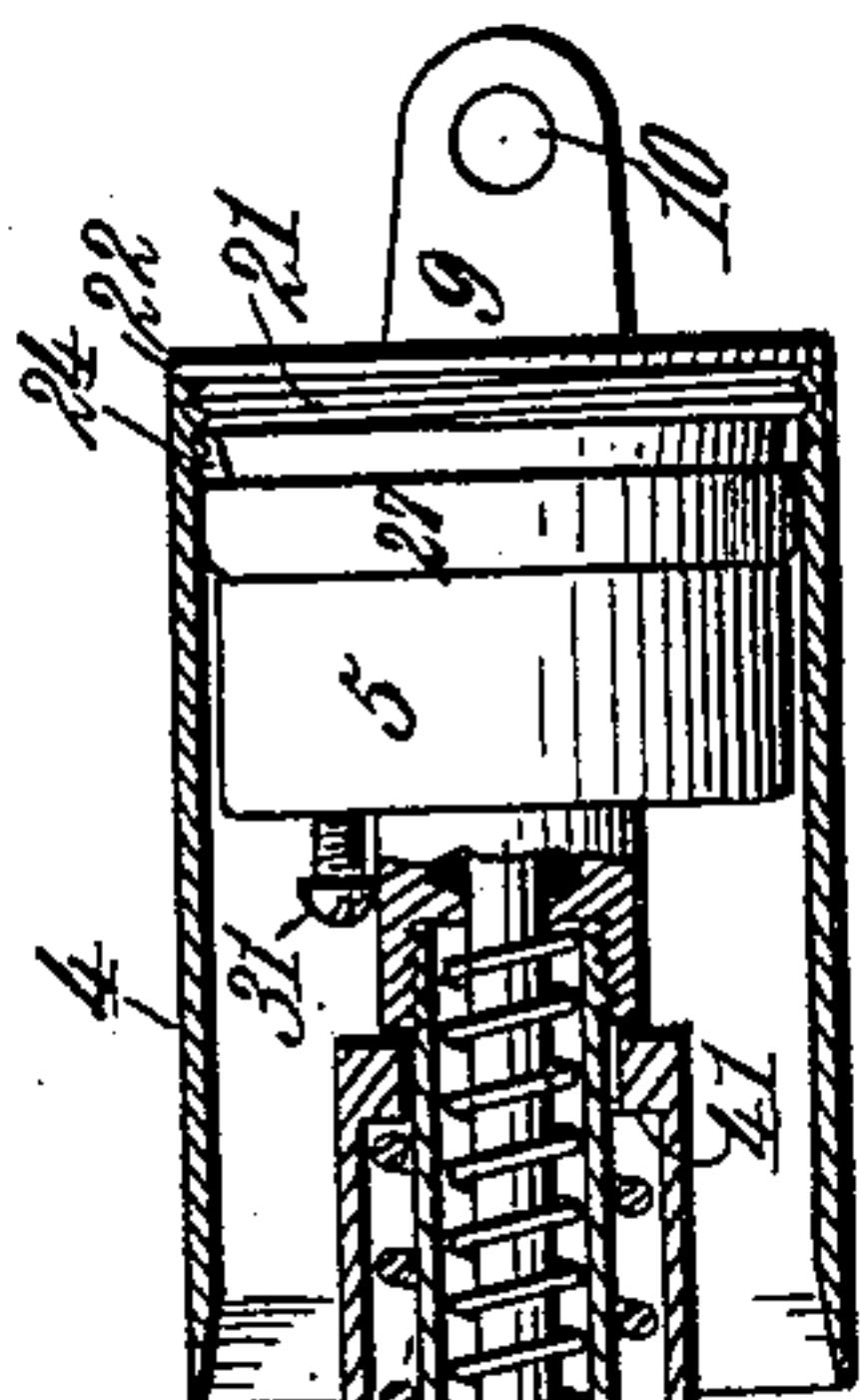
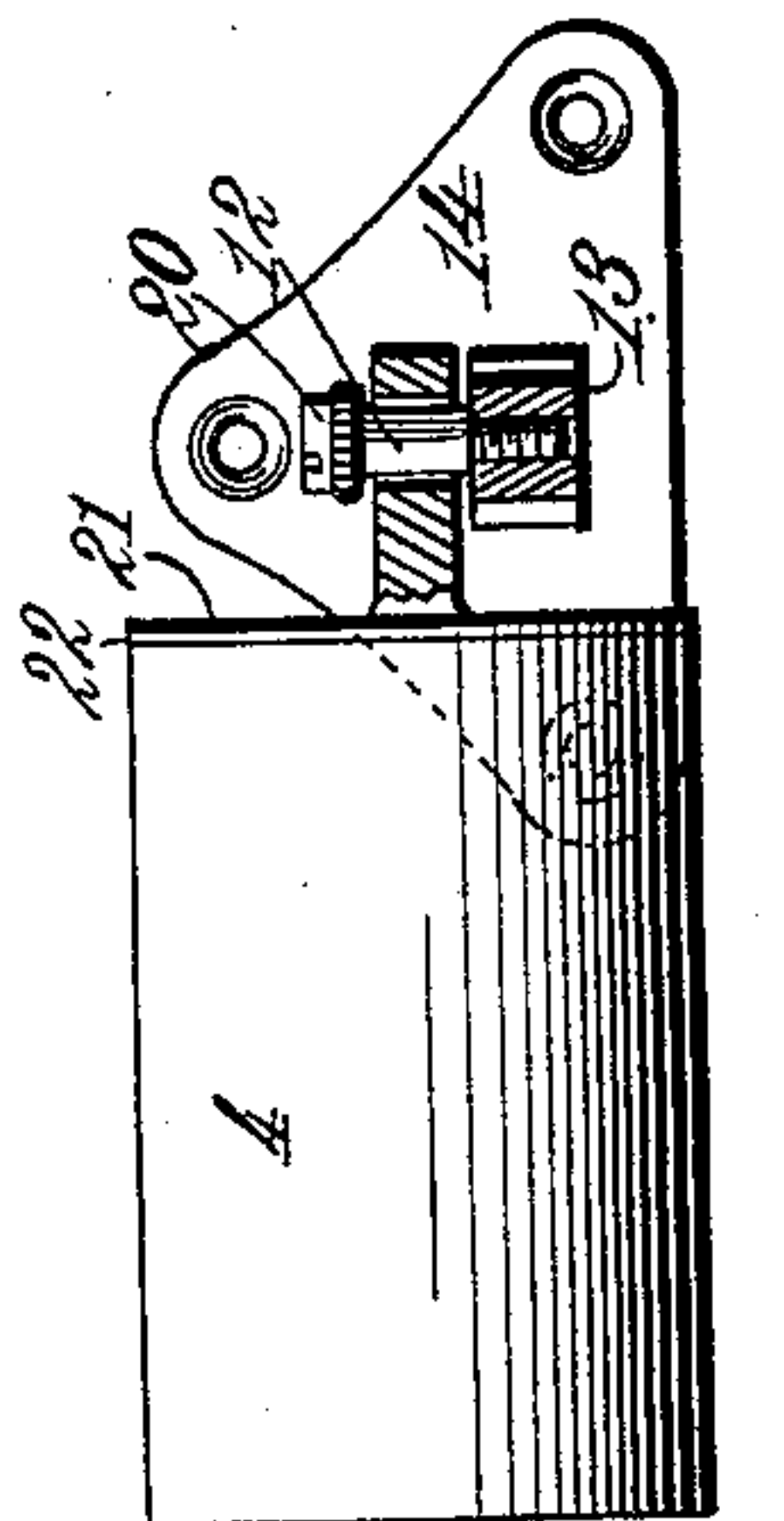
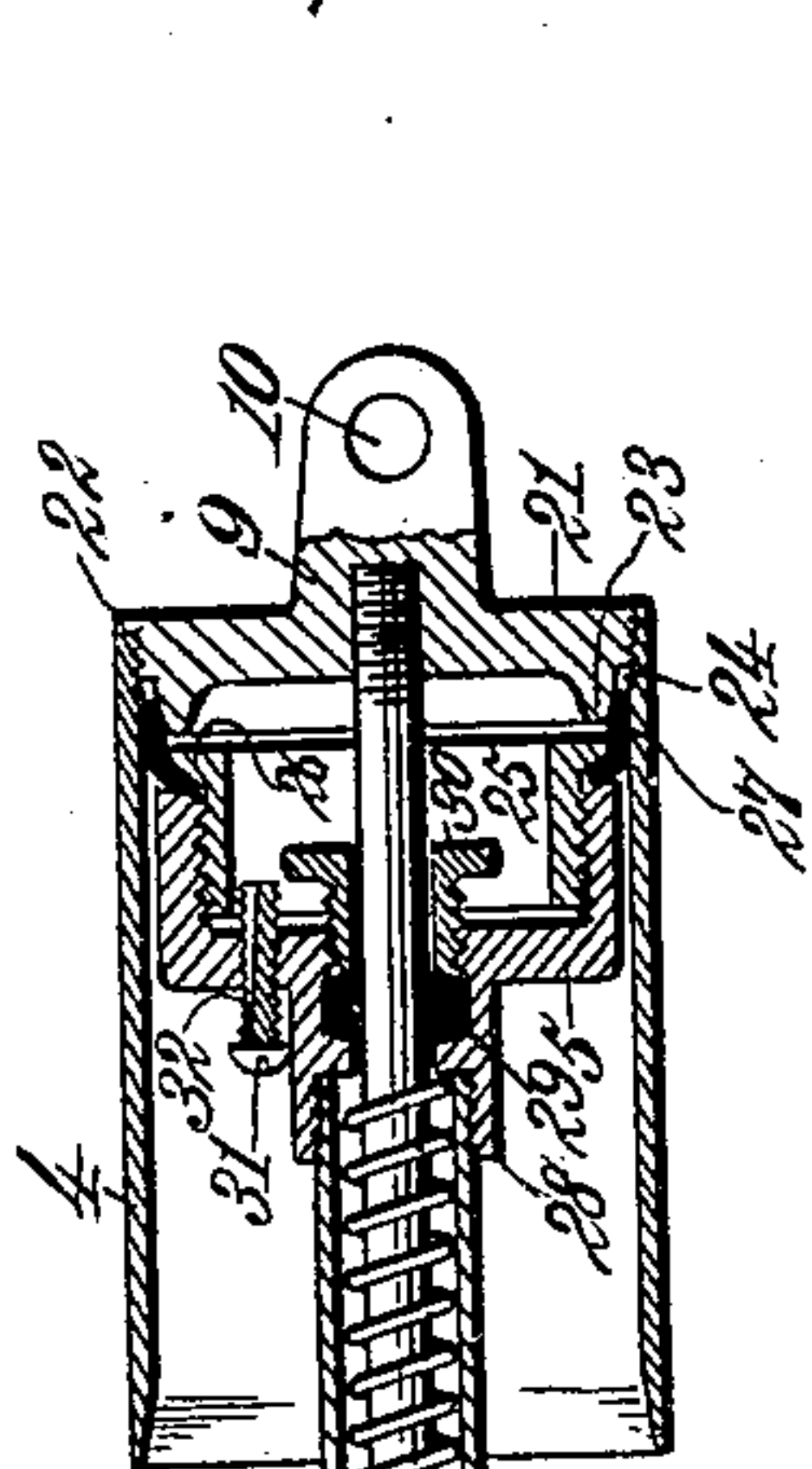


Fig. 3.

Fig. 4.

Fig. 5.

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(No Model.)

3 Sheets—Sheet 3.

C. E. BRUNTHAVER.
DOOR CHECK AND CLOSER.

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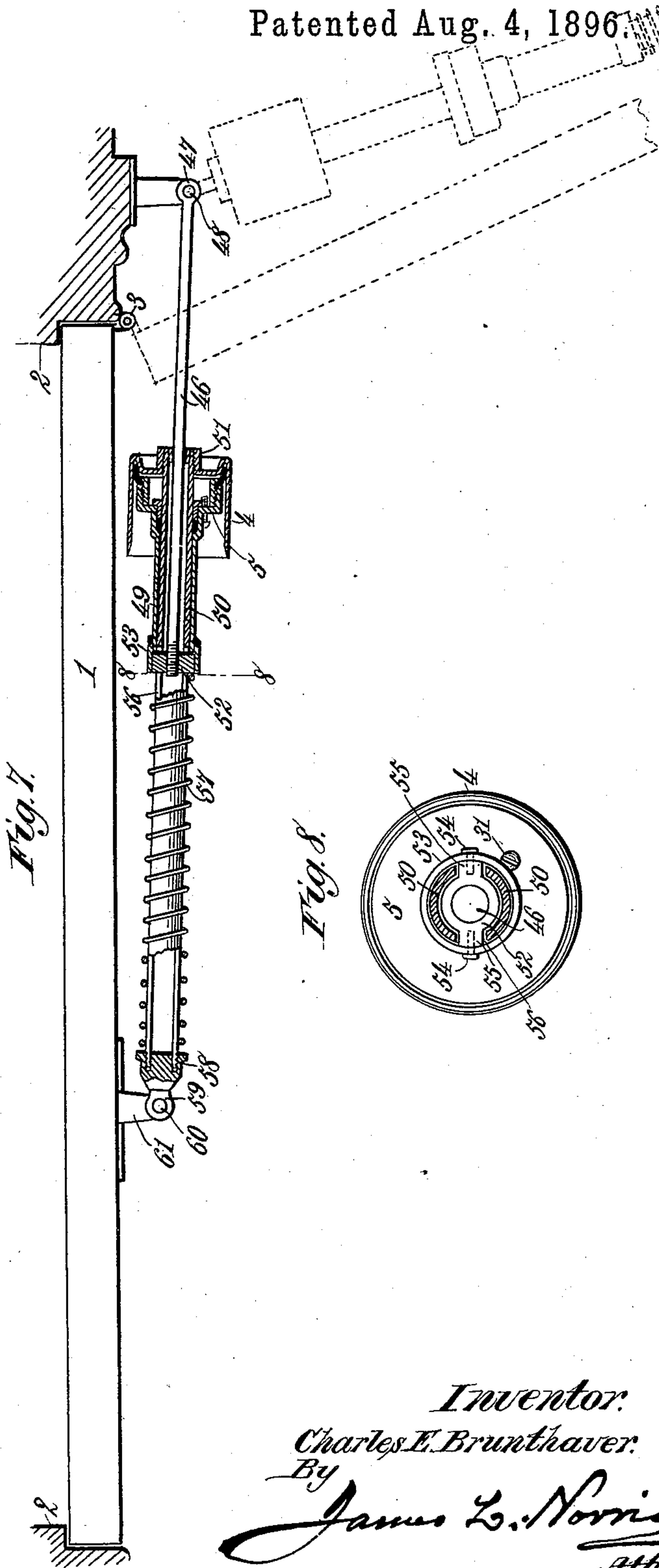
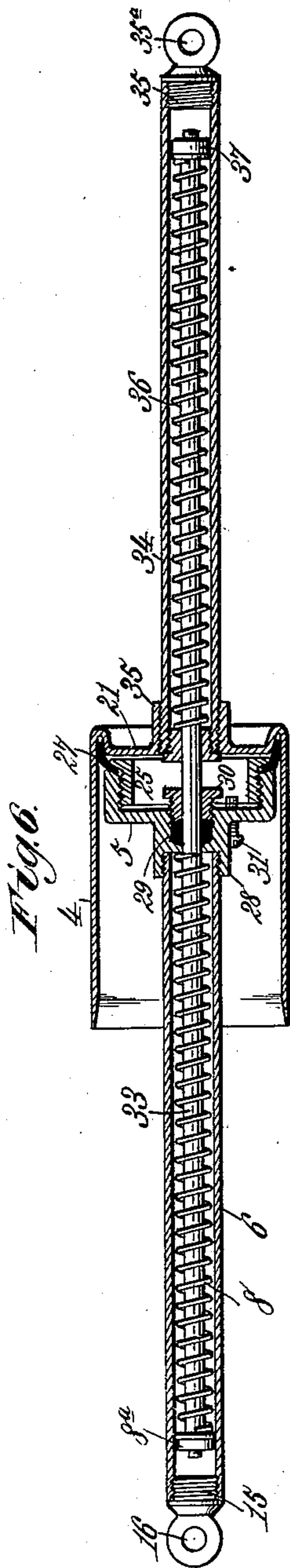
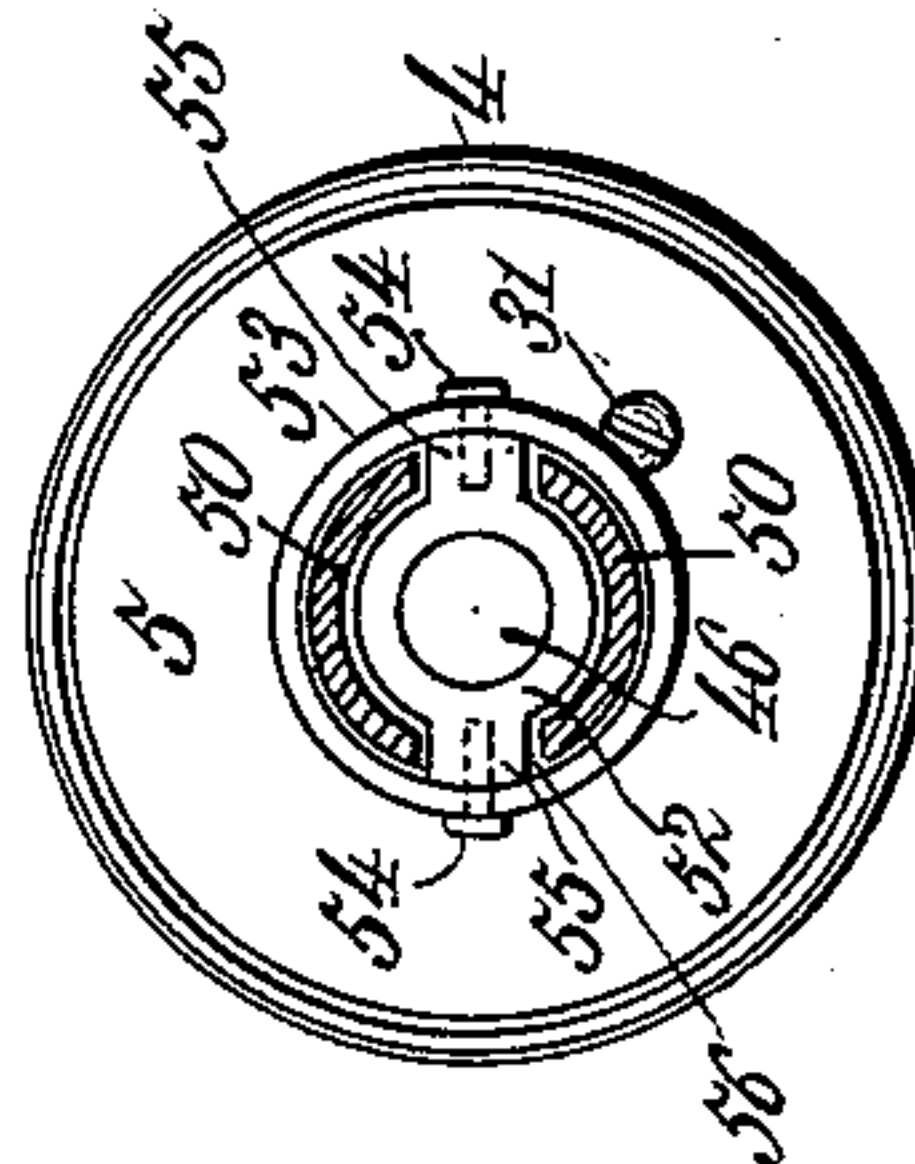


Fig. 8.



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UNITED STATES PATENT OFFICE.

CHARLES E. BRUNTHAVER, OF WASHINGTON, DISTRICT OF COLUMBIA.

DOOR CHECK AND CLOSER.

SPECIFICATION forming part of Letters Patent No. 565,377, dated August 4, 1896.

Application filed March 12, 1896. Serial No. 582,915. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. BRUNTHAVER, a citizen of the United States, residing at Washington, District of Columbia, have invented new and useful Improvements in Door Checks and Closers, of which the following is a specification.

My present invention relates to door checks and closers, my purpose being to provide a device of this type which shall be applicable to either a right-hand or left-hand door without change, and which shall have operative action in closing a door without noise, without regard to the angle the door may make with its frame, or, in other words, without regard to the point to which the door may be swung upon its hinges.

It is my purpose also to provide a door check and closer which shall have but very few parts, a marked simplicity of construction, and perfect ease and certainty in operation, besides being of very low cost in production. I aim, moreover, to attain such an organization that the principal operative parts shall be entirely inclosed and concealed and the piston and cylinder self-cleansing, so that dust and grit shall be removed as fast as it enters or is deposited, and the parts thereby protected from excessive and rapid wear.

It is one purpose of my invention also to provide a door check and closer consisting of a single organization or combination of parts which may be easily connected with and disconnected from a door in such manner as to operate without straining the hinges or loosening their attachment to the frame of the door. My single device can be easily and instantaneously combined with a door, it being suitable for use in connection with doors of any construction, size, and weight, such, for example, as glass doors, slat-doors, half-doors, or hinged screens and panel, or solid doors, and upon right-hand and left-hand doors without change.

My invention consists, to these ends, of the novel features of construction and the parts and combinations of parts hereinafter fully described, and then particularly pointed out and defined in the claims which conclude this specification.

To enable others to clearly understand and to make and use my said invention, I will

now proceed to describe the same in detail, reference being had for this purpose to the accompanying drawings, in which—

Figure 1 is a perspective view showing a door check and closer constructed in accordance with my invention and applied to a door of ordinary construction. Fig. 2 is a plan view of the parts shown in Fig. 1, part of the door-frame being broken away and the door being shown as closed in full lines and as opened in broken lines, the action of the door check and closer in these different positions being indicated by full lines and broken lines, respectively. Fig. 3 is a central longitudinal section of the parts comprising the door check and closer removed from the door. Fig. 4 is a front elevation of the parts illustrated in Fig. 3, showing the cylinder pivotally connected to the bracket by which it is attached to the door-frame and the piston-rod similarly connected to the bracket-arm by which it is secured to the door. Fig. 5 is a central longitudinal section of a door check and closer having a modified construction whereby a supplemental spring is combined with an independent spring of less force in such manner that the two springs shall have practically successive action. Fig. 6 is a longitudinal central section showing a further modification. Fig. 7 is a horizontal section, taken in a plane coinciding with the axis of the piston-rod and cylinder, showing said parts in the position they occupy when the door is closed and when it is opened, said figure showing a modified arrangement of the parts. Fig. 8 is a transverse section taken upon the line 8 8 in Fig. 7.

The reference-numeral 1 in said drawings indicates a door of any ordinary construction, and the numeral 2 denotes the frame of said door, the two being connected by hinges 3.

My door check and closer consists, essentially, of a cylinder 4, a piston 5, a tubular piston-rod 6, connected to the piston, a guide-rod 7, connected to the cylinder and inclosed in the tubular piston-rod 6, and a coiled spring 8, lying in the annular space between the tubular piston-rod and the guide-rod, one end of said spring bearing against the piston and the other end against a nut or collar 8^a upon the end of the guide-rod. By this arrangement the movement of the piston toward the open

end of the cylinder will compress the spring between the two parts against which its ends abut. The closed end of the cylinder, to which the guide-rod 7 is centrally attached, is provided with a projection 9 upon its outer face, and in or near the end of said projection an eye or opening 10 is formed to enable it to have pivotal engagement with a pintle 12, which forms part of a short arm 13, projecting from a plate 14 of any suitable form, which is firmly secured to the door-frame 2, directly over the top of the door. The point of attachment of this plate is preferably in a vertical line removed a little distance from the hinged edge of the door toward its free edge, as shown in Figs. 1 and 2.

The end of the tubular piston-rod 6 is closed by a screw-plug 15, which is provided with an eye 16 to pivotally engage a pintle 17 upon the end of a bracket-arm 18, which has a rigid plate 19, by which the arm is firmly secured to the top of the door at a little distance from its free edge. The bracket-arm 18 is of such length, relatively to the arm 13, that when the door is closed a continuation or prolongation of the axial line of the piston-rod and cylinder will intersect the door at a point between the hinged edge and the arm 13, as seen in full lines in Fig. 2. The pintle 12 upon said arm is preferably formed with a head 20 of greater diameter than the pintle, so that it retains the end of the cylinder in pivotal engagement. A convenient construction is to tap the reduced end of the pintle into the short arm 13, as shown in Fig. 4, for which purpose the head may be slotted, as well as provided with a milled edge, to enable it to be turned by the fingers. The pintle 17 is preferably formed as shown in Fig. 4, so that the eye on the end of the piston-rod may be detached by merely raising it, and is retained in its pivotal engagement by gravity.

The cylinder 4 is comparatively short and is closed at one end and open at the other, the open end having a slight flare or enlargement. The cylinder is closed by a peripherally-threaded disk 21, upon which is centrally formed the projection 9. The disk is provided with a peripheral flange 22, which lies against and is flush with the end of the cylinder. Upon its inner face is formed a circular rib 23, between which and the interior face of the cylinder is a narrow annular space 24. The face of this rib adjacent to the cylindrical wall forms a small angle with the latter, as shown in Fig. 3, for a purpose presently to be explained.

The piston 5 consists of a short cylinder having an open end which is turned toward the closed end of the cylinder 4. Into this open end is screwed a bushing 25, having an outwardly-turned flange 26, between which and the edge of the piston is clamped a packing 27, which projects beyond the open end of the piston and has a slight outward flare to cause it to hug the interior face of the cylinder 4. At each stroke of the piston this

flared edge of the packing enters the space 24 between the rib 23 and the cylinder, and when the door remains closed the edge and most of the projecting portion of the packing lies in said annular space, whereby it is preserved in distended form and held pressed against the wall of the cylinder at every point. It remains in this condition as long as the door remains closed, so that it is effectually prevented from shrinking, buckling, or becoming loose at any point, so that air might pass. Heretofore it has not been uncommon for a piston-packing to be inoperative when a door has remained closed for some time. This may be due to the drying of the oil which lubricates the packing, or to the shrinking of the material, or many other causes, but to whatever cause it be assigned it renders the apparatus inefficient until the piston has been removed and the packing either renewed or restored to proper condition. By the provision I have made, however, the piston-packing remains in operative condition during any period of non-use and requires no renovation or special attention until it is worn out. Being pressed outward or distended by the outer surface of the rib, its form is preserved and no change therein can take place, so that a close joint between the piston and cylinder is at all times insured. Upon the closed end of the cylindrical piston is a neck 28, into which the end of the tubular piston-rod 6 is screwed. The guide-rod 7 passes centrally through an opening in the neck and through a stuffing-chamber 29, and a gland 30 is screwed into the closed end of the piston from the inside to compress the packing around the guide-rod. The latter extends to and is tapped into the center of the disk 21, which closes the end of the cylinder. In this closed end near the neck 28 is formed an outlet-opening, into which is tapped a screw 31, having one or more slots 32 formed longitudinally across its threads and increasing in depth or width, or both, from the head of the screw toward its point. By adjusting this screw in or out the outlet for the air confined between the piston and the closed end of the cylinder may be diminished or enlarged, as circumstances may require. By this construction the cylinder and piston have an operation closely resembling that of a dash-pot.

It should be clearly understood that the particular construction by which one end of the cylinder is closed, as well as the manner of forming and packing the piston, are not features of limitation in my invention, as I may substitute any construction of one or all the parts which is suitable for the accomplishment of the purposes I aim to accomplish.

Before describing the remaining features of my invention I will briefly explain the operation of the parts already described.

The short arm 13 and the long bracket-arm 18 being located as already described, and the short cylinder 4 and long tubular piston-

rod 6 being connected to the pintles on said arms, the coiled spring 8, which is always under compression in a greater or less degree, exerts a sufficient traction upon the long bracket-arm 18 to turn the door on its hinges into the closed position, as seen in Figs. 1 and 2. This movement is accomplished by traction, in contradistinction to a pushing action upon the bracket-arm 18, by reason of the fact that the line of force which coincides with the axial line of the piston and cylinder will always pass, if prolonged, between the hinged edge of the door and the point of attachment of the arm 13, and at a greater or less horizontal angle with the vertical plane of the door-frame. This angle is the smallest when the door is closed, and increases as the door opens, reaching ninety degrees when the door stands at an angle of somewhat less than ninety degrees with the vertical plane of the door-frame. As the door swings still farther the angle included between the axial line of the piston and the door-frame grows constantly less. If the door be opened so far as to bring it into a plane parallel with the plane of the frame 1, the said angle would be practically, though not exactly, the alternate opposite angle to that formed when the door is closed, and would therefore be substantially equal to the latter angle, and as the point of attachment to the arm 13 would be on the other side of the line of hinging, the draft of the spring would tend to hold the door open. The bracket-arm 13, however, prevents the door from turning so far back as to cause the line of traction to cross the axial line of the hinges, so that the force of the spring will in every position act upon the door to close it. From the beginning of the opening movement of the door the distance increases between the fixed pintle 12 and the pintle 17, which moves with the door. The piston 5 is thus drawn slowly out of the cylinder, the air therein being partly exhausted by its withdrawal and the compression of the spring 8 being steadily increased. The piston leaves the open end of the cylinder by the time the door has opened to an angle of about forty-five degrees, and during the entire remaining portion of the movement of the door the tubular piston-rod slowly draws farther and farther off the guide-rod 7, thereby increasing the compression of the spring 8 constantly. When the door is left to itself, the expansion of said spring tends to force the piston 5 toward and into the cylinder 4, which is reached by the piston when the door still has to swing through about forty-five degrees of arc, more or less, in order to complete its closing movement. As the piston enters the cylinder the sudden compression of air therein checks the movement of the door, which completes its closing movement slowly, the speed being regulated by the escape of air from the cylinder through the outlet channel or channels 32. The rate of

escape is easily adjusted by the screw 31, so that any friction or other obstacle to the closing and latching of the door can be overcome and a perfect action insured without noise or slamming. As the piston 5 completes its movement in the cylinder the flaring edge of the packing enters the annular space 24, between the rib 23 and the cylinders, whereby said packing is restored to uniform shape and position throughout its circumference and pressed against the interior cylindrical face, thus preserving a close fit, preventing the material from becoming bent inward at its edge or becoming displaced so that one portion will enter the cylinder a little in advance of the other.

By the construction and arrangement shown and described I am able to greatly diminish the weight of the parts and thus reduce the cost of the device by the considerable economy I obtain in the use of the metal. I can also effect a further reduction by reason of the fact that I can manufacture the parts by the most simple and inexpensive methods. For example, the cylinder may be drawn or struck out in suitable dies, and the piston also can be produced in like manner. The tubular piston-rod also may be ordinary drawn-metal pipe. As the power of the spring is exerted by drawing, in contradistinction of pushing, the piston-rod and guide-rod require only a small part of the rigidity and strength that would be required if the spring were to push the two points of attachment apart instead of drawing them together.

In those cases where an unusual range of movement of the door is required, or where its width renders the use of very long piston-rods necessary, or where for any reason it may be desirable, I may arrange the cylinder 4 between the two points of pivotal attachment—that is, midway between the arms 13 and 18, as shown in Fig. 6. In this case a single guide-rod 33 will be used, which will pass centrally through the cylinder and piston and through the closed end of the cylinder, any suitable means for packing the rod being provided. The piston 5, which is the same as that shown in Figs. 1 to 4, has a tubular piston-rod 6 screwed into its neck 28, its other end being closed by a screw-plug 15, having an eye 16. In the annular space between the guide-rod and tubular piston is a coiled spring 8, bearing at one end against a nut or collar 8^a on the end of the guide-rod and at its other end against the piston 5. This construction, which is substantially identical with that already described, is duplicated upon the other side of the closed end of the cylinder by means of a tubular piston-rod 34, screwed into a central neck 35, projecting from the outer face of the disk 21, the guide-rod 7 being packed through the disk as it is through the piston. A screw-plug 35, having an eye 35^a, closes the other end of the tubular piston-rod, and in the space between the latter and the guide-rod is coiled a spring 36, abutting at

its ends against the disk 21 and against a nut or collar 37 on the end of the guide-rod. Both springs are under a suitable tension, and each acts independently of the other. Nevertheless, so far as the result is regarded, the two may be considered as a single spring of increased length. The device is connected to the pintles 12 and 18 by means of the eye 16 in the plug of one piston-rod and the eye 35^a in the screw-plug of the other rod.

In some instances also I may use the compound form shown in Fig. 5, in which a duplex piston-rod is used, one tubular member thereof, 38, being screwed into the neck of the piston and inclosing a coiled spring 39 between it and the guide-rod 7, while a second tube 40 incloses the member 38. The tube 40 is provided with an inward flange 41 at the end next the piston, which flange fits and moves easily upon the outside of the tube 38. The other end of the tube 40 is connected to and closed by a screw-plug 42, having an eye 43. Between the tubes 38 and 40 is coiled a spring 44, abutting at its ends against the flange 41, and a collar 45 on the end of the tube 38. The spring 39 abuts at its ends against the piston and against a collar 8^a on the end of the guide-rod 7. In this construction I may make the springs of different power, so that one will be compressed to its maximum, or nearly so, before the other spring begins to contract to any marked extent. In this manner I may provide increased power to act upon the door at the inception of its closing movement, when the springs are acting at a disadvantage. In the case of a heavy door which swings to its utmost limit a single spring of ordinary force might not always be adequate to restore the door to a closed position.

I may also use the modified form shown in Figs. 7 and 8, in which the expansion of the spring pushes the door instead of drawing it. In this construction I extend the guide-rod 46 through the piston and the closed end of the cylinder, and provide its end with an eye 47 to engage a pintle 48 on the door-frame beyond the line of hinges. The neck 49 on the piston 5 is prolonged and incloses a tube 50, one end of which is screwed into a short neck 51 on the closed end of the cylinder. The guide-rod lies within this tube and extends beyond the neck on the piston, its end being tapped into a slide 52, which is movable in the tube 50 and forms part of a ring or collar 53, surrounding the tube, the slide and collar being connected to the neck of the piston by any suitable means, such as screws 54, tapped through the collar 53 into lugs 55, which project from the slide and lie in slots 56 in the tube 50. A spring 57 is coiled around the tube and abuts at one end against the collar 53 and at the other against a flange on a screw plug and cap 58, which is screwed into the end of the tube. This plug has an eye or loop 59, which engages a pintle 60 on a short arm 61, projecting from the door.

It will be seen that by opening the door in Fig. 7 the tube 50 will slide within the prolonged neck 49 and carry the cylinder off the piston, causing it to approach the pintle on the frame. The spring will thereby be compressed. The slide and collar 52 and 53, being connected to the neck of the piston and to the rigid guide-rod, must always remain at the same distance from the pintle on the frame to which the rod is connected. The cylinder, however, will approach the pintle as the door opens and recede from it as the door closes.

By my invention, which comprises but very few parts, which are combined with the utmost simplicity, I accomplish all that has heretofore been done by two entirely separate organizations, one of which is used to close and the other to check the door. In apparatus of this type it has been customary to connect the parts to the door and door-frame at points so close to the hinged edge of the door that an excessive strain is imposed upon the hinges and upon the door-frame at the points where the hinges are applied, especially the upper hinge, upon which the greater part of the strain falls. So great is the force necessary in order to close and to check the door, when acting at such a disadvantage, that it is not unusual for the hinge to become loose in a short time, and in many instances the screws have either been partly drawn out or the frame has split, requiring expensive and troublesome repairs. This difficulty has been partly overcome by wholly disconnecting the checking devices from the parts which close the door, the check being placed a little distance from the free edge of the door, the cylinder or dash-pot being mounted on the frame and the piston on the door, or vice versa. This change has but partly removed the objection and has given rise to another, since it complicates the apparatus, increases its cost, and requires that the door shall swing accurately in order that the piston shall enter the dash-pot. My invention wholly obviates these difficulties, as it wholly removes all excessive strain from the door frame and hinges and combines the closing and checking devices in a single mechanism, which can be readily attached by any person and which requires no repair or special attention during the period it is in use.

What I claim is—

1. A door check and closer, consisting of a cylinder having one end closed and the other open, a guide-rod centrally secured to said end and passing out the open end, a tubular piston-rod inclosing said rod and connected to a piston, a stuffing-box in said piston for the guide-rod, and a spring coiled in the space between said rod and tubular piston, its ends abutting against the piston and a collar on the end of the guide-rod, substantially as described.

2. A door check and closer, consisting of a cylinder closed at one end, a guide-rod cen-

trally secured to said end and passing out of the open end, a piston-rod and a spring coiled upon the guide-rod, its ends abutting against the piston and a collar on the guide-rod, the piston-rod and the closed end of the cylinder being provided with eyes to engage pintles on the door and frame, substantially as described.

3. In a door check and closer, the combination with a piston having an expansible or elastic packing projecting from it a cylinder having in its end an annular space to receive the said packing and retain its form and expansion, one wall of said space being the inner face of the cylinder and the other wall being at an angle therewith, the annular space extending beyond the end of the cylinder and converging to a width less than that of the packing, so that the latter will be compressed a central guide-rod rigidly attached to the closed end of the cylinder, a stuffing-box in the piston through which the rod passes, and a spring coiled on the guide-rod, and bearing against the piston and against a collar on the end of the guide-rod, substantially as described.

4. In a pneumatic door check and closer, the combination with a cylinder having a closed end, of a guide-rod entering the open end of said cylinder and rigidly secured to the closed end, a piston, a stuffing-box in said piston for the guide-rod, a tubular piston-rod movable with the piston on the guide-rod, a spring coiled between the guide-rod and piston-rod and bearing on the piston and on a collar on the end of the guide-rod, and upright pintles to which the end of the piston-rod and closed end of the cylinder are pivotally connected, one pintle being carried by a long arm projecting from the door near its free edge, and the other by a short arm on the frame near the hinged edge of the door, substantially as described.

5. In a door check and closer, the combination with a cylinder having a closed end, of a piston having a tubular piston-rod, a guide-rod lying in said piston-rod and packed through the piston, its end rigidly attached to the closed end of the cylinder, a spring bearing on the piston at one end and on a collar on the guide-rod at the other end, and an adjustable vent in the piston, substantially as described.

6. In a door check and closer, the combination with a cylinder having a closed end provided with a circular rib lying near the interior cylindrical face of the cylinder and converging toward it, forming beyond the end of the cylinder a space narrowing to a width less than that of the packing, of a piston having a projecting, flared packing, a guide-rod lying in a tubular piston-rod and packed through the piston, its end rigidly secured to the closed end of the cylinder, a coiled spring pushing at one end on the piston and at the other end on a collar on the guide-rod, and a vent-screw adjustable in the piston, substantially as described.

7. A cylinder and piston, the latter having an expansible or elastic packing, and the former having in its end an annular space to receive the said packing and retain its form and expansion, one wall of said space being the inner face of the cylinder and the other wall being at an angle therewith, the annular space extending beyond the end of the cylinder and converging to a width less than the thickness of the packing, so that the latter will be compressed, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

CHARLES E. BRUNTHAVER.

Witnesses:

JAMES L. NORRIS,
THOS. A. GREEN.