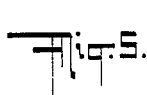
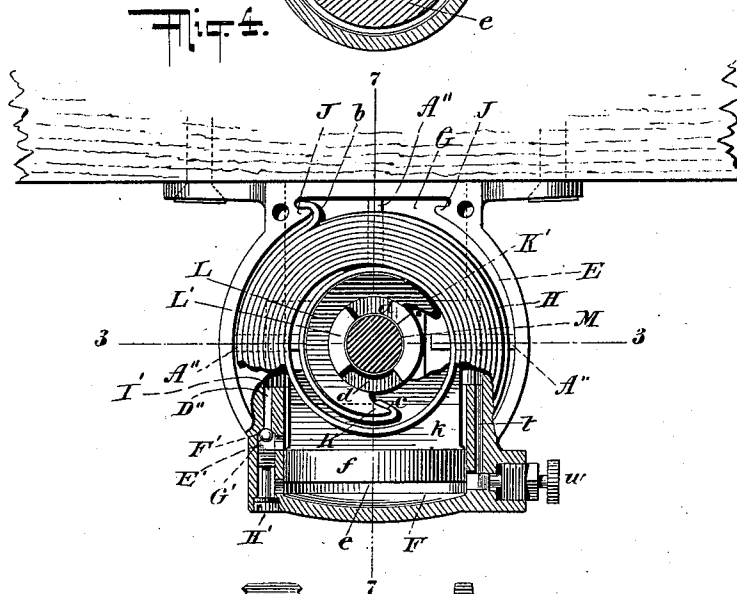
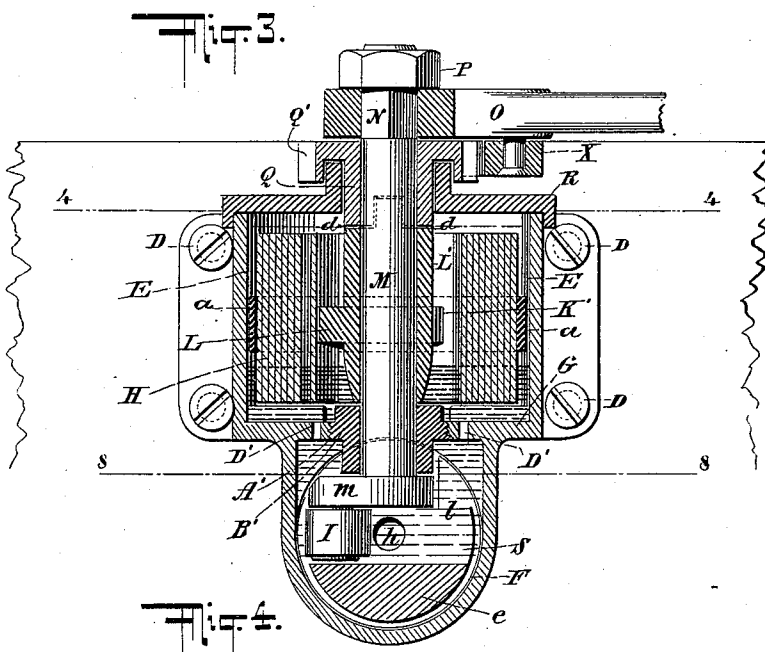


J. BARDSLEY.
COMBINED DOOR SPRING AND CHECK.

No. 567,121.

Patented Sept. 8, 1896.



WITNESSES:

Gustave Dierich
John Kehlenbeck

INVENTOR
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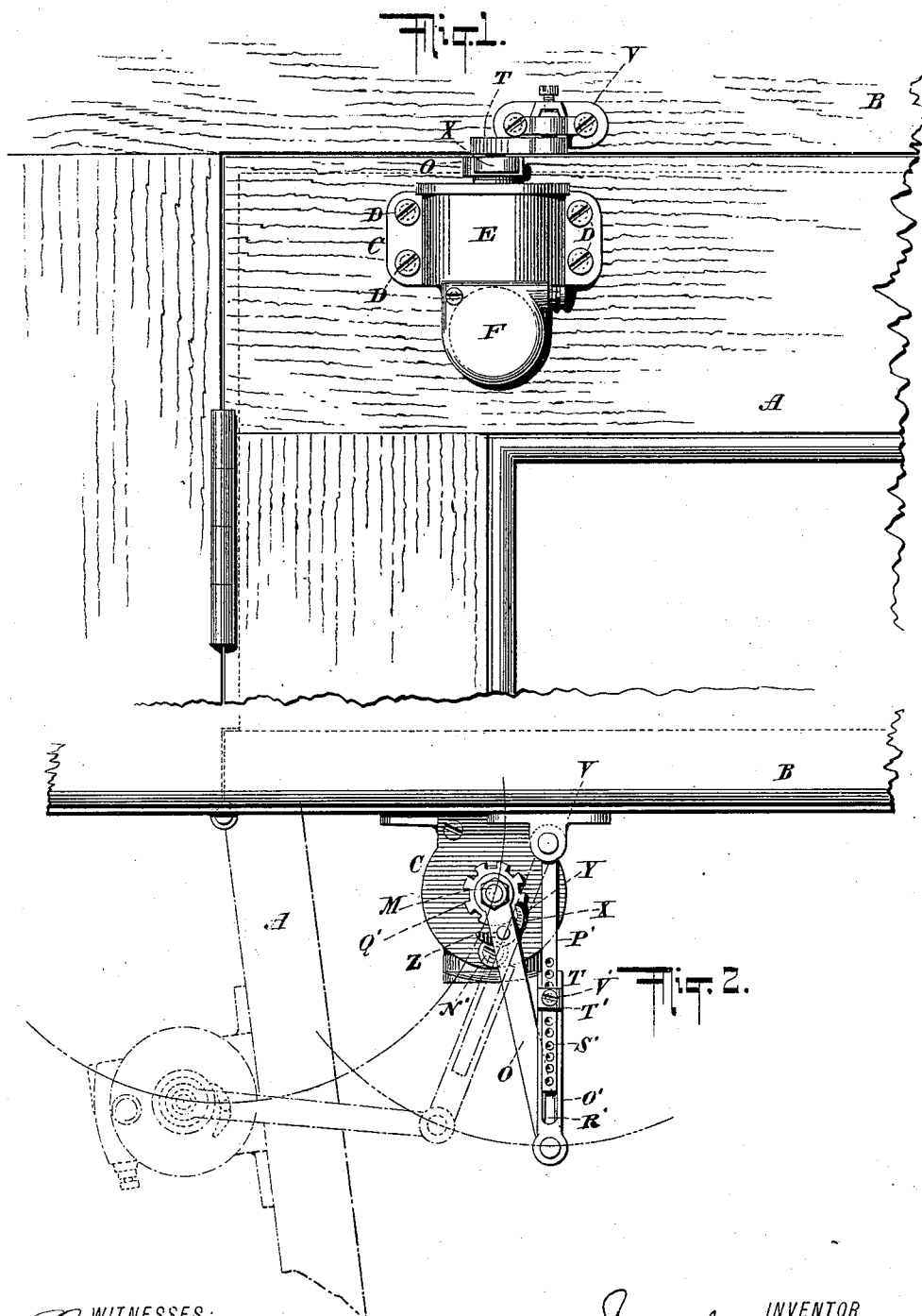
(No Model.)

3 Sheets—Sheet 1.

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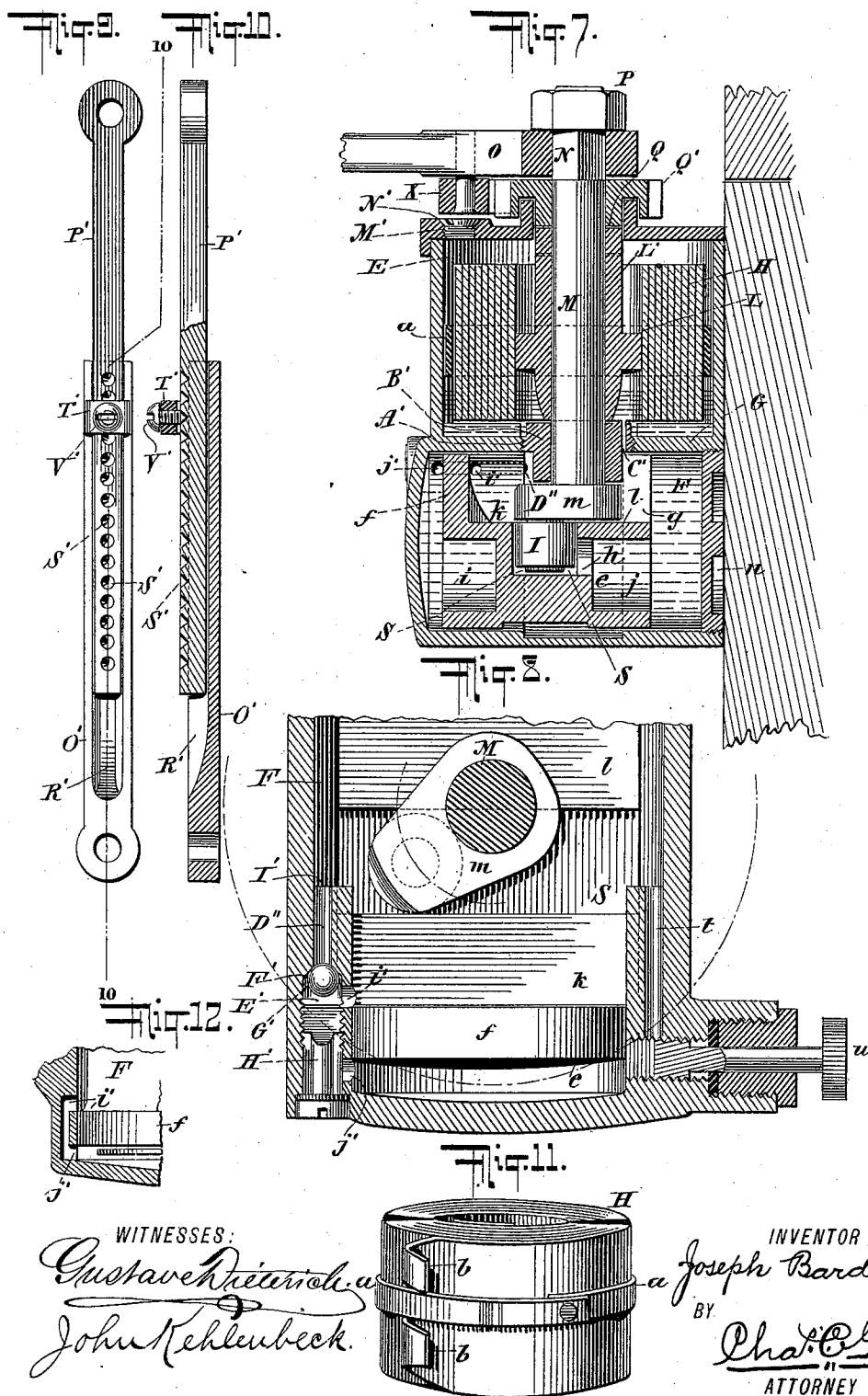
(No Model.)

3 Sheets—Sheet 3.

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UNITED STATES PATENT OFFICE.

JOSEPH BARDSLEY, OF MONTCLAIR, NEW JERSEY.

COMBINED DOOR SPRING AND CHECK.

SPECIFICATION forming part of Letters Patent No. 567,121, dated September 8, 1896.

Application filed August 17, 1895. Serial No. 559,592. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH BARDSLEY, a citizen of the United States, and a resident of Montclair, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in a Combined Door Spring and Check, of which the following is a specification.

The invention relates to improvements in combined door springs and checks; and it consists in the devices hereinafter described, and particularly pointed out in the claims.

Referring to the accompanying drawings, Figure 1 is a front elevation of a combined door spring and check constructed in accordance with and embodying the invention, the same being shown applied to a door, the latter being partly broken away. Fig. 2 is a top view of same, the position of the parts when the door is closed being shown by full lines and when the door is opened by dotted lines. Fig. 3 is a central vertical section, on an enlarged scale, of same, the section being on the dotted line 3 3 of Fig. 4. Fig. 4 is a top view of same with the cap removed and a part of the liquid-cylinder being in horizontal section, a portion of the spring and a portion of the partition between the liquid-cylinder and spring-chamber being broken away. Fig. 5 is an enlarged detached side elevation of a stop or screw for the ball-valve located in a by-pass around the piston-head. Fig. 6 is an enlarged detached edge view of same. Fig. 7 is an enlarged vertical section of the combined door spring and check on the dotted line 7 7 of Fig. 4. Fig. 8 is an enlarged horizontal section through a portion of the liquid-cylinder of the check on the dotted line 8 8 of Fig. 3. Fig. 9 is a top view of one of the levers connecting the actuating-spindle of the combined door spring and check with the door or the lintel over the door. Fig. 10 is a sectional view of same on the dotted line 10 10 of Fig. 9. Fig. 11 is a perspective view of the spring detached from the spring-chamber, and Fig. 12 is a sectional view of a portion of the liquid-cylinder and indicates one method of forming the releasing by-pass.

In the accompanying drawings, A designates the door, B the lintel above the same, and C the casing containing the spring and checking mechanism hereinafter specifically

referred to. The casing C is secured, preferably, to the upper portion of the door by means of screws D, as illustrated more particularly in Figs. 1 and 3, and contains two chambers (lettered E F, respectively) which are separated by a shelf or partition G, the latter containing the openings hereinafter referred to for permitting the passage of the liquid from the spring-chamber E into the liquid chamber or cylinder F.

Within the chamber E is the helical spring H of tempered steel properly coiled and retained in shape by the band *a*. The ends of the spring H form hooks *b c*, the outer one of which (lettered *b*) is adapted to engage one or the other of the lugs J, formed within the casing C, as illustrated more clearly in Fig. 4, while the other hook, *c*, at the inner end of the spring H is adapted to engage one or the other of the lugs K K', formed at the ends of the horizontal flange or shoulder L on the sleeve L', which encompasses that portion of the actuating-spindle M which is within the spring-chamber E, and is provided upon its upper end with the recesses *d*, for the purpose hereinafter referred to. The flange or shoulder L extends outward horizontally from the sleeve L' and affords an enlarged bearing against which the inner coils of the spring H press during the opening of the door, and which shoulder or flange L prevents the spring at its inner end from being wound so closely as to render it liable to break during the operation of the device.

Great difficulty has heretofore been experienced with the class of checks to which the present invention refers by reason of the frequency with which the springs have been broken, and it is the purpose of the shoulder or flange L to overcome the tendency of the springs to break and thereby to prevent the loss and annoyance which have heretofore been caused by the winding of the spring directly upon the sleeve L'. Great loss and annoyance have also been caused heretofore by the fact that purchasers of the combined door springs and checks of the class referred to have placed the springs within the spring-chamber E in a reverse position; that is to say, many purchasers of the devices when erecting the checks have placed the spring H in position for a left-hand door when it

should properly have been arranged for a right-hand door, and vice versa, and to overcome the resulting loss and annoyance from this inexperience or carelessness I have provided the flange or shoulder L and formed on the ends of said flange or shoulder the lugs K K'.

In the position in which the spring H is illustrated in Fig. 4 the said spring is adapted for a right-hand door, and the lug K properly engages the hook *c* at the inner end of the spring. If the device should, however, while in the condition illustrated in Fig. 4, be applied to a left-hand door, the lug K would during the operation of the device recede from the hook *c* and the lug K', instead of engaging the hook *c* and moving the spring in the reverse direction and probably breaking it, would meet the inclined outer surface of said hook and pass over the same without engaging it otherwise than merely to press the hook slightly outward, so as to pass it. It will thus be seen that should a spring arranged for a right-hand door be placed upon a left-hand door the spring would not be operated and would give no result, and hence the person erecting the device would be informed at once that the spring had not been properly placed within the casing C and would be compelled to reverse or turn the said spring upside down before the desired result could be obtained. It will thus be seen that the flange or shoulder L, having the lugs K K', not only prevents the breaking of the spring H by not permitting it to be wound into too small a circumference, but also by preventing the spring from being engaged by the actuating mechanism unless the spring is in correct position for effective use.

The spindle M extends downward from the spring-chamber E and into the liquid chamber or cylinder F, as illustrated in Figs. 3 and 7, and has a squared upper end or head N to receive the end of the oscillating lever-arm O, the latter being held in place by means of a nut P. The sleeve L' snugly fits the actuating-spindle M, and its recessed or notched upper end engages the correspondingly formed lower end of a supplemental sleeve Q, as illustrated clearly in Fig. 3, which supplemental sleeve extends upward above the casing C and has formed upon its upper end the toothed wheel Q', the latter being directly below the lever O and being undercut to receive a central annular raised flange formed upon the cap R, provided for the upper end of the casing C. The cap R is held in place by screws in the customary manner, as shown in Fig. 2, and is provided at its center with a proper opening to receive the supplemental sleeve Q, whereby the latter is permitted to be passed downward upon the actuating-spindle M in order that its lower notched or recessed end may engage, and thereby become keyed to, the upper notched or recessed end of the sleeve L'. The toothed wheel Q', supplemental sleeve Q, and sleeve L', while surrounding the actuating-

spindle M, are independent of the same, and their function is during the opening of the door to wind the spring H around the flange or shoulder L, the inner end of said spring being, as above described, held by one of the lugs K K', while the outer end of the spring clutches one or the other of the lugs J, formed in the casing C. The lever O, being on the squared end N of the actuating-spindle M, will, during the opening of the door, serve to rotate said spindle and also said toothed wheel Q' and its connecting parts. At the lower side of the lever O is pivoted the pawl X, having the two engaging points Y Z, as shown in Fig. 2, adapted to engage the teeth of the wheel Q' and effect that connection between the lever O and said wheel which will cause the movement of the former to be imparted to the latter during the opening of the door and the movement of the wheel to be imparted to the lever under the pressure of the spring H during the closing of the door. During the opening of the door the movement of the lever O will, through the pawl X, effect the rotation of the wheel Q', sleeve Q, sleeve L', and flange or shoulder L, and thereby wind the spring H. After the door has been opened and released the tension of the spring H will operate to reverse the movement of the sleeve L', sleeve Q, and wheel Q', and thus through the pawl X, lever O, and its connections close the door. As illustrated in Fig. 2, one end of the lever O is secured upon the upper end of the actuating-spindle M, while the other end thereof is pivotally secured to the extensible lever-arm T, which is pivotally secured to a lug V, fastened to the lintel B by means of screws or other suitable means, as illustrated in Fig. 1. The extensible lever-arm T is illustrated in detail in Figs. 9 and 10 and will be more fully described hereinafter.

The lower chamber or cylinder F of the casing C receives the reciprocating piston *e*, having at its opposite ends the heads *f g*, the latter being provided with the free opening *h* and the former being imperforate or solid. The outer ends of the piston *e* will preferably be cored out, as denoted by the reference-letters *i j* in Fig. 7, for the purpose of lightening the piston and affording increased space for the liquid, and the middle portion of the piston *e* is cut away to receive the crank and wheel I, the latter being mounted upon a vertical pin at the outer end of said crank. The wheel I is retained within a transverse race S, formed in the piston *e*, while the crank or arm *m* plays within the space formed between the heads *f g* of the piston *e* and above the shelves *k l*.

In the partition G between the chambers E F is formed a threaded aperture A', of sufficient dimensions to permit the passage through the same of the lower end of the actuating-spindle M and crank or arm *m*, carrying the wheel I, and after the introduction of the said spindle, crank, and wheel in position

the said aperture A' is substantially closed by means of the nut B', having a threaded projecting flange to engage the walls of the said threaded aperture A', and having also the upwardly and downwardly projecting portions, the latter serving as a stop to prevent upward movement of the arm or crank *m* and the former serving as an elevated surface above the floor of the partition G through which a vent C' may be formed, as illustrated in Fig. 7. The upper portion of the nut B' will preferably be squared for the purpose of facilitating its introduction by means of a wrench into the aperture A'. The partition G is provided with the inlet-apertures D, (shown in Fig. 3), which are open at all times, and through which the oil, glycerin, or other liquid passes from the spring-chamber E to the liquid-chamber F. The partition G is also provided with suitable raised ribs A'', which afford a support for the spring H above the floor of said partition. The end of the cylinder F has a threaded plug *n*, adapted to firmly close the end of said cylinder after the piston *e* has been introduced therein.

Within the walls of the cylinder F is formed the restricted by-pass *t*, which, as illustrated more clearly in Fig. 4, extends around the head *f* of the piston *e*, and the purpose of which is to permit the passage of oil or other liquid within the cylinder F from one side to the other of the said head *f* of the piston, particularly during the closing of the door.

In order to regulate the flow of the oil or other liquid through the by-pass *t*, there has been provided the adjusting-screw *w*, (shown on an enlarged scale in Fig. 8), which passes through a suitable nut or packing and meets the outer end of the said by-pass *t*, whereby said screw is adapted, upon being moved inward, to restrict the by-pass *t* and regulate the flow of oil or other liquid through the same.

Within the walls of the cylinder F, and preferably at the side thereof opposite to the by-pass *t*, is formed the by-pass D'', containing the chamber E', valve-seat F', ball-valve G', and screw H', as shown on an enlarged scale in Fig. 8. The by-pass D'' extends from one side to the other of the head *f* of the piston *e*, its inlet being at I' and its outlets at *i'* and *j'*, the said outlets opening directly into the cylinder F and being separated from each other a distance about equal to the thickness of the head *f* of the piston. The position of the parts illustrated in Fig. 8 is that they will assume when the door is about closed, and while the door is being opened the piston *e* will travel toward the opposite end of the cylinder F, during which movement the liquid will be drawn through the by-pass D'' into the outer end of the cylinder F, the liquid moving the ball G' from its seat F' and flowing freely around the same and issuing into the outer end of the cylinder through the openings *i'* *j'*. During the closing of the door the piston *e* will move toward the outer end of the cylinder F, and at this

time the liquid confined in the outer end of the cylinder F will, owing to the pressure exerted by the piston-head *f*, move against and close the ball G' against the seat F', thereby maintaining the by-pass D'' closed and compelling the liquid to make its escape around the piston-head through the by-pass *t*, which will be of such restricted diameter as to insure the checking of the spring H by the liquid. As soon, however, as the piston-head *f* has about completed its movement toward the outer end of the cylinder F and the door has about reached its jamb the piston-head *f* will arrive at the position in which it is illustrated in Fig. 8, and at this time, the opening *i'* having been uncovered, the liquid confined in the end of the cylinder and against which the piston-head *f* has been moving will find a sudden release through the opening *j'*, chamber E', and opening *i'* and into the main body of the cylinder F, the confined liquid being thus released at the closing movement of the door and its resistance being thereby relieved from the door at the last portion of the closing movement. The door at this time, the liquid-pressure having been relieved from the piston *e*, will be exposed to the full action of the spring H, whereby the latter is enabled to effect the latching of the door. The releasing of the liquid-pressure through the openings *i'* *j'* may not at all times be necessary, but in many instances it will be found of advantage, since when employed the checking medium is relieved from the door at its closing-point and the spring is allowed full freedom to latch the same. The screw H' at its inner end has flattened sides, as indicated more clearly in Figs. 5 and 6, in order to permit the flow of the liquid past it, and said screw will be provided under its head with a suitable washer in order to prevent leakage. The purpose of the screw H' is to close the outer end of the chamber E' and to afford a stop for the ball G'. The ball G' is introduced to the chamber E' from the outer end of the latter, and thereafter the screw H' is applied to close the outer end of said chamber and, as above described, to operate as a stop for the ball G'. The screw H' being removable, it may be withdrawn and the by-pass D'' and chamber E' readily cleansed.

The by-pass D'' proper does not necessarily comprise the opening *i'*, since this opening is only employed when it is desired to secure the releasing action when the door has about reached its closed position, and hence in considering the by-pass D'' it may be assumed that the opening *i'* is absent. I have for convenience formed the opening *i'* to lead from the chamber E' for the purpose of dispensing with the formation of a separate releasing by-pass in the wall of the cylinder F. I do not, however, limit the invention in all its parts to the forming of the by-pass D'' with the opening *i'*. If preferred, therefore, the releasing by-pass around the head *f* of the

piston may be separately formed in the walls of the cylinder F at some other point, as shown in Fig. 12, and if so formed it will be convenient to omit the opening *i'* from the chamber E' and only employ the opening *j'*, which is the outlet proper for the by-pass D". The inner flattened end of the screw H' serves as a stop to prevent the ball G' from reaching the outlet-opening *j'*, and, as may be seen from an inspection of Fig. 8, the inner end of said screw is between the opening *j'* and the ball G'. The position of the inner end of the screw H' shown in Fig. 8 prevents the ball G' from reaching the opening *j'*, and also insures the quick return of the ball to its seat when, during the operation of the check, the piston *e* starts to move toward the outer end of the cylinder F. If the ball G' could reach the opening *j'* or pass slightly to the outer side thereof, the pressure of the liquid would not act to drive the ball to its seat and upon the movement of the piston *e* to the inner end of the cylinder the suction created thereby would be liable to draw the ball G' into the opening *j'* and close or partly close the same and materially interfere with the correct operation of the check. The position of the screw H' illustrated in Fig. 8 necessitates the employment of the chamber E' or enlargement in the by-pass D" in order that the liquid may flow freely around the ball G' on its way to the opening *j'*. I regard the position of the screw or stop H' with respect to the ball and opening *j'* shown in Fig. 8 as of the utmost importance, and I have found by experience that when the parts are constructed and arranged as illustrated in Fig. 8 highly satisfactory results are secured.

After the piston *e* has been inserted into the liquid cylinder or chamber F and the plug *n* secured in place the actuating-spindle M is inserted downward into the cylinder F until its wheel I is within the race S and the crank or arm *m* is in the space above said race, whereupon the nut B' is applied to close the aperture A' and the spring H and sleeve L' are applied over the said spindle. The cap R may thereupon be secured upon the casing C and the auxiliary sleeve Q passed downward through the opening in said cap to engage or key with the upper end of the sleeve L'. The lever-arm O and nut P may thereupon be secured upon the upper end of the actuating-spindle M.

The oil or other liquid (indicated in the drawings by broken lines) may be poured into the chamber E and permitted to pass downward through the openings D' into the liquid-cylinder F either before or after the cap R is applied upon the casing C. I prefer, however, to introduce the oil or other liquid to the casing after the latter has been secured to the door, and hence in the cap R is provided an opening M' and a removable screw-plug N', adapted to close said opening. The oil will pass downward through the open-

ings D' until the cylinder F has become entirely filled, and any additional oil entering the casing will fill the lower part of the spring-chamber E, as indicated in the drawings, and during the filling of the cylinder F with the oil the air will escape upward therefrom through the vent C'.

The position of the actuating-spindle M with its crank or arm *m* illustrated in the drawings is such as to adapt the devices for a right-hand door, and in this position it is illustrated in Figs. 1 and 2. Upon the door being opened the spring H will, through the medium of the lever O, pawl X, toothed wheel Q', sleeves Q L', and flange or shoulder L, be caused to wind upon the said flange or shoulder, thus creating a tension opposing the opening of the door, and which will upon the door being released close the same. During this operation the actuating-spindle M will also, owing to the lever O being secured upon its upper end, have a rotary motion imparted to it, whereby the wheel I is brought against the inner face of the race S, moving the piston *e* inward toward the door and drawing the oil or other liquid through the by-pass D" into the outer end of the cylinder F. After the door has been opened and then released, the spring H will, by reversing the movement of the sleeves L' Q and toothed wheel Q', act through the lever O and arm T to close the door, and at this time the wheel I of the crank-arm *m* will come into contact with the outer side of the race S and thereby reverse the movement of the piston *e*, causing it to leave the inner end of the cylinder F and approach the outer end thereof. During this movement of the piston *e* toward the outer end of the cylinder F the oil or other liquid between the head *f* and the outer end of the cylinder will be forced through the by-pass *t*, and this being of restricted diameter, will retard the flow of the liquid and the movement of the piston *e* to such an extent that the door will close gently. While the piston *e* is moving toward the outer end of the cylinder F the pressure of the liquid will close the ball G' against its seat F' and thus prevent the escape of the oil except through the by-pass *t*. Upon the opening of the door, however, the piston *e* moves toward the inner end of the cylinder F and at this time the oil passes into the inner end of the by-pass D" and the ball G' leaves its seat F', and thus a free passage is formed for the oil from the inner to the outer side of the piston-head *f*.

As has been described above, when the piston *e* has almost reached the outer end of its movement the head *f* will have the pressure of the liquid removed from it by means of the openings *i' j'*, which at the time referred to will permit the escape or release of the liquid around the said head *f*, and thus remove the checking action from the spring H, allowing the latter to exert its entire force in the latching of the door. The opening *i'* being adjacent to the opening *j'* will not be uncovered

by the head *f* until the latter has almost reached the end of its movement.

By reason of the pawl *X* the movement of the lever *O* may be communicated to the sleeve *L'*, while at the same time the said lever is engaged in rotating the actuating-spindle *M*. The object of having the two points *Z Y* on the pawl *X* is to adapt the device for right and left hand doors.

The lever-arm *T* is made extensible, so as to adapt the device to the different localities in which it will be desired to use the same, and the said arm *T* is composed of sections *O' P'*, the former having the groove *R'* to receive the section *P'*. The side walls of the groove *R'* are tapered inward and downward, as shown more clearly in Fig. 9, and the side surfaces of the section *P'*, entering said groove, will conform to the tapered sides of the latter.

The section *P'* is provided on its upper surface with the recesses *S'*, and the section *O'* with the transverse bar *T'*, having a screw *V'*, the latter at its point, as shown in Fig. 10, being adapted to engage any one of the recesses *S'*, the object being to permit the section *P'* to be adjusted longitudinally within the groove *R'* and to be securely fastened in its adjusted position by means of the screw *V'*. The screw *V'* operates to wedge the section *P'* within the groove *R'*, and this is a feature of importance not only in securing rigidity of structure but in preventing the screw *V'* from becoming loose. The fact that the section *P'* does become wedged within the groove *R'* causes said section to exert an outward pressure against the point of the screw *V'*, and this pressure acts to bind the screw and prevent it from becoming loose. In constructing the sections *O' P'*, care should be taken to prevent the section *P'* from having free contact with the base of the groove *R'* or freedom of lateral movement or play between the sides of said groove, since such looseness of the section *P'* within the said groove would prevent the wedging of said section within the groove and result in an inferior arm.

The outer end of the section *P'* is provided with an eye to facilitate its pivotal connection with the lug *V*, secured to the lintel over the door, and the outer end of the section *O'* is provided with an eye to receive the pin which connects the said arm *T* with the lever *O*, as shown in Fig. 2. The section *P'* of the extensible arm *T* may be very quickly and rigidly adjusted within the groove *R'* of the section *O'*, and when in use the extensible arm *T* possesses great strength and rigidity and effectually resists the strain which comes upon it during the opening and closing of the door.

The screw *V'* affords a very secure means for locking the sections *O' P'* in their adjusted position, and the sides of the groove *R'* aid materially in affording rigidity to the arm and support to the section *P'* thereof.

I deem it of importance to separate to some extent the liquid-cylinder from the spring-

chamber, but I regard it of equal importance that the liquid-cylinder shall not be what is called a "closed" cylinder, but shall communicate with the spring-chamber by means of an aperture or apertures and an air-vent, and this part of the invention is not limited to the form of the piston in the liquid-cylinder, nor to the means by which the vertical actuating-spindle is enabled to operate said piston, nor to the arrangement of the by-passes and valves shown. In the present instance I have illustrated two apertures *D'* in the partition *G* as affording a communication for the oil from the spring-chamber to the liquid-cylinder, but I do not desire to be limited to the use of any special number of apertures *D'*, since if one aperture of sufficient size is employed the oil or other liquid may properly feed into the liquid-cylinder from the spring-chamber. Where small apertures *D'* are used instead of larger apertures, it is believed that less dirt or other foreign matter will be likely to enter the liquid-cylinder. The air-vent between the liquid-cylinder and the spring-chamber has its upper end on a higher elevation than the partition *G*, and this permits all the air to escape from the liquid-cylinder while the oil or other liquid is entering the same through the aperture or apertures *D'*. By means of the construction presented a quantity of oil or other liquid may be permitted to remain in the spring-chamber above the partition *G*, this tending to prevent the entrance of dust or other foreign matter to the liquid-cylinder and insure said liquid-cylinder being at all times filled. The presence of oil in the spring-chamber lubricates the surfaces between the actuating-spindle and the walls of the nut *B'*, and also the coils of the spring *H*. In accordance with my invention the nut *B'* serves as a bearing for the lower end of the actuating-spindle and contains no packing.

While I have shown the air-vent *C'* as being in the nut *B'*, I do not limit the invention to the actual placing of the vent in said nut, since the vent may be arranged in the walls of the casing or in a separate nut or hub provided in the partition *G* for that purpose. I, however, deem it convenient and expedient to place the said air-vent in the nut *B'*.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A combined door spring and check comprising the casing forming the spring-chamber and the horizontal liquid-cylinder, the spring in said chamber and the horizontally-reciprocating piston in said cylinder, the said cylinder being separated from said chamber by a partition but communicating therewith through a permanent opening formed in said partition and by a permanently open air-vent extending from the liquid-cylinder into the spring-chamber and being at its upper end on a higher elevation than the upper surface of said partition, in combination with the actuating-spindle for operating said piston

in connection with a checking fluid, and lever-arms connected with said spindle; substantially as set forth.

2. The combined door spring and check 5 comprising the casing forming the spring-chamber and horizontal liquid-cylinder, the helical spring in said chamber and the horizontally-reciprocating piston in said cylinder, the said cylinder and chamber having be- 10 tween them a partition provided with a permanent opening to permit the passage of the liquid from the spring-chamber into the liquid-cylinder and a central nut extending upward above the floor of said partition and 15 having a central opening and also an air-vent, the latter extending upward from the liquid-cylinder into the spring-chamber and being at its upper end on a higher elevation than the upper surface of said partition, in 20 combination with the actuating-spindle passing downward through the said chamber and nut and provided with means engaging said piston to operate the same, the sleeve and toothed wheel upon said spindle, the lever- 25 arm on the spindle, and the pawl connecting the said arm and toothed wheel; substantially as set forth.

3. The combined door spring and check comprising the casing forming the spring- 30 chamber and liquid-cylinder, the piston in said cylinder, the actuating-spindle extending through said chamber into said cylinder and adapted to operate said piston, combined with the sleeve upon said spindle, having the 35 laterally-projecting bearing-shoulder L within said chamber (the ends of said shoulder forming engaging points), the spring within said chamber and secured at one end to the walls thereof and at the other end to said 40 shoulder, the toothed wheel having a depending sleeve engaging the sleeve upon the said spindle, the lever-arms secured to said spindle, and the pawl secured to one of said arms and engaging said toothed wheel; substan- 45 tially as set forth.

4. The casing forming the spring-chamber, and the spindle mounted therein, combined with the sleeve upon said spindle and having the flange or shoulder L extending laterally 50 therefrom, the coiled spring within said chamber and at its ends respectively engaging said casing and flange or shoulder, and lever-arms for operating the sleeve; substantially as set forth.

5. In a door spring and check of the char- 55 acter described, the liquid-cylinder having a restricted by-pass *t* and a main by-pass *D''* provided with an inlet at one end and an out-

let at the other end and containing the ball- 60 valve, the seat therefor, the enlarged chamber permitting the liquid to flow freely around the ball and the stop intermediate said outlet and said ball and being of a form to permit the liquid to flow past it, combined with the 65 piston in said cylinder and means for operating the same; substantially as set forth.

6. In a door spring and check of the character described, the liquid-cylinder having a restricted by-pass *t* and a main by-pass *D''* 70 provided with an inlet at one end and main and releasing outlets at the other end and containing an automatically-operating valve, combined with the piston in said cylinder, and means for operating the same; substantially 75 as set forth.

7. In a door spring and check of the character described, the liquid-cylinder having a restricted by-pass *t* and a main by-pass *D''* 80 provided with the automatically-operating valve, and the stop-screw having flattened sides and arranged to check the movement of said ball, the inner end of said stop-screw being intermediate the outlet *j'* from said by- 85 pass *D''* and the said ball, combined with the piston in said cylinder, and means for operating the same; substantially as set forth.

8. In a door spring and check of the character described, the liquid-cylinder having the restricted by-pass *t*, the main by-pass *D''* 90 containing an automatically-operating valve, and a releasing by-pass, combined with the piston in said cylinder, and means for operating the same; substantially as set forth.

9. The helical spring and its casing, com- 95 bined with the actuating-spindle, the lever-arm secured to the end thereof, and the extensible arm connected to said lever-arm and comprising the section *O'* having integral therewith the cross-bar *T'* and the longitudinal 100 groove *R'* whose opposite side walls taper inward toward the base of said groove, and the section *P'* whose sides also taper inward or are wedge-shaped and are capable of being 105 tightly wedged into said groove, said section *P'* having the series of recesses *S'* and said cross-bar having the screw *V'* to engage said recesses; substantially as and for the purposes set forth.

Signed at New York, in the county of New York and State of New York, this 16th day 110 of August, A. D. 1895.

JOSEPH BARDSLEY.

Witnesses:

CHAS. C. GILL,
WILLIAM B. ELLISON.