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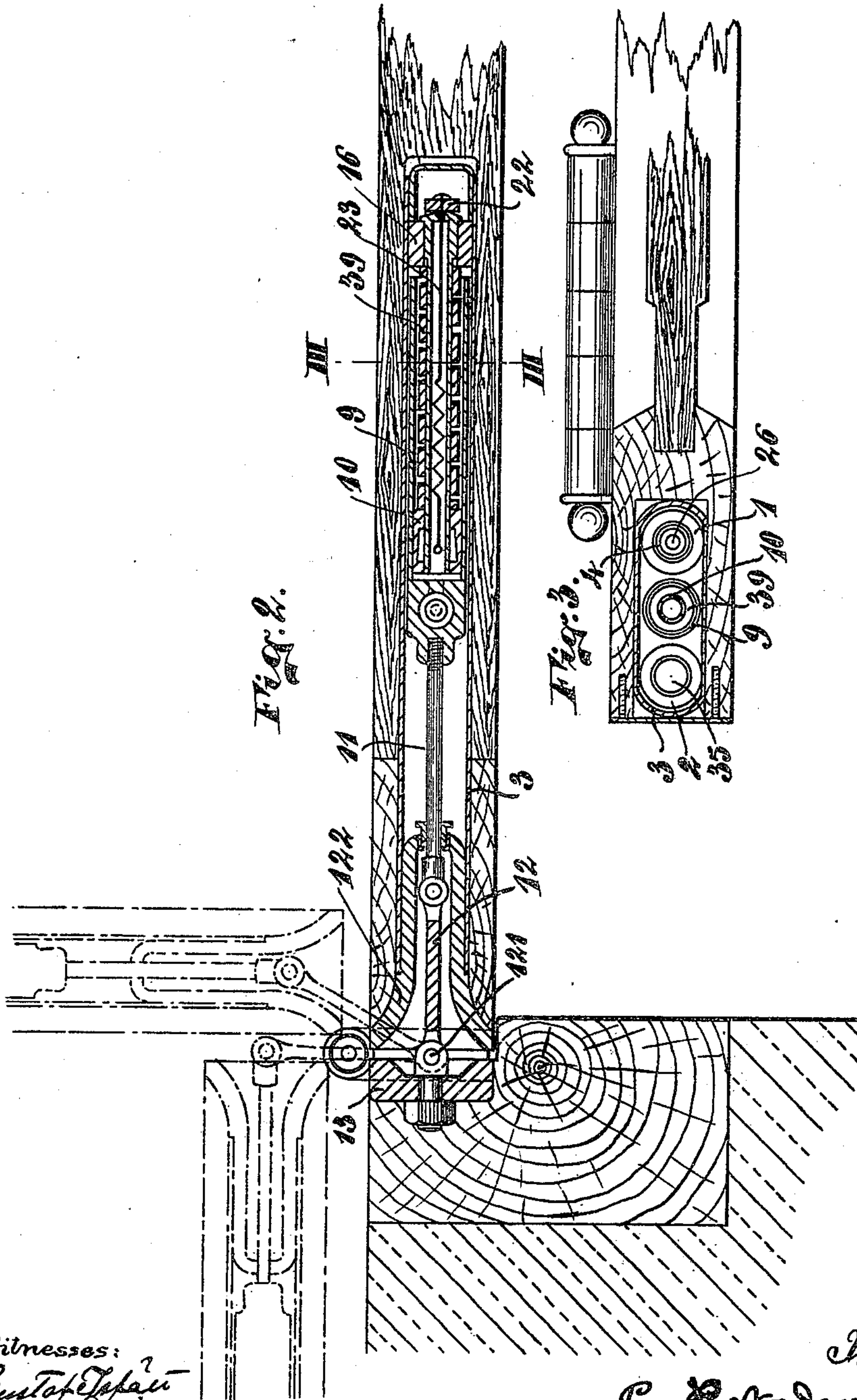
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LIQUID DOOR CHECK.

(Application filed Nov. 28, 1900.)

(No Model.)

2 Sheets—Sheet 2.



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# UNITED STATES PATENT OFFICE.

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## LIQUID DOOR-CHECK.

SPECIFICATION forming part of Letters Patent No. 683,972, dated October 8, 1901.

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*To all whom it may concern:*

Be it known that we, JOHAN NORDQVIST, a resident of 74 Grefthuregatan, Stockholm, and PER ERIK NORDQVIST, a resident of Villa Lottebo, Sundbyberg, Sweden, have invented new and useful Improvements in Liquid Door-Checks, of which the following is a specification, reference being had to the drawings accompanying and forming a part hereof.

10 The present invention relates to improvements in liquid door-checks with a view to producing a uniform, sure, and easily-adjustable braking action on the door and obtaining a ready means of checking the door  
15 in any desired position, as well as allowing of the door being closed by main force without injuring the door-closing apparatus.

One of the novel features of this invention is a flat and smooth valve-plate or the like  
20 adjoining an even and polished bearing-surface surrounding the outlet or inlet aperture for the fluid used in the apparatus and which plate under influence of gravity or a spring-pressure strives to place itself in close contact with the said surface and become sucked  
25 fast to it by adhesion, while by suitable devices the plate may be rocked about one of its edges, and thus be brought to provide a through-passage of greater or smaller size for the fluid. Said feature offers a means of producing a very uniform and at the same time very soft and elastic braking action which may be regulated as required, so as to be  
30 more or less forcible or even cease entirely. An additional advantage of said construction is that the hydraulic braking action can by a simple manual operation be made sufficiently strong to check the door in any desired position, (suitably up to an angle of one  
40 hundred and ten degrees,) special contrivances being, moreover, provided for permitting the closing of the door from its said open position by main force without danger of injuring the apparatus or the door in any way  
45 and all this without the use of special open-keeping devices to engage with the movable parts, such devices being undesirable, owing to their complicated nature and the space occupied by them. Finally, as described below, the braking action may be discontinued in a simple manner immediately before the

locking of the door, the closing-springs thus being given an opportunity during a brief interval to act more or less quickly, according as the lock has a tendency to work heavily. 55

The invention further consists in the combination and construction of parts, hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a vertical longitudinal section of a liquid door-check made in accordance with the present invention and shown in the position it possesses when the door is shut. Fig. 2 is a horizontal section on the line II II in Fig. 1, two open positions of the door being shown with  
60 dotted lines. Fig. 3 is a vertical section on the line III III in Fig. 2, and Figs. 4 and 5 show details on an enlarged scale.

Referring to the drawings, the closing-springs 1 2 and most of the other parts of the  
70 apparatus are inclosed in a casing 3, the said closing-springs being coiled, the one, 1, about a tube 4 and the other, 2, about a rod 35, conveniently in such a manner that the said springs bear at their outer ends directly on  
75 the end piece 7 of the casing, said end piece being formed of a cast frame which closes the casing liquid-tight. At their inner ends the said springs 1 2 bear against cross-pieces 8,  
80 arranged on the longitudinally-movable cylinder 9 of the braking device. The said casing is closed tight and contains a liquid, suitably glycerin, with which the brake operates and which at the same time forms a lubricant for the movable parts inclosed in the casing. 85  
The cylinder 9 is made to slide on a normally stationary piston-head 10 and is connected at the end opposite from the cross-pieces with the inner end of a draw-bar 11. The said draw-bar is jointed at its outer end to a link  
90 12, which in its turn is jointed to a fixture 13, secured to the door-casing. The said link 12, which preferably should be twice as long as the distance between the fixed turning axes of the door and the link, is pivotally connected to the fixture 13 by means of a pin 121. 95  
In opening the door more than ninety degrees the inner end of the link should preferably slide on a guide 122, formed to such a curve that when the door is being opened the  
100 attaching-point between the draw-bar 11 and the link 12 will move along a straight line.



The draw-bar slides with a tight fit through a packing-bush 14 at the inner end of the frame 7. Through the said piston 10 is provided a central passage 20, by which the part  
 5 of the cylinder 9 which is shut off by the piston communicates with the space outside the cylinder. The outer part of the passage 20 is formed as a narrow outlet 21, opposite a plate 22, serving as a valve. Said valve 22 is pressed  
 10 close against the outer end of the piston by means of a spring 23, located in the passage 20, and secured at its inner end to the walls of said passage. The bearing-surfaces of the piston 10 and valve-plate 22 in contact with each  
 15 other are carefully polished, the adhesion between said surfaces consequently being so great that when plate 22 bears fully on the end surface of the piston the pressure of the liquid in the cylinder even when at its maximum  
 20 is unable to separate the plate from said surface and allow liquid to flow out of the narrow outlet 21. At the inner end of the cylinder is a larger inlet-opening, with a valve 24, consisting of a ball. By the aid of some  
 25 suitable packing the piston is arranged so as to slide perfectly tight in the cylinder, so that liquid cannot escape between the cylinder and the packing-surface of the piston. To allow of escape of liquid from the  
 30 cylinder 9, therefore, the valve-plate 22 is arranged so that it can be rocked about one edge of the end surface of the piston. This may conveniently be accomplished by means of a rod 26, made to slide in the tube 4 and  
 35 bearing with its inner end against the plate 22. Said rod 26 at its outer end passes through a packing-sleeve 27. Outside said packing the said rod is screwed into a screw 38, which in its turn is screwed into a nut 30,  
 40 provided with a slot 301, in which engages the forked end of a bell-crank lever 44, the other end of which is pivotally connected to a sliding bolt or push-rod 29. The said screw 38 is provided with a head 32, by means of which  
 45 and by the aid of some suitable tool the rod 26 can be turned in one direction or so that valve-plate 22 may thereby be regulated to close the aperture 21 more or less. The bolt 29 is at its lower end provided with a loop 45,  
 50 engaging, as shown in Fig. 4, with a hook 46, pivotally connected to a handle-lever 47, which in its turn is pivotally connected to a fixture 48, secured in the edge of the door so that said handle-lever is accessible as soon as  
 55 the door is opened. The said handle 47 is actuated by a spring 49, so as to keep the handle in either extreme position. When the bolt 29 is pulled upward by means of the handle 47, it compels the nut 30, with the rod 26,  
 60 to move outward. By pushing the bolt downward the nut 30, with the rod 26, is returned to the position shown in the drawings. The said rod 26 should be so adjusted that when bolt 29 is drawn down a large enough aper-  
 65 ture will be present between the end surface of the piston 10 and the plate 22 for producing the desired braking action, while in the

pushed-up position of bolt 29 the plate 22 will be moved by the spring 23 close to the end face of the piston, so as to completely close  
 70 the aperture 21.

The rod 35 is provided at its inner end with a recess in which is located a bell-crank lever 43, pivoted to said rod, one end of said bell-crank lever bearing against the plate 22,  
 75 while the other wedge-shaped end is provided with a hook adapted in the closing of the door to be actuated by the cross-piece 8 in such manner that the said bell-crank lever is pressed down, whereby the other end pushes  
 80 the plate-valve 22 off its seat. The said rod 35 engages with its outer threaded end in a correspondingly-threaded recess in a screw 36, inserted in the frame 7 of the apparatus. The outside of said screw and the end of the  
 85 rod 35 are threaded in opposite directions, so that when the screw 36 is revolved and correspondingly shifted in one direction or the other the rod 35 will be shifted at a greater velocity in the same direction. To the said  
 90 casing 3 is securely fastened a cross-piece 16 or the like abutment. The smaller part or rod of the said piston runs through said cross-piece 16. The said piston is normally held stationary by a spring 39, which is coiled  
 95 around said piston-rod. The outer end of said spring 39 bears against a shoulder on the piston 10, while its inner end bears against the said cross-piece 16. The strength of the said spring 39 is greater than the combined  
 100 strength of the said closing-springs 1 2, so that normally it has power to hold the piston stationary.

The working of the apparatus is as follows: In closing the door by main force the piston  
 105 10 is shifted under compression of the said spring 39, whereby the valve-plate 22 will strike against an abutment in the shape of a screw 40, whereby it will be rocked about one edge of its seat, so that liquid will flow out.  
 110 When the door is opened, the link 12, draw-rod 11, and cylinder 9 are pulled out, compressing the closing-springs 1 2. The piston 10 remaining stationary, the space shut off by the piston in the cylinder becomes enlarged  
 115 and is without appreciable resistance filled with liquid through the inlet-valve 24. When the door is subsequently released, the cylinder 9 is pulled back over the piston 10 while the door is being closed. The liquid inclosed  
 120 in the cylinder, being at the same time subjected to pressure, forces its way out through the passage 20, aperture 21, and the narrow slit between the end face of the piston and the valve-plate 22. As, however, the liquid can  
 125 escape but slowly, a certain resistance is created against the movement of the cylinder 9, and consequently also against that of the door. By shifting the rod 26 more or less in-  
 130 ward in the manner above described, and thus increasing more or less the aperture between the end face of the piston-head and the valve-plate 22, the braking force may be regulated at will. When the door is to be checked in



any desired more or less open position, the handle-lever 47 is turned outwardly, whereby, as above described, the bolt 29 is pushed upward, whereby the rod 26 is moved out of contact with the plate 22, thus allowing the latter to hug close to the end face of the piston. The adhesion between the contacting surfaces of piston 10 and plate 22 now becomes so considerable that liquid cannot escape from the cylinder, and the door is brought to a standstill in the position occupied at the moment the said handle-lever was turned. If, however, main force be applied to the door, the piston 10 will be forced inward, (to the right,) while the spring 39 is simultaneously compressed, causing the valve-plate 22 to strike against the head of the screw 40 and in the further movement of the piston to rock about the other edge of the end face of the piston, thus permitting the escape of the liquid inclosed in the cylinder. No damage to the apparatus or the door can thereby be caused, the door yielding smoothly and satisfactorily to the pressure. If the said main force is continued until the door is nearly closed, the handle-lever 47 will by its outer end striking against the door-casing be turned back automatically. As soon as the forcible pressure on the door ceases the piston 10 is returned by the spring 39 into the position shown in the drawings and the door is again arrested once more, remaining so until the handle-lever 47 is turned back, when the rod 26 rocks the valve-plate 22 about the upper edge of its bearing-surface, and liquid is thereby allowed to slowly escape once more from the cylinder 9, so that the closing-springs will be able to close the door. Just before the locking of the door the wedge-shaped inner end of the bell-crank lever 43 is depressed by the part of the end piece 8 which is above the recess in said rod 35, the said bell-crank lever 43 consequently acting on the valve-plate 22, causing the latter to move far enough from the end face of the piston to suddenly discontinue the braking action and permit the closing-springs to act with greater force in shutting the door to. The position of the door in which the braking action is thus made to cease is regulated by turning the screw 36, whereby the position of the rod 35 and bell-crank lever 43 is correspondingly shifted longitudinally, so that the engagement of the end piece 8 will take place sooner or later, as desired. If the rod 35 by turning the screw 36 be moved sufficiently far outward—for instance, to the position shown in the drawings—the braking action continues even until the door reaches its shut position. If while the door is closing an extraneous force be exerted to shut it, the piston 10 will first be moved far enough inward to cause the plate 22 and rod 26 to part from each other, when the aperture 21 will be closed entirely, whereupon during the continued compression of spring 39 the piston 10 in the

manner described above pushing on the valve-plate 22 provides an escape for the liquid inclosed in the cylinder. Owing to the fact that a considerable amount of compression of the spring 39 is required to permit of the door being closed at any materially-increased velocity, the door is not easily influenced by gusts of wind or other temporary conditions, its closing movement therefore being gentle and smooth.

The braking device described can be modified in a number of different ways while still retaining the essential features of the invention. Thus, for instance, the cylinder 9 may be stationary, while the piston 10 in the opening and closing of the door moves outward and inward in the cylinder. The valve-plate 22, serving to impede the motion of the liquid, may be situated at an aperture in the cylinder in place of at an aperture 21 in the piston. The spring 23, acting on the plate 22, may be located outside of the cylinder and piston—i. e., may act on the outer side of the plate—while the plate is guided by means of a pin or the like entering in the aforesaid aperture 21 or in some other manner. Other devices may be substituted for rods 26 and 35 and for rocking the valve-plate 22 about one edge or the other of its bearing-surface on the piston (or cylinder) for the different purposes described, as long as the substitutions are the equivalents of the described devices, and we consider ourselves entitled to such equivalents. The bolt 29 may be so arranged (for instance, by locating the fulcrum of the bell-crank 44 to the right of the bolt instead of on the left, as in Fig. 2) that the door will be arrested when the bolt is pulled downward and released when the bolt is pushed up, &c. It is also obvious that the said apparatus may, with certain modifications well understood by persons skilled in the art, be applied to either the door or to the door-casing.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In door-checks of the class described, the combination of draw-springs, a cylinder on which said springs act, a link connected to said cylinder and to the door-casing, a piston in said cylinder having a longitudinal bore, a plate-shaped valve adapted to close the aperture of said bore and to rock about the edges of its seat, and a spring adapted to press said valve against its seat, substantially as and for the purpose set forth.

2. In door-checks of the class described, the combination of draw-springs, a cylinder on which said springs act, a link connected to said cylinder and to the door-casing, a piston in said cylinder having a longitudinal bore, a plate-shaped valve adapted to close the aperture of said bore and to rock about the edges of its seat, a spring adapted to press said valve against its seat, and means such as an adjustable bar for rocking the said



valve-plate more or less around one edge of its seat, substantially as and for the purpose set forth.

3. In door-checks of the class described, the combination of draw-springs, a cylinder on which said springs act, a link connected to said cylinder and to the door-casing, a piston in said cylinder having a longitudinal bore, a plate-shaped valve adapted to close the aperture of said bore and to rock about the edges of its seat, a spring adapted to press said valve against its seat, means such as an adjustable bar for rocking said valve-plate about one edge of its seat, an abutment such as a cross-piece arranged around the end of the rod of said piston, a coiled spring the one end of which presses against the head of said piston and the other end of which bears against the said cross-piece, and an abutment such as a screw-head adapted to arrest the motion of one side of said valve, substantially as and for the purpose set forth.

4. In door-checks of the class described, the combination of draw-springs, a cylinder on which said springs act, a link connected to said cylinder and to the door-casing, a piston in said cylinder having a longitudinal bore, a plate-shaped valve adapted to close the aperture of said bore and to rock about the edges of its seat, a spring adapted to press said valve against its seat, a device such as an adjustable bar adapted to lift said valve more or less from its seat, an abutment such as a cross-piece arranged around the end of the rod of said piston, a coiled spring the one end of which presses against the head of said piston and the other end of which bears against the said cross-piece, another abutment adapted to arrest the motion of one side of said valve, and means for lifting one side of said valve-plate from its seat just when the door is about to close, such as a bell-crank lever pivoted to one end of an adjustable rod, one arm of said bell-crank lever being wedge-shaped and adapted to engage with an abutment of the cylinder and the other end of said bell-crank lever being adapted to lift the one edge of the said valve-plate out of engagement with its seat when the other

end of said bell-crank lever engages with said abutment, substantially as and for the purpose set forth.

5. In door-checks of the class described, the combination with the casing, of draw-springs, a cylinder on which said springs act having a perforated abutment, a link connected to said cylinder and to the door-casing, the length of said link being such that the distance between the centers of joints is double the distance between the swinging axis of the door and of said link, guides for said link of such shape that the joint between said draw-bar and link will move in a straight line, a piston in said cylinder having a longitudinal bore, a plate-shaped valve adapted to close the aperture of said bore and to rock about the edges of its seat, a spring adapted to press said valve against its seat, an adjustable bar adapted to lift said valve more or less from its seat, a perforated abutment of the said casing arranged around the end of the rod of said piston, a coiled spring the one end of which presses against the head of said piston and the other end of which bears against the said abutment of the casing, an abutment adapted to arrest the motion of one side of said valve, an adjustable rod, a bell-crank lever pivoted in a recess formed in the inner end of said adjustable rod so as to lie within said recess and pass therewith through the perforations of said abutments, one arm of said bell-crank lever being wedge-shaped and adapted to engage with said abutment of the cylinder and the other end of said bell-crank lever being adapted to lift the one edge of the said valve-plate out of engagement with its seat when the other end of said bell-crank lever engages with said abutment, substantially as and for the purpose set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

JOHAN NORDQVIST.  
PER ERIK NORDQVIST.

Witnesses:

GORDA PINDKVIST,  
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