

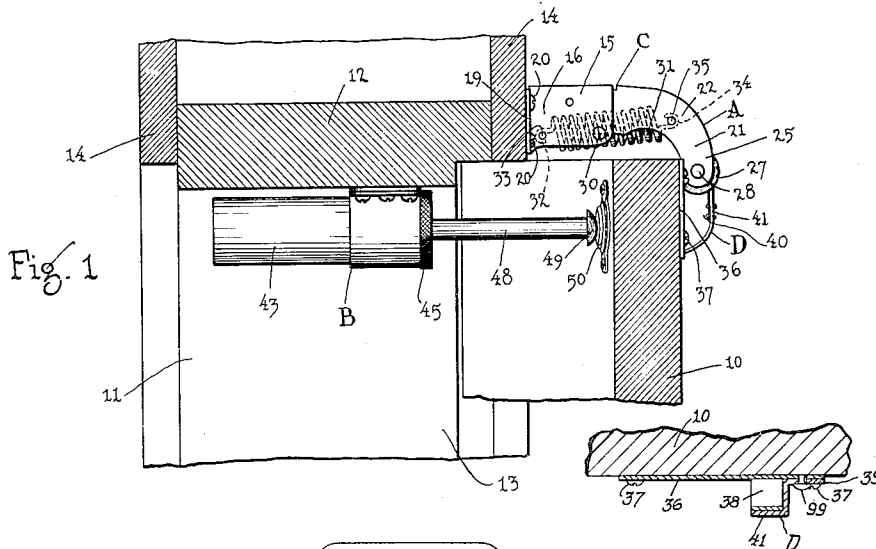
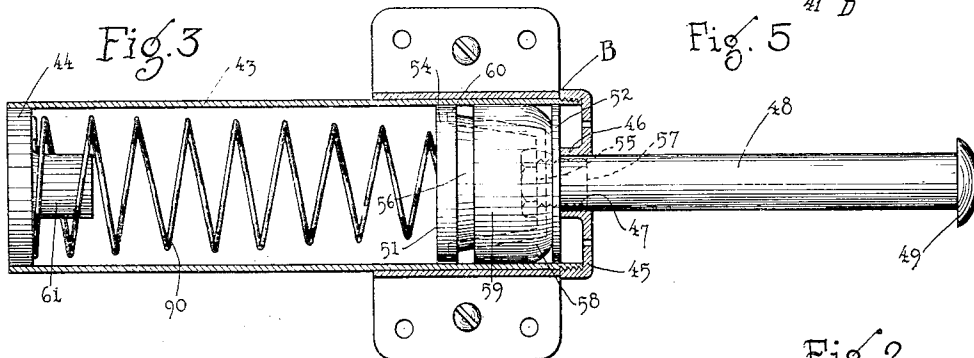
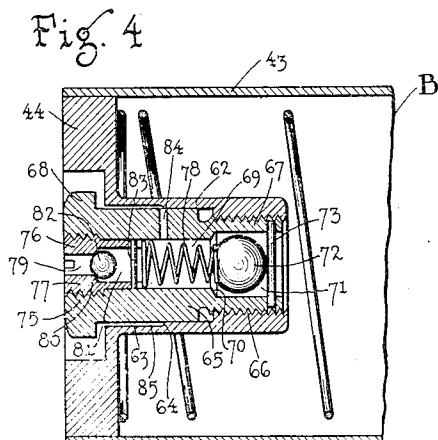
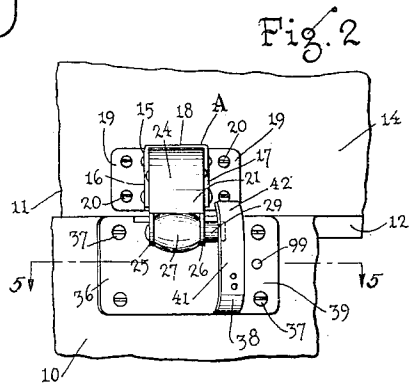
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DOOR CONTROL APPARATUS

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DOOR CONTROL APPARATUS

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13 Claims. (Cl. 16—84)

My invention relates to door control apparatus and particularly to apparatus for closing doors and for preventing the slamming thereof.

momentarily closing of communication between the chamber and port.

An object of the invention resides in providing a device whereby a door may be free to move or remain in any open position and in which the door upon approaching closed position is checked in its movement and thereafter positively moved into closing position and so held.

10 An object of the invention resides in providing a check for a door adapted to be actuated shortly before the door reaches closed position, to retard the closing movement of the door, said check being disengaged from the door at
15 all other positions thereof.

Another object of the invention resides in providing a release for said check operative to control the timed closing of the door, said release becoming effective for the desired purpose after
20 the movement of the door has been retarded.

A still further object of the invention resides in providing a normally inactive door closing device adapted to operate in conjunction with said check for the purpose of closing the door
25 against the action of said check during operation thereof.

An object of the invention resides in constructing the check with an expansible chamber having a fluid therein and in providing a movable member for compressing the fluid within
30 said chamber, said chamber having an escape port for relieving the pressure therein to control the timed movement of said movable member.

25 A still further object of the invention resides in providing a valve for momentarily closing communication between said chamber and port to check the movement of said member.

40 A feature of the invention resides in providing means for adjusting the size of said check port to time the closing of the door.

45 An object of the invention resides in forming the check with a valve cage communicating with said expansible chamber and in threading a valve housing into said cage, said valve housing having the check port, said port communicating with said cage and chamber and being adapted to close upon screwing of the valve housing within said cage.

50 A feature of the invention resides in constructing the cage with a shoulder adapted to overlie said port to vary the opening thereof.

55 Another object of the invention resides in disposing within said housing said valve for the

60 movement of the movable member associated with said expansible chamber.

Other objects of the invention reside in the novel combination and arrangement of parts, and in the details of construction hereinafter
65 illustrated and/or described.

In the drawing:

Fig. 1 is an elevational sectional view of a door and jamb illustrating an embodiment of my invention applied thereto.

70 Fig. 2 is a front elevational view of a portion of the structure shown in Fig. 1.

Fig. 3 is an inverted plan sectional view of the cylinder structure of my invention detached from the door structure and drawn to a larger
75 scale.

Fig. 4 is an enlarged longitudinal sectional detail view of a portion of the cylinder illustrating the valve mechanism of the invention.

Fig. 5 is a cross sectional view taken on line 80 5—5 of Fig. 2.

In controlling the movement of doors and particularly upon closing, it has heretofore been attempted to employ a check mechanism in conjunction with a door closing mechanism both
85 continuously operable throughout the range of movement of the door. Such devices greatly lengthen the time required to both open and close the door and also prevent leaving the door partially open as is frequently desired. Such
90 structures further required considerable force and exertion to operate. My invention overcomes these difficulties by providing a simple and inexpensive construction whereby the checking and closing of the door is effected only
95 when the door closely approaches closing position thereby permitting the door to remain open without interference at substantially all of its positions and to permit of quickly opening and closing the same when desired.

100 For the purpose of illustrating the application of my invention, I have shown a portion of a door 10 which is mounted in an ordinary door frame 11. This frame comprises a header 12 and vertical jamb members 13 constructed
105 in the usual manner. The frame construction further includes a casing 14 secured to and surrounding the jamb proper which serves the usual function. For the purpose of convenience the door has been shown as pivoted to the frame
110

11 in a manner to lie flush with the outer surface of the said casing when in closed position. It will be readily comprehended however that the invention may be applied to doors and frames wherein the door is set into the frame, by merely building up under the escutcheon plate of the invention, causing the parts to function in the same manner for all installations with which the invention is desired to be used. The installation of the invention in such cases, being within the skill of any ordinary mechanic, such applications have not been shown in the drawing.

The invention proper comprises a door closer indicated in its entirety at A which is adapted to positively engage and close the door when the same approaches closed position and to maintain the door closed after the same reaches closed position. In conjunction with this door closer the invention further includes a check which I have indicated in its entirety at B and which is mounted on the frame structure of the door and is adapted to come into operation at or about the time when the door closer commences to function. It is to be noted that both of these devices are entirely free from the door throughout the major portion of the movement thereof and only come into action when the door is almost closed. These parts will now be described in detail.

The door closer A comprises a structure attached to the door frame which I have indicated in its entirety at C and a complemental device D attached to the door proper and co-operating therewith. The structure C includes a bracket 15 which is preferably constructed of sheet metal and which is bent to form two side pieces or flanges 16 and 17 and a web 18 connecting the same. From the flanges 16 and 17 are bent ears 19 formed with openings for the reception of a number of screws 20 by means of which the entire device may be rigidly secured to the casing 14 of the door frame proper.

At the outer end of the bracket 15 is mounted a rocking arm 21 which is also preferably constructed of sheet metal and consists of two flanges 22 and 23 connected together by means of a web-like portion 24. The flanges 22 and 23 are constructed hooked as shown and are formed at their extreme ends with two ears 25 and 26 between which is rotatably mounted a roller 27. A pintle 28 extends through the ears 25 and 26 and serves as a journal for said roller, said pintle having a lug 29 formed on the one end thereof and extending outwardly beyond the arm structure for a purpose to be presently described. The roller 27 is constructed ellipsoidal in form so as to engage the surface with which it comes in contact with a minimum amount of friction regardless of the angular relation of the door structure with respect to the door frame. The ends of the two flanges 22 and 23 are pivoted to the flanges 16 and 17 of the bracket 15 through rivets 30 which permit the said rocking arm to swing from a position in which the same is substantially in alignment with the bracket 15 to a position substantially at right angles thereto.

Between the flanges 22 and 23 of the arm 21 and between the flanges 16 and 17 of the bracket 15 is disposed a tension coil spring 31 which is constructed with a hook 32 at one end thereof adapted to hook over a pin 33 extending across the two flanges 16 and 17 of the bracket 15 near the ends thereof. The other

end of this spring is similarly formed with a hook 34 adapted to hook over another pin 35 extending across and secured to the flanges 22 and 23 of the arm 21. The pins 33 and 35 are so disposed as to lie to one side of the rivets 30 when the arm 21 is in one position, and to lie to the other side of said rivets when the arm is in its other position. When the said arm is moved sufficiently to bring the spring 31 past the hinge axis the same continues to move automatically through the action of said spring in the direction of its ultimate position.

The device D mounted upon the door proper consists of a plate 36 which serves as an escutcheon for engagement with the roller 27 of the rocking arm 21 when said arm is brought into operation to close the door. This plate may be secured to the door through a number of screws 37 and is so disposed so as to be engaged by the roller 27 of said arm when the door is moved into closing position. Upon this plate is mounted a trip 38 which is preferably constructed of sheet metal and comprises a base portion 39 secured to the plate 36 through a rivet 99 or any other suitable means. This trip further includes an outstanding portion 40 bent from the base 39 which terminates in a guide 41 spaced from the said plate and substantially parallel therewith. This portion of the trip is offset from the base 39. The extreme end of the guide 41 is formed with a cam portion 42 which when the plate 36 is properly disposed upon the door is adapted to come into operation to engage the lug 29 on the rocking arm 21 so as to shift the same from its extreme outwardly extended position to a position engaging the escutcheon plate 36 whereby the spring 31 connected with said arm may function to swing the door inwardly into its closing position within the door frame. Reference is hereby made to my co-pending application, Serial No. 434,621 which illustrates a device which may be advantageously used for this purpose though it can readily be comprehended that any other suitable door closer may be employed which operates in a like or similar manner.

The check B which I use in conjunction with my invention comprises a cylinder 43 which is closed at one end through an end wall 44 securely connected therewith as by soldering or through suitable threads. This cylinder is further closed at its other end through a cap 45 adapted to be screwed upon the exterior of the said cylinder. The cap 45 is formed with a central boss 46 which is bored at 47 to receive a piston rod 48 slidable within said bore. Upon the end of the piston rod is formed a button 49 adapted to be engaged by some part of the door structure or a striker 50 mounted thereon. As the door moves into closing position, the piston rod 48 is reciprocated within the cylinder 43 to effect the checking of the movement of the door as will be presently described.

Upon the inner end of the piston rod 48 is mounted a piston structure indicated in its entirety at 51. This structure includes a disc 52 and a bell shaped member 54 formed with a plate-like portion 55 at one end thereof, and a frustro-conical portion 56 diverging from said plate-like portion. The piston rod 48 is internally threaded at its inner end to receive a stud 57 which is adapted to be screwed therein. The disc 52 and the plate-like portion 55 of the member 54 are apertured to receive the stud 57. In conjunction with these parts, a piston

leather 58 is employed which is also apertured to receive the stud 57 and which is clamped between the disc 52 and the plate-like portion 55 of the member 51. The bell-like member 54 is formed hollow opposite the plate-like portion to provide an opening to receive the head of the stud 57. When the member 54, leather 58, and disc 52 are all mounted upon the stud 57 and the same screwed into the threaded portion of the piston rod 48 the entire structure is firmly and rigidly mounted upon the end of the piston rod to form the complete piston structure.

As will become apparent from the drawing, the frustro-conical or bell-shaped portion 56 of the member 51 is of a smaller diameter than the diameter of the cylinder 43. The piston leather 58 is constructed with a flange 59 which is adapted to overlie this portion of the bell 56 and to be retained in place thereby so as to prevent the leather from receding from the cylinder wall and causing leakage of the device. The hollow end of the frustro-conical portion 56 of the member 51 is formed with a flange 60 which engages the inner wall of the cylinder 43 and serves as a guide for guiding the piston structure for reciprocation within the cylinder.

In the operation of my invention when pressure is applied to the button 49 on the piston rod 48 the air within the dead end of the cylinder 43 is compressed through the action of the piston leather 58 checking the movement of the said piston rod and the structure in engagement therewith. For the purpose of controlling the checking of the movement of said piston assembly, a valve mechanism which I have indicated in its entirety at 61 is attached to the cylinder end wall 44 and extends into the interior of the cylinder. This valve mechanism is best shown in Fig. 4 and will now be described in detail.

The valve mechanism 61 includes a valve housing 62 which is preferably formed integral with the end wall 44 of the cylinder 43 or which may be rigidly secured to said end wall in any suitable manner. This housing is constructed with an internal bore indicated at 63 extending completely through the same. Intermediate the ends of this bore, the same is somewhat reduced in diameter to form a shoulder 64 for a purpose to be presently described, and the inner end of the said bore is further reduced in diameter and threaded as designated at 66 to receive a valve cage 65 which is insertable therein through the enlarged outer end of the bore of said housing. The cage 65 is threaded at its extreme end 67 to screw into the threaded portion 68 of the housing 62 while the remainder of the said cage is of uniform diameter throughout and of a diameter equal to the diameter of the intermediate portion of the bore of said housing so as to snugly fit within the same. The extreme end of the cage 65 is constructed with a head 68 by means of which the same may be rotated from without the cylinder structure to permit of screwing the cage into the housing in assembling the valve structure of the check. The cage 65 is constructed with a bore 69 extending completely through the same which bore is enlarged at the inner end thereof to form a shoulder 70 which serves as a valve seat and to provide a valve chamber 71 adjacent thereto. Within this valve chamber is disposed a ball 72 which is adapted to seat against the valve seat 70 and serves to close communication between the interior of the cylinder proper and

the bore 69. This ball is retained within said valve chamber through a pin 73 which extends through the extreme end of the cage 65 a distance back of the seat 70 sufficient to allow the ball to unseat from the seat 70. The ball is of a diameter somewhat less than the diameter of the enlarged portion of the bore of the cage 65 forming the valve chamber 71 so that when the said ball valve is open, air may readily pass the said ball and into the bore 69 of the cage.

The end of the cage 65 opposite to that in which the ball 72 is disposed is internally threaded as indicated at 75 to receive a bushing 76 which is threaded at 77 to screw into the same. Between this bushing and the ball 72 and within the bore 69 is disposed a compression coil spring 78 which serves to hold the ball valve 72 unseated from its seat 70. The bushing 76 is constructed similar to the cage 65 with an internal bore 79 which is enlarged at its inner end to form a shoulder 80 serving as a valve seat and providing a valve chamber 81 at the extreme end thereof. Within this valve chamber is disposed a ball valve 82 which is adapted to seat against the seat 80 and to close communication between the interior of the bore 69 and the exterior of the cylinder structure. A pin 83 extending through the walls of the bushing 76 at the extreme end thereof serves to retain the ball 82 within the chamber 81 and is so disposed as to allow the ball to unseat from the seat 80 when the air travels in the proper direction. The ball 82 similar to the ball 72 is of a diameter less than the diameter of the enlarged portion 81 of the bore 79 so that the air may readily flow past said ball when the valve is in open position.

For relieving the air pressure within the cylinder 43 an escape port 84 is provided which extends through the wall of the cage 65 between the two valves contained therein bringing the bore 69 into communication with an annular space 85 formed between the cage 65 and the housing 62. This port is so disposed that the same may be covered or uncovered by the shoulder 64 previously referred to and formed within the housing 62. When the cage 65 is completely screwed into the said housing the port 84 is completely covered thereby precluding the passage of fluid from the device. By turning the head 68 of the cage 65 the proper amount, the escape of the fluid from the cylinder may be regulated to time the operation of the check so as to control the proper closing of the door.

The operation of my invention is as follows: At any position of the door prior to the engagement of the cam portion 42 with the lug 29 of the door closing arm 21 the door may be moved or set in any position without interference. When the door is being closed and approaches closing position, the cam 42 first comes into engagement with the lug 29 which has the effect of moving the arm 21 in a manner to bring the roller 27 into engagement with the escutcheon plate 36. As soon as the spring 31 of the said arm passes the pivot thereof the said spring exerts a pull through said arm which forces the door into closing position. The check B is so disposed with reference to the door 10 that as soon as the spring 31 is freed, the said check is engaged by the striker plate 50 to bring the check into action. Where the door is slammed or moved into closing position rapidly the button 49 on the end of the piston rod 48 is struck with considerable violence creating a high pressure within the cylinder 43. This

causes a rapid rush of air through the valve chamber 71 of cage 65 which has the effect of carrying with it the ball 72 in opposition to the spring 78 to cause the same to seat against the seat 70 and close communication between the interior of the cylinder 43 and the exterior of the device. This causes the air within the cylinder to be further compressed and serves as a check or buffer for retarding the movement of the door. As soon as the force procured through the momentum of the moving door has been expended in compressing the air within the cylinder the pressure within said cylinder decreases until the pressure is insufficient to maintain the ball 72 seated against the valve seat 70. When this occurs, the spring 78 forces the ball away from the said seat permitting the air to escape into the bore 69 through port 84 and the annular passageway 85 with which the said port communicates, and from there outwardly from the device to the atmosphere. This is made possible by designing the springs 31, 90 and 78 so that the resultant pressure created within cylinder 43 by the springs 31 and 90 tending to hold the ball valve 72 closed is less than the force exerted by spring 78 tending to open it. The escape of air thus effected may be timed by adjusting the size of the said port as previously described to cause the device to function in a manner to produce the desired results in any suitable length of time. During such movement of the piston 51 and piston rod 43, the door closer A is in operation, which through the action of the spring 31 and the arm 21 positively moves the door into closing position while the air is being expelled from cylinder 43. When the door finally reaches closing position the said closing device serves to maintain the same shut.

Within the interior of the cylinder 43 is disposed a compression coil spring 90 which is seated at one end against the end member 44 of said cylinder 43 and at its other end against the piston 51. When the air is being expelled from the cylinder and the piston moved toward the valve structure 61, said spring is being compressed. As soon as the pressure is released from the end of the button 49 the spring 90 within the interior of the cylinder 43 moves the piston and piston rod to its outermost and exposed position. During the movement of piston 51 a reduction in pressure occurs within the interior of the cylinder 43 due to the inability of the air to rush into the said cylinder through the port 84. This has the effect of opening the ball valve 82 which permits of an inrush of air directly through the bore 79 of the bushing 76 the valve chamber 81 the bore 69 of cage 65 and the valve chamber 71 and into said valve proper so as to bypass the port 84 and cause the cylinder to become refilled with air. Upon termination of movement of the piston the same is again in proper position to be engaged by the door in the closing thereof as previously described. Were the bypass valve not present the air would pass by the flange 59 of the piston leather 58 in entering the cylinder 43 which would cause the leather to soon become dry and inoperative. The bypass valve 82 prevents this thereby maintaining the leather in proper condition at all times.

Although I have shown and described a device particularly adapted to be used in conjunction with air, yet it must be readily comprehended that any suitable fluid may be employed by merely securing a suitable reservoir

to the end of the cylinder 43 in which the expelled fluid may be contained and through which the same may be redrawn into the cylinder to refill the same when the device is returned to its normal position. Such construction being within the skill of any ordinary mechanic has not been illustrated in this application. My invention may be used in shock absorbers and particularly shock absorbers for automobiles, as well as for door checks, the invention being applicable wherever the control of a moving member is desired.

My invention is highly advantageous in that an extremely simple and positive device is provided. The door is free at most positions thereof to be opened or closed without interference or may be left in any open position without holding means. Slamming of the door is absolutely prevented and when the door is moved into closing position the same is positively closed and so held. The invention may be easily installed on different types of doors without reconstructing the same. By means of the valve structure within the check, the movement of the door is positively retarded regardless of the speed at which the door is travelling when being closed. By means of the supplemental valve, the check is quickly brought back to normal position so as to be at all times set for operation. The entire valve structure being mounted upon a single housing may be readily removed from the check for replacement, inspection or repair as desired. The timing of the operation of the check may be readily accomplished merely by turning the valve housing at the end of the check.

Changes in the specific form of my invention, as herein described, may be made within the scope of what is claimed without departing from the spirit of my invention.

Having described my invention, what I claim as new and desire to protect by Letters Patent is:

1. A check comprising a case having an expandible chamber with a fluid therein, a movable member for compressing the fluid within said chamber, a valve housing attached to said housing, a valve cage threaded into said housing, said cage having a port communicating with said housing and chamber, a valve within said cage for momentarily closing communication between said chamber and port to check the movement of said member, and a bypass valve in said cage for conducting fluid into said chamber to refill said chamber upon the return movement of said member.

2. A check comprising a case having an expandible chamber with a fluid therein, a movable member for compressing the fluid within said chamber, a valve housing attached to said case and having a bore extending therethrough, a valve cage threaded into said bore and having a port communicating with said housing and chamber, the bore of said housing being formed with a shoulder adapted to cover said port upon the screwing of the cage within said threaded bore to vary the time required for the escape of the fluid from said chamber upon compression thereof through said movable member.

3. A check comprising a case having an expandible chamber with a fluid therein, a movable member for compressing the fluid within said chamber, a valve housing attached to said case, a valve cage threaded into said housing, said cage having a port communicating with said

housing and chamber, a valve within said cage for momentarily closing communication with said chamber and port to check the movement of said member, said valve being situated at the inner end of said cage, and a bypass valve for conducting fluid into said chamber to refill said chamber upon the return movement of said member, said bypass valve being situated at the outer end of said cage, said valves and cage being jointly removable from said housing upon the unscrewing of said cage therefrom.

4. A check comprising a cylinder having a piston therein, a cylinder head forming a housing, a valve cage mounted in said housing, a leakage port in said cage for controlling the flow of fluid out of said cylinder, a valve in said cage for momentarily closing communication between the cylinder and said leakage port to check the movement of the piston, and a by-pass valve mounted in said cage for conducting fluid into the cylinder to refill the same upon the return movement of said piston.

5. A check comprising a cylinder having a piston therein, a cylinder head forming a housing, a valve cage mounted in said housing, a leakage port in said cage for controlling the flow of fluid out of said cylinder, a valve in said cage for momentarily closing communication between the cylinder and said leakage port to check the movement of the piston, and a by-pass valve mounted in said cage for conducting fluid into the cylinder to refill the same upon the return movement of said piston, said valves being in alignment with one another.

6. A check comprising a cylinder having a piston therein, a cylinder head forming a housing, a valve cage mounted in said housing, said cage having a central bore therethrough, a valve seat formed in one end of said cage, a bushing in the other end of said cage and forming a second valve seat, said cage having a leakage port communicating with said bore intermediate the valve seats, a valve within said cage seated against said first named valve seat for momentarily closing communication between said cylinder and leakage port, a spring disposed between said bushing and said valve for urging said valve open, and another valve seated against said second named seat and adapted to open by gravity to allow the influx of air into the cylinder upon the return movement of the piston, said cylinder being in communication with the exterior through said bore and leakage port and through said valves.

7. In combination with a door, a check therefor comprising means forming an expansible fluid chamber, a movable member for compressing the fluid within said chamber, said chamber having an escape port for relieving the pressure therein to control the timed movement of said movable member, a valve for momentarily closing communication between said chamber and port to check the movement of said member, a spring acting to close said door in opposition to the check and a spring for holding said valve open, said spring exerting a greater pressure upon said valve than the spring for closing the door exerts upon said valve through the compression of said fluid.

8. In combination, a case having an expansible chamber for the reception of a fluid, a movable member for compressing the fluid within said chamber, a housing attached to one thereof, a cage threaded into said housing, said cage having a port communicating with said

housing and chamber, and means on said housing for closing said port upon the screwing of said cage within said housing to vary the timing of the escape of fluid from said chamber through said port.

9. In combination, means forming an expansible fluid chamber, a movable member for compressing the fluid within said chamber, means forming an escape port communicating with said chamber, two valves communicating with said chamber, both of said valves closing at pressures in the chamber above atmospheric pressure, one of said valves opening at a pressure under atmospheric pressure, the other of said valves obstructing communication between said chamber and the escape port, and a spring for opening said last named valve, said spring operating to procure opening of said valve at a pressure above atmospheric pressure.

10. In combination, means forming an expansible fluid chamber, a movable member for compressing the fluid in said chamber, means forming a housing communicating with said chamber, a valve cage mounted in said housing, said cage having an escape port therein for controlling the flow of fluid out of said chamber, a valve in said cage for momentarily closing communication between the chamber and said escape port to check the movement of the movable member, a spring for opening said valve, a bushing threaded into said cage and engaging said spring for varying the tension thereof, and a by-pass valve in said bushing for refilling the chamber upon the return movement of said movable member.

11. In combination, means forming an expansible fluid chamber, a movable member for compressing the fluid within said chamber, means forming a valve chamber, a valve for bringing said fluid chamber into communication with said valve chamber, said valve opening into said fluid chamber, an escape port communicating with said valve chamber and with the atmosphere, and a second valve bypassing said port for bringing the valve chamber into communication with the atmosphere, said valve opening into the valve chamber.

12. In combination with a door, a check therefor comprising means forming an expandable fluid chamber, a movable member for compressing the fluid within said chamber, said member having an escape port for relieving the pressure therein to control the timed movement of said movable member, a valve for momentarily closing communication between said chamber and port to check the movement of said member, a spring acting to close said door in opposition to the check and a spring for the return of said movable member to its outward position, said return spring exerting less pressure on said movable member than said closer spring.

13. In combination, means forming an expandable fluid chamber a movable member for compressing the fluid within said chamber, means forming an escape port communicating with said chamber, a valve communicating with said chamber and adapted to obstruct communication between said escape port and chamber, said valve closing at a pressure above atmospheric pressure and a spring for opening said valve, said spring permitting the partial closing of said valve, the degree of closing being in proportion to the ratio of the pressure in the fluid chamber to the closing pressure.

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