No. 868,357. PATENTED OCT. 15, 1907.

L. C. NORTON.

DOOR CHECK.

APPLICATION FILED MAR. 13, 1906.

3 SHEETS—SHEET 1.

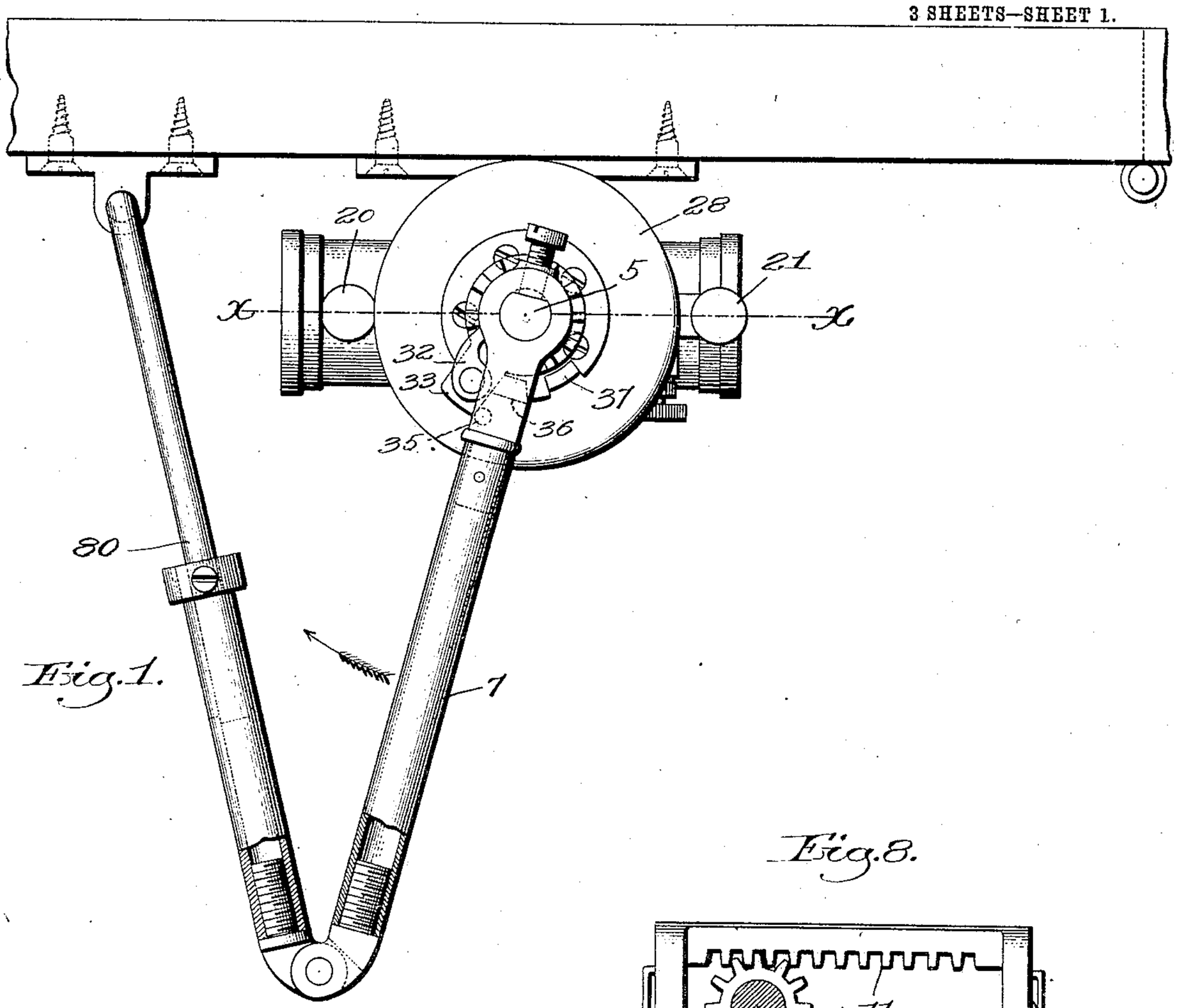


Fig. 1.

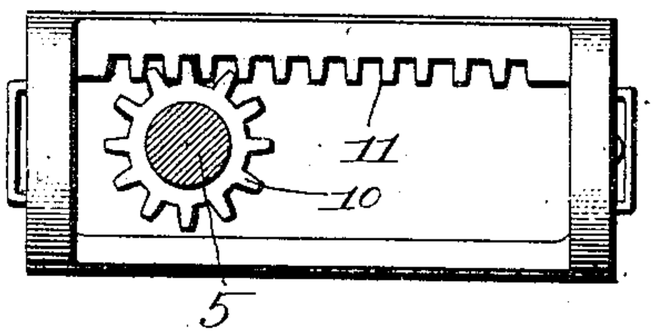
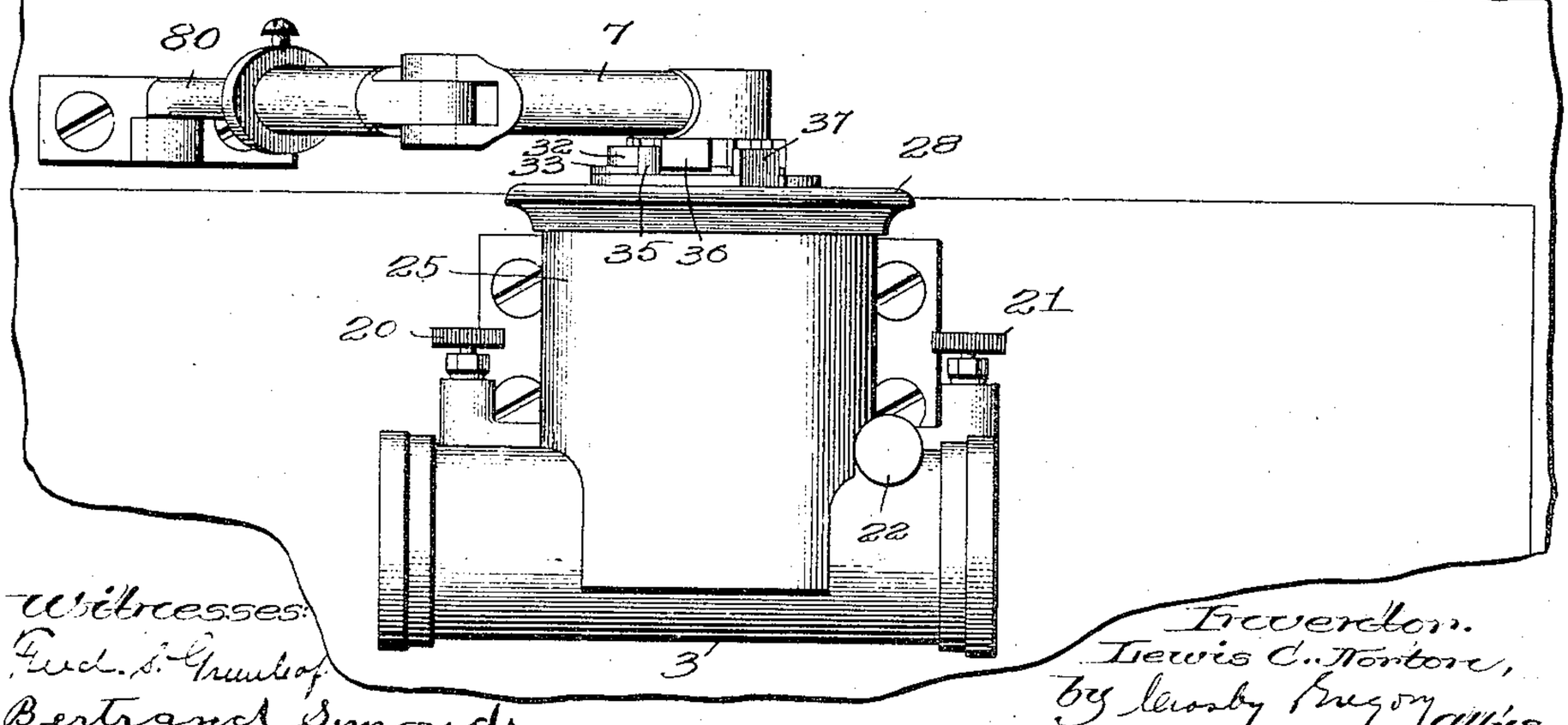


Fig. 8.

Fig. 2.



Witnesses:
Fred. S. Grumbo
Bertrand Simonds.

Inventor.
Lewis C. Norton,
by Crosby Gregory Attys.

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3 SHEETS—SHEET 2.

Fig. 3.

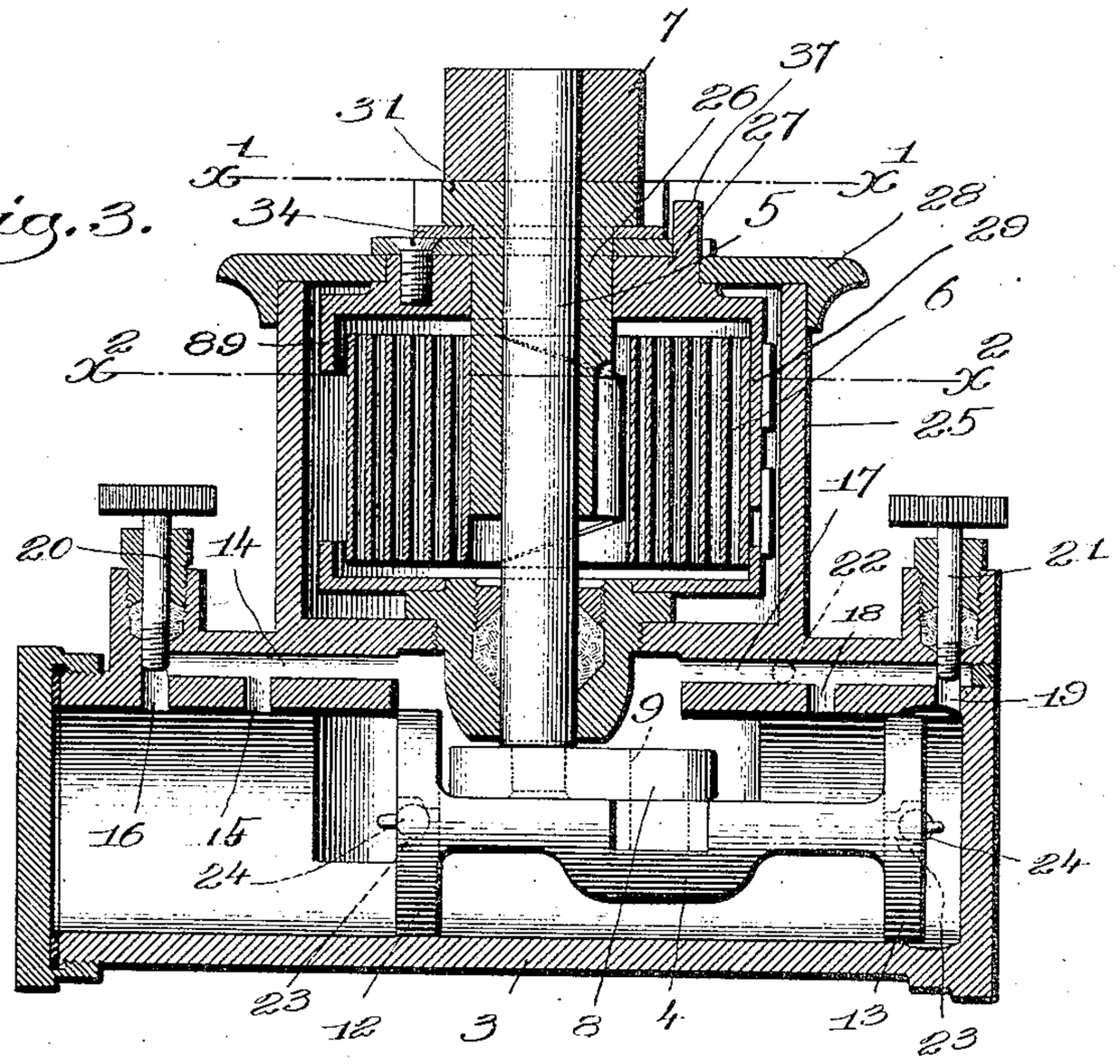


Fig. 4.

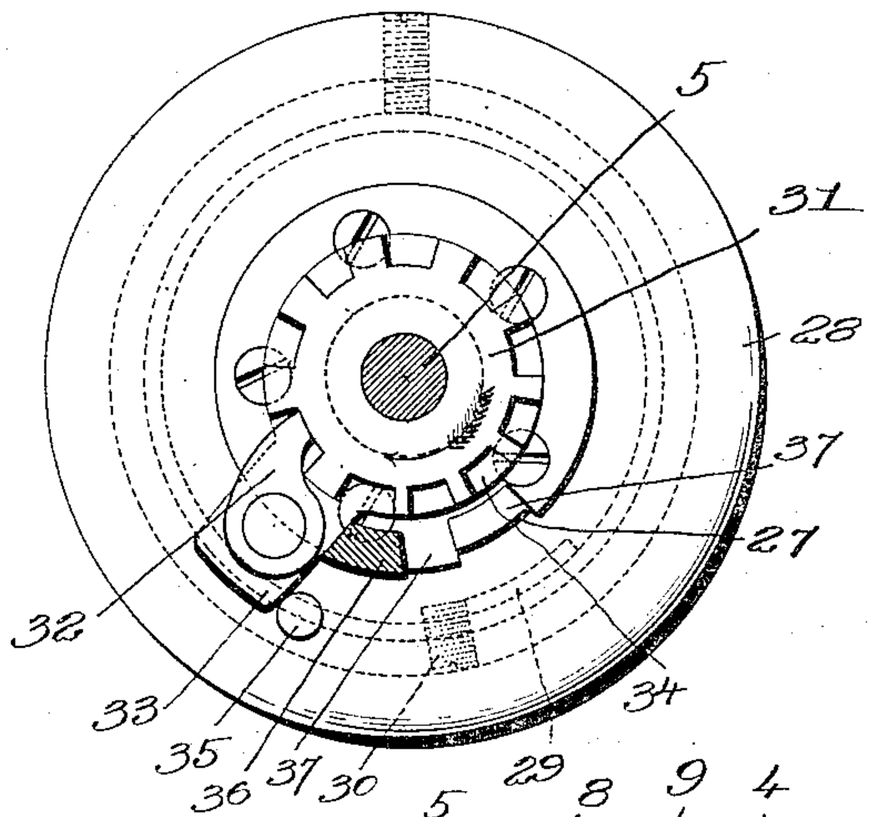


Fig. 5.

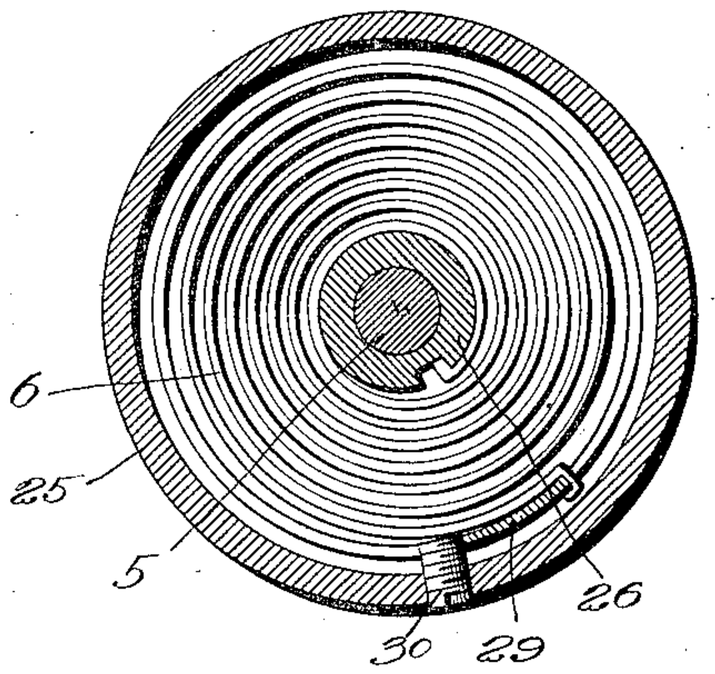


Fig. 7.

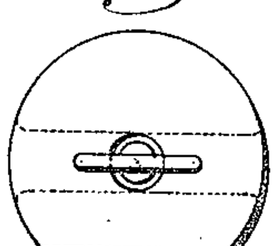
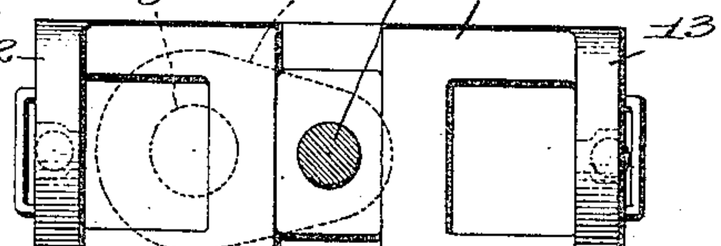


Fig. 6.



Witnesses:
Fred. L. Grumbaf.
Bertrand Simonds.

Inventor.
Lewis C. Norton,
by Darby & Bugon Attys.

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3 SHEETS—SHEET 3.

Fig. 9.

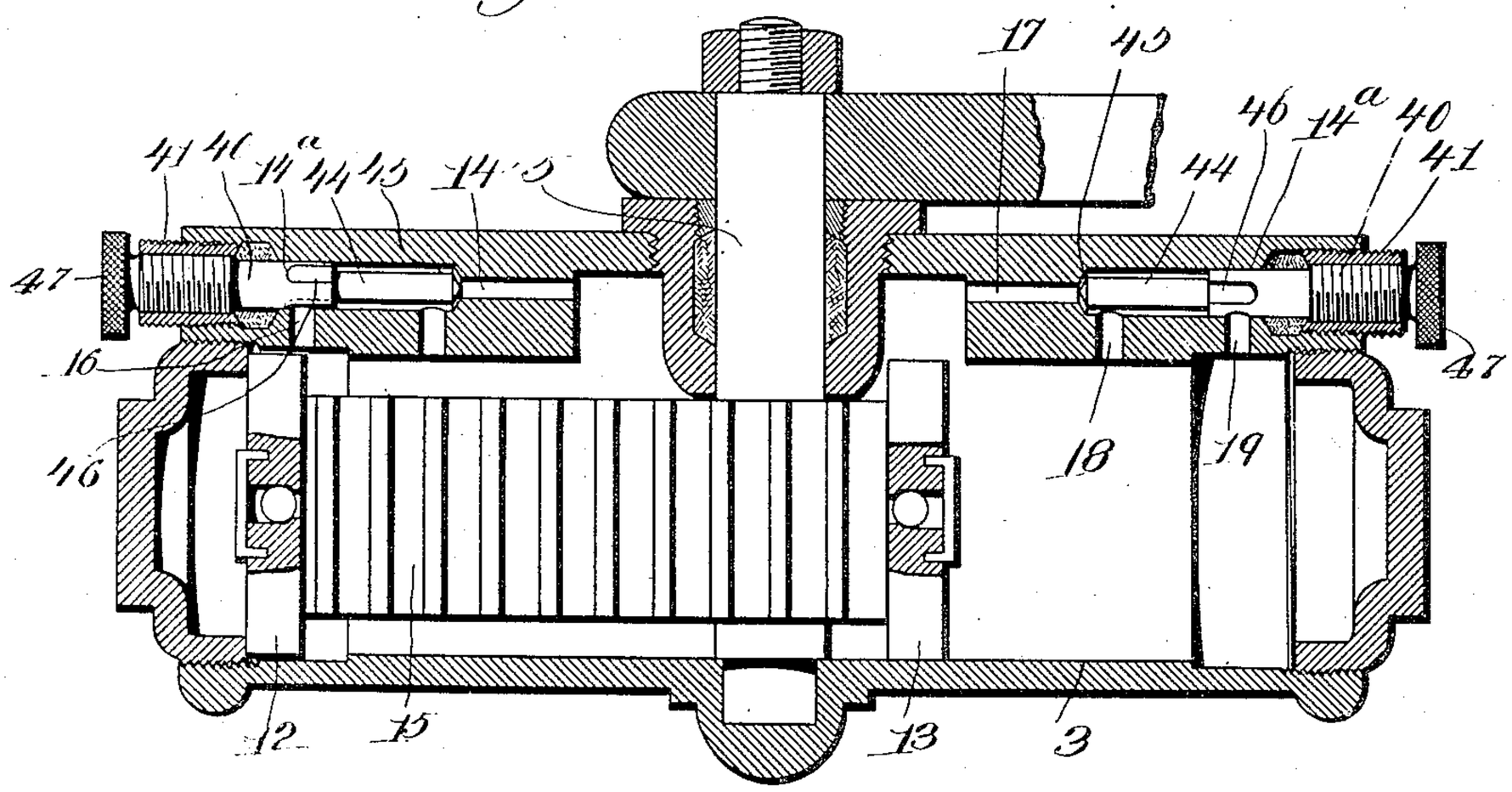
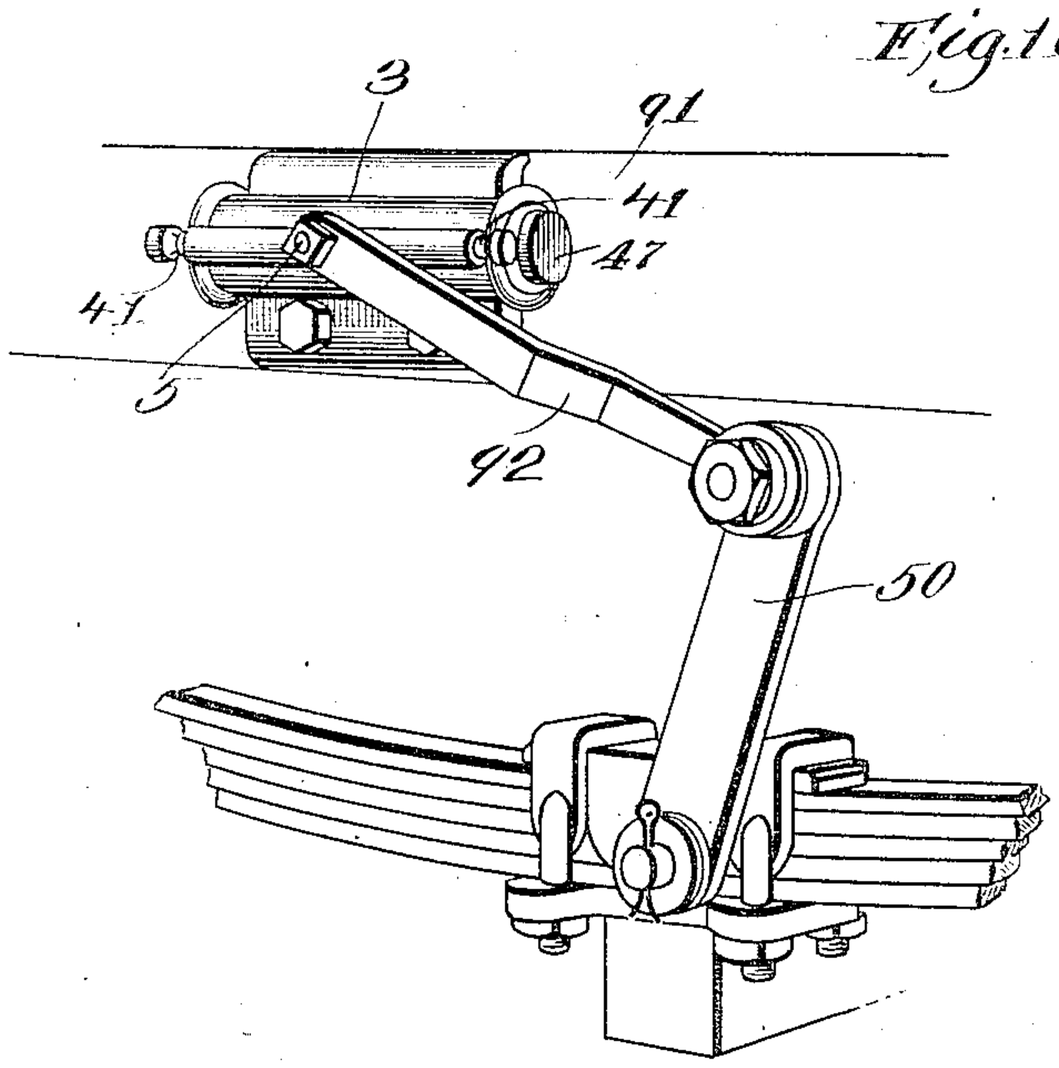


Fig. 10.



Witnesses
W. C. Dumford
E. H. Allen.

Inventor
Lewis C. Norton,
By Crosby & Gregory
Att'ys.

UNITED STATES PATENT OFFICE.

LEWIS C. NORTON, OF NEWTON, MASSACHUSETTS, ASSIGNOR TO NORTON DOOR CHECK CO., OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

DOOR-CHECK.

No. 868,357. Specification of Letters Patent. Patented Oct. 15, 1907.

Application filed March 13, 1906. Serial No. 305,759.

To all whom it may concern:

Be it known that I, LEWIS C. NORTON, a citizen of the United States, residing at Newton, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Door-Checks, of which the following description, in connection with the accompanying drawing, is a specification, like letters on the drawings representing like parts.

This invention relates to checks or retarding devices in which a liquid is employed in a cylinder for checking the movement of an object, and it has for its principal object to provide a novel check of the character in which the movement of the object may be checked or retarded in both directions; a further object of the invention is to provide means whereby the speed of the movement of the object may be controlled throughout its entire extent instead of merely during any particular part of the movement.

The invention may be employed in a variety of ways, such for instance as checking the movement of a door, or as checking the movement of a spring or of any other movable object.

When the invention is embodied in a door check said door check will operate to check both the opening and closing movement of the door; and also control the speed of the closing movement of the door throughout its entire extent instead of merely during the latter part of the movement as is the case with ordinary door-checks.

I provide for checking both the movement of an object in both directions by providing the usual cylinder with a double-headed piston and suitable passages, so that the piston operates to check the turning movement of the operating shaft in both directions; and I provide for controlling the speed of the movement of the object throughout its entire extent by making in the cylinder a plurality of ports through which the liquid flows during such movement of the object and employ a plurality of valves to close these ports all as will be more fully hereinafter described.

When the invention is embodied in a door-check I propose to make the check adaptable for either a right-handed door or a left-handed door by interposing between the ribbon spring which is used to operate the door suitable means whereby when the shaft is turned in one direction one end of the spring is wound up, and when the shaft is turned in the other direction the other end of the spring is wound.

Referring now to the drawings, Figure 1 is a top plan view of my improved check; Fig. 2 is a front elevation of Fig. 1; Fig. 3 is a section on an enlarged scale on the line x—x, Fig. 1; Fig. 4 is a section on the line x'—x', Fig. 3; Fig. 5 is a section on the line x^2—x^2, Fig. 3; Fig. 6 is a plan view of one form of piston or plunger; Fig. 7 is an end view thereof; Fig. 8 is a plan view of a different form of piston or plunger; Fig. 9 shows a check having a slightly different arrangement of valves; and Fig. 10 shows the invention embodied in a spring check.

I will first describe my invention as embodied in a door check and will then point out some other ways in which it may be used. A door check embodying my invention has the same principal elements that are common to liquid door checks of this type, that is it comprises a checking cylinder 3, which is usually secured to the door, and in which the liquid is held, a piston 4 operating in said cylinder; an operating shaft 5 connected to the piston; a spring 6 which is wound up by the turning movement of the shaft; an arm 7 connected to the shaft, and a link 80 pivotally connecting said arm to the door casing. The operating shaft 5 may be connected to the piston 4 in any suitable or usual way, and in Figs. 3 and 6 said shaft is shown as having a crank 8, provided with a crank-pin 9 which plays in the slot in the piston, and in Fig. 8 the shaft is shown as provided with a gear 10 which meshes with a rack 11 on or carried by the piston.

In order that the checking feature of the device may be operated to check the opening as well as the closing movement of the door I have made the piston a double ended one, that is, one having two heads 12 and 13 so that the movement of the piston is retarded or checked in both directions.

The cylinder is provided with a duct or passageway 14 communicating with two ports 15 and 16 opening into the cylinder at one end, said duct or passageway 14 communicating with the cylinder at its central point between the two heads of the piston. The walls of the cylinder are also provided with another duct or passage 17 which communicates at one end with the cylinder between the heads of the piston, and at the other end opens into two ports 18 and 19 which lead into the cylinder, all of these ports may be controlled by valves whereby the speed of movement of the piston may be regulated throughout its entire extent.

In the embodiment of the invention shown in Fig. 3 the ports 16 and 19 are controlled by valves 20 and 21 of any appropriate construction by means of which valves the size of the ports may be adjusted. The duct or passage 17 is also controlled by a suitable valve 22, and if desired the duct 14 may be controlled by a similar valve.

The arrangement of passageways and ports and the arrangement of valves enables me to control the speed of the closing movement of the door throughout the entire extent of such movement, that is, the door may be allowed to move rapidly during the first part of its movement and made to move slowly during the latter part of its movement, or it may be given a uniform speed throughout the extent of movement, or it may be made to move slowly through the first part of the movement and rapidly as the door finally closes.

It will be understood of course that as the door is

opened the spring 6 is wound up, and at the same time the operating shaft is turned by the arm 7 thereby moving the piston in the cylinder, this operation being common to all door checks of this type.

The parts are shown in Fig. 3 in the position which they occupy when the door is closed. The opening movement of the door turns the operating shaft 5 and moves the piston toward the left, Fig. 3, and because said piston has the two heads 12 and 13 its movement toward the left is retarded more or less according to the position of the valve 20. During the first part of the opening movement of the door the piston can move comparatively freely in the cylinder, the liquid in the cylinder in front of the piston head 12 being forced through the port 15 and passageway 14 around behind the piston head 12, the liquid between the two heads passing through the passageway 17 to the right of the piston head 13. When the door is nearly opened the piston head 12 passes over the port 15, and therefore during the final opening of the door the liquid in front of said piston-head can only escape through the retracted port 16, and as the size of said port may be regulated by the valve 20 the opening movement of the door may be retarded more or less, thereby preventing the door from being slammed while being opened.

The piston-heads are each provided with a port 23 which is controlled by a check valve 24 of any suitable construction. As the piston-head 12 moves toward the left, Fig. 3, the check-valve therein closes automatically so that all the liquid in front of the piston-head must be forced through the ports 15 and 16 and the duct 14. During this time the check-valve in the piston head 13 is open, as shown in Fig. 3, thereby allowing some of the liquid between the piston-heads to flow through said port. The reason for employing these check-valves in the piston-head is so that during the movement of the piston in one direction one piston-head only acts as a retarding device, and when the piston is moved in the other direction the other piston head only acts in this way.

During the closing movement of the door the piston moves toward the right, Fig. 3, and the valve 24 in the piston-head is closed. During the first part of the closing of the door the liquid between the piston-head 13 and the end of the cylinder is forced through the two ports 18 and 19 and the duct 17, and during the final closing movement of the door the liquid is forced through the port 19 only.

If the valve 22 is wide open the piston will move freely during the first part of its movement toward the right but will be retarded more or less during the last part of the movement, and as soon as the piston-head 13 has passed the port 18, dependent upon the position of the valve 21, if it is desired to have the door close slowly during the first part of its movement and more rapidly during the latter part the valve 21 is opened and the valve 22 partially closed. With the valves thus arranged, the liquid in front of the piston head 13 can escape to the space behind said piston head during the first part of the stroke of the piston only by passing through the duct 17 which is controlled by the valve 22, and therefore during this first part of the stroke of the piston the speed thereof may be controlled by regulating the valve 22. As soon, however, as the piston head has passed the port 18, then the liquid can escape into the space behind the piston, both through the duct 17 and the port 18, and the speed of movement of the piston is then controlled by the valve 21. It will be seen, therefore, that by adjusting the valves 22 and 21, the piston may be controlled so that it will move uniformly throughout its entire stroke, or it may have a comparatively quick movement during the first part of its stroke and a slow final movement, or a slow movement at the first part of the stroke and a comparatively quick final movement.

In Fig. 9, I have illustrated a slightly different arrangement of valves for controlling the ports 15, 16, 18 and 19. In this embodiment the valves for controlling any pair of ports 15, 16, or 18, 19 are connected together so as to be moved in unison, and a single adjustment therefore will answer to operate both of said valves.

40 designates a valve-stem which is screw-threaded into a bushing or sleeve 41, and which extends parallel to the port or duct 14. The inner end of said duct is of smaller diameter than the outer end and intermediate said portions of different diameter is the valve-seat 45 with which the end 44 of the stem coacts as a valve. The enlarged portion 40 of the stem just fills the portion 14^a of the duct having a larger diameter, and said stem is provided with one or more grooves 46. By turning the stem 40, the valve 44 may be closed against its seat 45 and the duct 14 entirely closed. The duct 14 may be opened more or less by retracting the valve-stem, and by turning said stem slightly the port 16 may be completely closed, or entirely opened, or partially closed, as desired. The same character of valve is employed in the duct 17 for controlling the ports 18, 19. This form of valve is preferred by me because the thumb-piece 47 by which it is operated is more readily accessible than in the form of the invention shown in Fig. 3, and the two valves for controlling the two ports of any duct are connected so as to be moved in unison, and both, therefore, may be operated by manipulating a single thumb-piece. With this embodiment of the invention it is possible to so control the ports 15, 16, 18, 19 that the piston may have any speed of movement desired in either direction, that is, either a slow initial movement and a rapid closing movement, a rapid initial movement and a slow final movement, or uniform movement throughout its extent. It will thus be seen that I have not only provided means for checking both the opening and closing movements of the door, but also means whereby the speed of the closing movement of the door may be controlled throughout its entire extent. The spring which I have herein illustrated is a spiral ribbon spring and it is inclosed in a suitable barrel or casing 25. In order that the device may be used for either right or left-handed doors it is necessary that the spring may be wound either by a right hand turning movement of the shaft 5 or a left hand turning movement thereof. To accomplish this I connect one end of the spring 6 to a sleeve 26 loosely mounted on the operating shaft 5, as best seen in Fig. 5, and connect the other end of said spring to a head 27 which is also mounted to turn about the operating shaft 5. The head 27 is herein shown as being mounted to turn in the cap 28 of the spring barrel 25, and it has depending therefrom an arm or flange 29 to which the outer end of the spring is secured, see Fig. 5. This arm or flange 29 normally rests against an abutment or stop 30 rigid with the spring

barrel 25, said stop limiting the turning movement of the head 27 in one direction.

The sleeve 26 has integral therewith at one end a ratchet head 31 with which engages a pawl 32 on an arm 33 projecting from a plate 34. Said plate 34 loosely surrounds the sleeve 26 and can be turned with relation thereto. When the door is closed the arm 33 of said plate engages a stop or abutment 35 projecting upwardly from the cap of the spring barrel. The operating arm 7 which is rigid with the operating shaft 5 has depending therefrom a lug 36 which is adapted to engage the arm 33 of the plate, so that as the door is opened and said arm swung in the direction of the arrow, Fig. 1, said lug 36 engages the arm 33 and through the pawl and ratchet construction turns the sleeve 26 with it in the direction of the arrow Fig. 4, thereby winding up the spring from its inner end. When the door is released after being opened, the unwinding of the spring closes the door as will be obvious.

The above-described operation is that which transpires when the device is applied to a right-handed door, as shown in Fig. 1 of the drawings. When the device is applied to a left-handed door, the opening movement of the door would wind the shaft 5 in the opposite direction.

In order to wind up the spring when the shaft turns in such opposite direction the head 27 is provided with a lug or projection 37 which is engaged by the lug 36 when the arm swings oppositely to that indicated by the arrows, Figs. 1 and 4. When, therefore, the arm does swing in such opposite direction the head 27 is rotated with the arm and the shaft 5 and through the flange 29 the spring 6 is wound up from the outside; the inner end of the spring being held from turning by reason of the fact that the sleeve 26 is held from rotation by the pawl 32 and the plate 34 to which the pawl 32 is pivoted is held from rotation by the stop 35.

The head 27 is provided with the depending flange 89 which encircles the upper edge of the spring. This flange serves to hold the spring in proper position and prevents it from being crowded out of place when it is wound up from the outside.

By combining in a door check the double-acting spring 6 and the double-headed plunger piston I have provided a door check which is universal and reversible in its operation. I believe that it is new to make a door check of this character with means whereby the door may be checked in its opening as well as its closing movement, and also to provide a door check with means whereby the speed of movement of the door may be controlled throughout the entire extent of such movement. My invention may also be embodied in checks other than door checks, in fact the checking feature of my invention may be used in a great many places where a retarding device is employed for retarding the movement of any object.

In Fig. 10 I have illustrated the invention applied as a spring check. Where it is used in this way the ribbon spring 6 employed in the door check is omitted, and the operating shaft 5 is connected directly to the part to be retarded. In other respects, however, the invention is like that shown in Fig. 9, that is the arrangement of the piston and the controlling ports 15, 16, 18 and 19 and the valves is the same.

When applied as a spring check for an automobile the cylinder 3 may be placed either directly on the axle or attached to the vehicle frame 91. When the latter construction is employed the operating shaft 5 may be connected to the axle by an arm 92 and a link 50. When used in this way the device will prevent any sudden movement of the spring and will eliminate to a great extent the bouncing movement of an automobile body caused by the rebound of the spring.

It will be obvious that the checking feature of the invention may be used in various other ways than that above described.

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

1. In a door check, the combination with an operating shaft and a spring opposing the turning movement thereof, of a cylinder, a piston therein connected to the shaft, and means to retard the movement of the piston in both directions.

2. In a checking device, the combination with an operating shaft and a spring opposing the turning movement of the shaft in one direction, of a liquid-containing cylinder, a piston therein connected to the shaft, and valve devices to check the movement of the piston in both directions.

3. In a door check, the combination with an operating shaft and a spring opposing the turning movement of the shaft in one direction, of a cylinder to contain a liquid, a piston therein having two rigidly-connected heads, and a valve in each head, one valve acting when the piston moves in one direction, and the other valve acting when the piston moves in the opposite direction.

4. In a door check, the combination with an operating shaft, of a cylinder, a piston therein having two rigidly-connected heads each provided with a valve, and ports at each end of the cylinder, whereby the piston is checked in its movement in both directions.

5. In a door-check, an operating shaft, a spring which is wound up by the turning movement of the shaft in one direction, a cylinder to contain a liquid, a piston therein connected to the shaft, said cylinder having a plurality of ports through which the liquid is forced as the piston moves in the cylinder, and a plurality of valves controlling said ports whereby the speed of the piston may be regulated throughout the entire extent of its movement.

6. In a door-check, an operating shaft, a spring which is wound up by the turning movement of the shaft in one direction, a cylinder, a piston therein, and means to control the speed of the piston throughout the entire extent of its movement during the closing movement of the door.

7. In a checking device, in combination, an operating shaft, a spring opposing the turning movement of the shaft in one direction, a cylinder to contain liquid, a piston therein connected to the operating shaft, said cylinder having a duct one end of which opens into the cylinder behind the piston and the other end of which communicates with the cylinder through two ports, one of which is so situated that the piston head during its movement passes across the same and valves for separately controlling said duct and one of said ports.

8. In a checking device, in combination, an operating shaft, a spring opposing the turning movement of the shaft in one direction, a cylinder to contain liquid, a piston therein connected to the operating shaft, said cylinder having a duct one end of which opens into the cylinder near its middle part and the other end of which communicates with the end of the cylinder through two separated ports, one of the ports being so situated that the piston head during its movement passes across the same, a valve controlling the other port, and another valve controlling the duct.

9. In a check, an operating shaft, a cylinder to contain liquid, a double-headed piston in the cylinder, means to move the piston by the turning movement of the shaft, and regulatable means to retard the movement of the piston in both directions.

10. In a check, a cylinder to contain liquid, a double ended piston therein, said cylinder having at its end ports through which the liquid is forced as the piston moved

from one end to the other of the cylinder, and an operating shaft connected to the piston.

11. In a check, a cylinder to contain liquid, a piston therein, said cylinder having two ducts each communicating at its inner end with the central portion of the cylinder and having at its outer end two ports, one port of each duct being situated so that the piston head during its movement passes across the same, and an operating shaft operatively connected to the piston.

12. In a check, a cylinder to contain liquid, a piston therein, said cylinder having two ducts each communicating at its inner end with the central portion of the cylinder and having at its outer end two ports, one port of each duct being situated so that the piston head during its movement passes across the same, valves controlling said ports, and an operating shaft operatively connected to the piston.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

LEWIS C. NORTON.

Witnesses:
LOUIS C. SMITH,
MARGARET A. DUNN.