

March 12, 1929.

A. R. AYERS

1,704,817

LOCOMOTIVE CYLINDER COCK

Filed Jan. 5, 1920

3 Sheets-Sheet 1

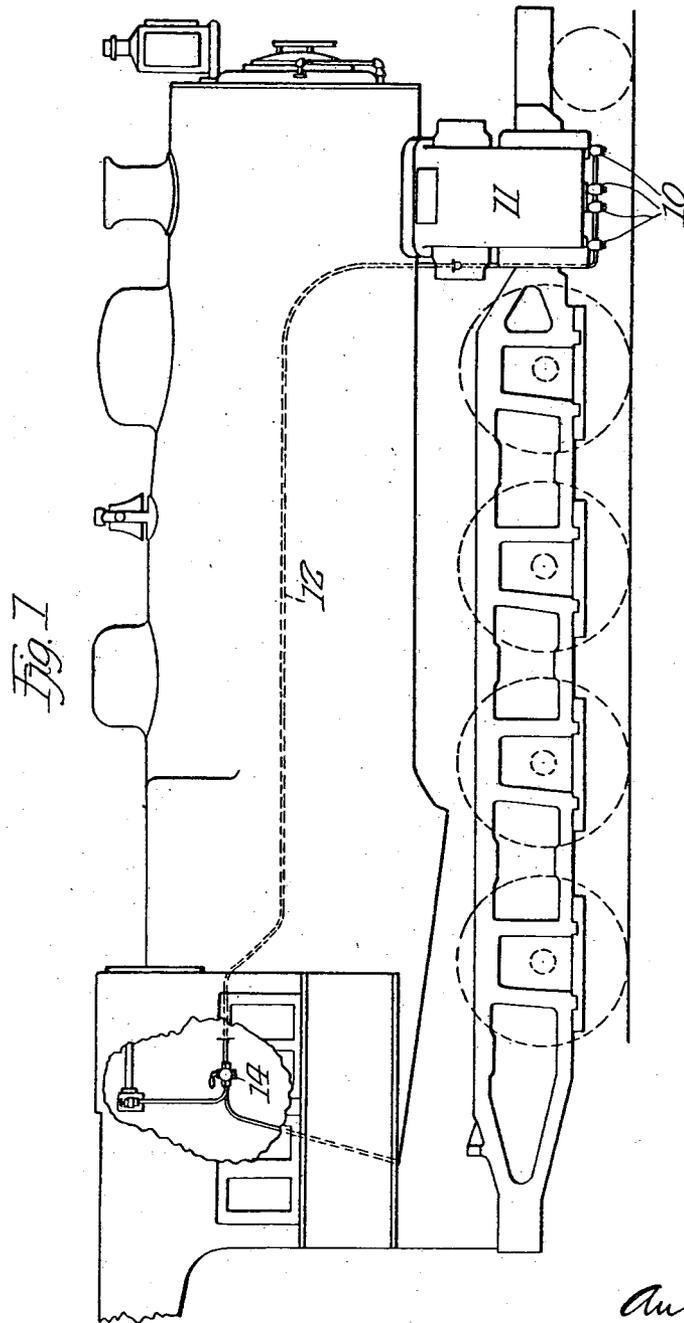


Fig. 1

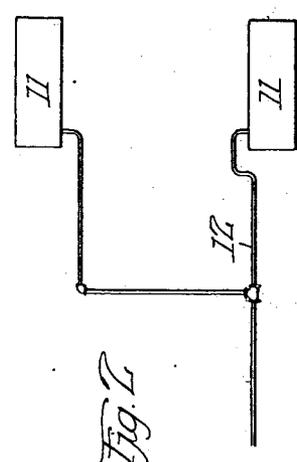


Fig. 2

Augustine R. Ayers  
by attorney  
Pare Carpenter

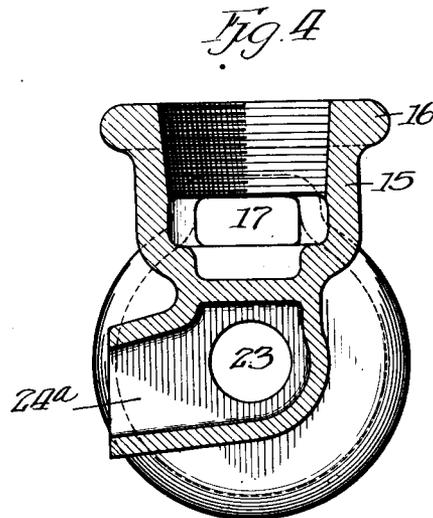
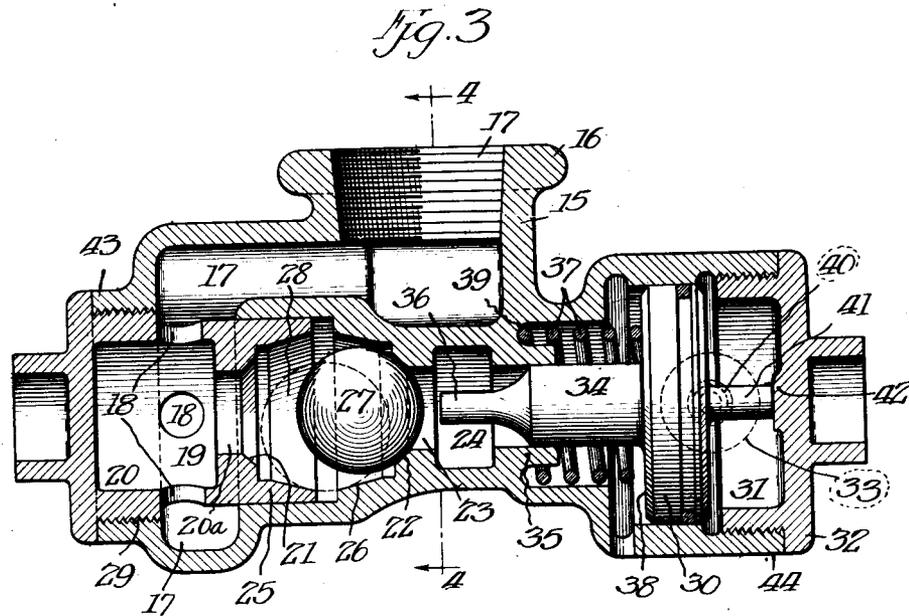
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3 Sheets-Sheet 2



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Carver & Carpenter

March 12, 1929.

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3 Sheets-Sheet 3

Fig. 5

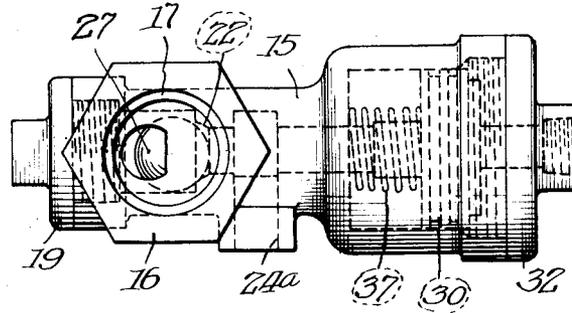


Fig. 7

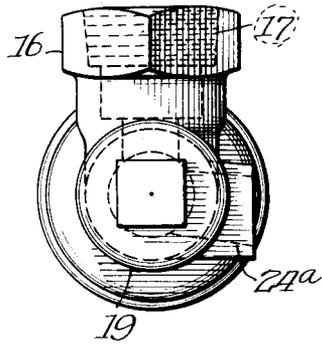


Fig. 6

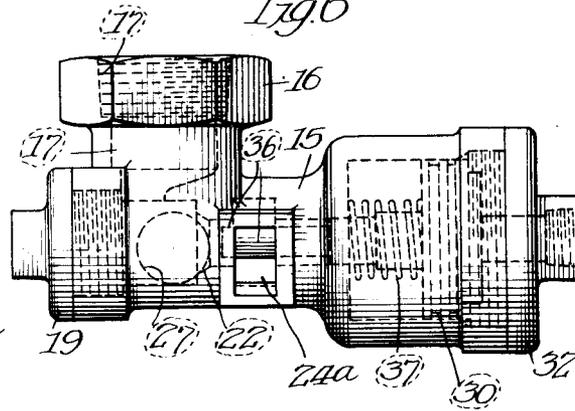
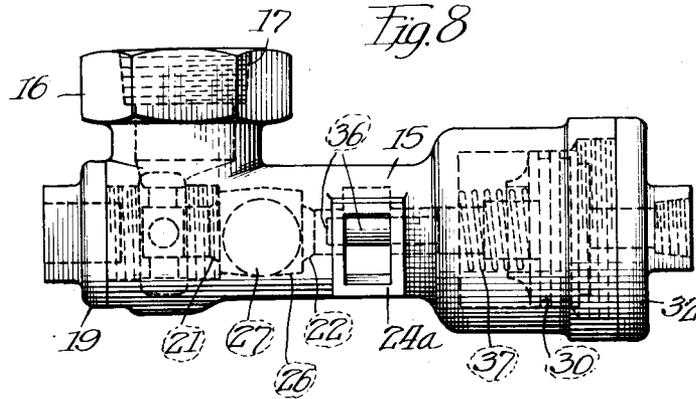


Fig. 8



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by attorney  
Charles E. Carpenter

Patented Mar. 12, 1929.

1,704,817

# UNITED STATES PATENT OFFICE.

AUGUSTINE R. AYERS, OF CLEVELAND, OHIO, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE OKADEE COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

## LOCOMOTIVE-CYLINDER COCK.

Application filed January 5, 1920, Serial No. 349,595, and in Germany January 17, 1928.

My present invention relates in general to valves, and, more particularly, to drain valves, and has special reference to the provision of an improved form of cock adapted for the drainage of fluid containers, such as locomotive cylinders.

The principal objects of my present invention are provision of an improved form of cock for the drainage of the water of condensation from a steam container, such as a locomotive cylinder, not only preventing the escape of steam pressure but so constructed and arranged that admission of steam to the drainage side of the body of the cock will positively close the valve and thereby shut off communication with the atmosphere; the provision of improved means for operating the valve independently of the pressure in the cylinder, whereby not only may the cylinders be blown at will, but in the event that the valve should, for any reason, become stuck on its closed position it may be unseated at will; the provision of an improved form of valve arranged for normally preventing any sucking of air into the cylinder when the locomotive is drifting; the provision of a device of the character described employing a ball-valve so arranged that the ball normally rests in an off-seat position save when positively moved therefrom by becoming subject to the action of fluid pressure; the provision of improved fluid pressure means for operating devices of the character described, together with such other objects as may hereinafter appear.

Steam engines generally are characterized by the fact that when steam supply to the cylinders thereof is discontinued, water of condensation forms therein and remains unless removed therefrom. Ordinarily, this is accomplished either by means of a pet-cock, which requires manual operation, or else some device purporting to operate automatically is employed. The devices intended to act automatically, in so far as known, are not satisfactory to me in operation, while those which involve mechanical means for positively effecting such operation when the valve becomes fixed in its seat, either on account of becoming choked or on account of the deposit of debris in the body of the valve, are undesirable in my experience because they are more or less complicated and are likely to become out of order.

My present invention, therefore, is di-

rected most particularly to the provision of a form of valve which is unlikely to seat save when seating is desired and is so disposed relatively to the seat that accidental seating or sticking on the seat is unlikely, and further contemplates the provision of an improved form of valve operating means so arranged as to be reliable and efficient in operation, when desired, but unlikely to interfere with the operation of the valve except when put into operation at a predetermined time.

In attaining the objects and advantages referred to and gaining certain other benefits to be hereinafter pointed out, I have provided the constructions illustrated in the accompanying drawings wherein—

Figure 1 is a diagrammatical view of a railway locomotive with my improved drainage valves applied to the cylinders thereof;

Figure 2 is a diagrammatical view showing the connection of the valve operating means to the cylinders on each side of the locomotive;

Figure 3 is a longitudinal elevational view, largely in vertical section, showing one embodiment of my improved form of cylinder drainage valve or cock;

Figure 4 is a transverse sectional view of said cock, taken on the line 4—4 of Figure 3;

Figures 5, 6, and 7 are respectively top plan, and side and end elevational views of a modified form of cock, and

Figure 8 is a side elevational view of another modified form of cock.

Referring now more particularly to Figures 1 and 2 of the drawing, wherein I have illustrated schematically the application of my improved form of drainage cock to a railway locomotive, it will be observed that any desired number of the cocks 10 may be conveniently arranged on the under side of the cylinders 11.

These cylinder cocks 10 are fluid pressure controlled, and in the form herein disclosed the control by fluid under pressure is attained either by steam under pressure from the boiler and led to the cocks by a pipe 12 placing them in communication with a 3-way valve 14 conveniently arranged at the hand of the locomotive driver, or by compressed air supplied to such valve 14.

Referring now more particularly to Figures 3 and 4 of the drawing, it will be observed that the cylinder cock 10 includes a

body 15 provided with an extension 16 threaded for engagement with the cylinder. Within the body 15 is arranged a passage 17 communicating with the ports 18 formed in the bushing 19. The bushing 19 has a chamber 20 and passage 20<sup>a</sup> which terminates in a valve seat 21, disposed oppositely to a valve seat 22 formed within the body 15 of the casing at the margin of the passage 23. The valve seat serves to receive the ball 27, whereby to prevent the induction, by suction, such as atmospheric air, from outside the body 15 into the cylinder when the locomotive is drifting. The passage 23 is arranged in alignment with said passage 20<sup>a</sup> and communicates with a chamber 24 having a drainage discharge vent 24<sup>a</sup> laterally directed as indicated in Figure 4.

The bushing 19 and the body 15 form a cage for the ball-valve 27 and are provided with symmetrical annular enlarged openings 25 and 26 of a general truncated cone form, to the end that said ball-valve 27, adapted to seat alternately against said seats 21 and 22 formed in the bushing and body respectively, may rest in the socket formed thereby as indicated in dotted lines save when subjected to fluid pressure.

In order that the bushing 19 may be readily removable for cleaning of the valve chamber 28, renewing or regrinding the valve seat or seats, replacing the ball-valve, or for any other purposes, such bushing is conveniently threaded into the body 15 as indicated at 29.

For forcing the ball-valve 27 off the seat 22, I employ a piston 30 arranged in a chamber 31 in the casing 15, said piston being held in such chamber 31 by means of a cap 32, having threaded engagement with the casing, a connection to the fluid pressure supply pipe 12 being indicated at 33.

The piston 30 on one side has an extension 34 slidably mounted in a guide 35 formed in the body of the casing 15, the outer end 36 of the piston extension being adapted to contact with the ball 27 and force it off the seat 22 when the piston 30 makes its extreme traverse to the left of the position shown in Figure 3, thus establishing communication between the passage 17 and drainage port 24<sup>a</sup>, and so affording draining of the cylinders 11 against any pressure accumulated therein, or blowing off of the casing 15 should such action be desired.

For the three-fold purpose of cushioning the movement of the piston 30 towards the left, limiting its movement toward the valve seat 21, and returning it to the position shown, I employ a helically coiled spring 37 abutting at one end against the inner surface 38 of the piston, the opposite end of the spring 37 resting in a socket 39 formed in the casing 15.

For limiting the traverse of the piston 30

towards the right of the position shown in Figure 3, and thereby preventing it from covering the admission port 40, there is provided a stop 41 on the piston 30 adapted to abut against an enlarged portion 42 on the plug 32.

By virtue of the threaded connections between the bushing 19 and body 15, and between the plug 32 and body 15, such as are indicated at 43 and 44, the relation of the valve seats 21 and 22, and the degree of compression of the spring 37 may be varied at will.

The device of Figures 5, 6 and 7 differs from that of Figure 3 mainly in that the valve seat indicated at 21 in such a figure is omitted. The device of said figures, as well as that of Figure 8, further differs from that of Figures 3 and 4 in that the rest or socket for the ball 27 is formed entirely in the body 15 and not in the bushing 19 of such figures, though in Figure 8, however, the valve seat 21 is not omitted.

It will, of course, be understood that the nominal off-seat position of the valve 27, as indicated in dotted lines in Figure 3, will permit any ordinary accumulation of the water in the cylinders 11 to flow through the casing 15 and thence to the atmosphere through the discharge vent 24<sup>a</sup> without disturbance of the ball 27 or moving thereof against the seat 22, but that on the moving of any large amount of steam through the casing will move the ball against such seat and thereby close the passage 23 which communicates with the discharge vent 24<sup>a</sup>.

Those who are skilled in the art to which my invention pertains will appreciate that the references to the ball valve 27 as responsive to fluid pressure and unresponsive to liquid involve, of course, a volume of fluid under pressure sufficient to overcome the inertia of the valve and a normal flow of such liquid as water of condensation which is insufficient to move the ball out of the socket and towards the seat 22 and hold it there.

Such slight flow of steam as may be incident to the employment of lubricator devices will not move the ball. In the event of any extraordinary rush of water of a volume large enough or with an amount of pressure behind it great enough to force the ball out of the socket and against the seat 22, the ball is forced back into its normal off-seat or rest position by means of fluid pressure admitted against the face of the piston 30.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent is:

1. A drain-valve device comprising, in combination, a casing adapted for communication with a fluid container to be drained and having a drain port and two valve seats

between said communication and port, a valve arranged between said two valve seats responsive to fluid pressure and unresponsive to liquid for closing said ports in alternation as fluid under pressure is admitted through the opposite port, and auxiliary fluid pressure actuated means for moving said valve in one direction, said two valve seats being susceptible of relative movement, whereby the action of the valve may be varied.

2. A drain-valve device comprising, in combination, a casing adapted for communication with a fluid container to be drained and having a drain port and two valve seats between said communication and port, a ball-valve arranged between said two valve seats responsive to fluid pressure and unresponsive to liquid for closing said ports in alternation as fluid under pressure is admitted through the opposite port, and auxiliary fluid pressure actuated means for moving said valve in one direction, one of said valve seats being movable in the direction of the path of closing movement of said valve, whereby the extent of action of the said valve may be varied.

3. A drain-valve device comprising, in combination, a casing adapted for communication with a fluid container to be drained and having a drain port and a valve seat, a bushing provided with a second valve seat, both of said valve seats being arranged between said communication and port, a valve arranged between said two valve seats responsive to fluid pressure and unresponsive to liquid for covering said seats in alternation as fluid under pressure is admitted through the opposite seat, and auxiliary fluid pressure actuated means for moving said valve in one direction, said two valve seats being susceptible of relative motion, whereby the action of the valve may be varied.

4. A drain-valve device comprising, in combination, a casing adapted for communication with a fluid container to be drained and having a drain port and a valve seat, a bushing provided with a second valve seat, both of said valve seats being arranged between said communication and port, a valve arranged between said two valve seats responsive to fluid pressure and unresponsive to liquid for covering said seats in alternation as fluid under pressure is admitted through the opposite port, and auxiliary fluid pressure actuated means for moving said valve in one direction, said bushing and thereby one of said valve seats being movable in the direction of one of the paths of closing movement of said valve, whereby the extent of action of the said valve may be varied.

5. A drain-valve device comprising, in combination, a casing adapted for communi-

cation with a fluid container to be drained and having a drain port, a bushing provided with a valve seat which is arranged between said communication and said port, a valve for covering said seat responsive to fluid pressure and unresponsive to liquid, a piston, a connection to a source of fluid pressure supply for moving the valve arranged on one side thereof, a spring for returning said piston to a predetermined position arranged on the other side thereof, and means for varying the action of said spring.

6. A drain-valve device comprising, in combination, a casing adapted for communication with a fluid container to be drained and having a drain port, a bushing insertable longitudinally into the casing and provided with a valve seat which is arranged between said communication and port, and forming a closure for a part of the valve body, a valve for covering said seat responsive to fluid pressure and unresponsive to liquid, and fluid pressure actuated means for moving the valve.

7. A drain-valve device comprising, in combination, a casing adapted for communication with a fluid container to be drained and having a drain port, a valve in said casing, a bushing insertable into the casing and provided with a valve seat which is arranged between said communication and port, said casing and bushing forming a cage for said valve, and said valve covering said seat and being responsive to fluid pressure and unresponsive to liquid, and fluid pressure actuated means for moving the valve.

8. A drain-valve device comprising, in combination, a casing adapted for communication with a fluid container to be drained and having a drain port, a bushing insertable into the casing and provided with a valve seat which is arranged between said communication and port, a valve for covering said seat responsive to fluid pressure and unresponsive to liquid, a piston, a spring on one side thereof, and a connection to a source of fluid pressure for moving the valve, said piston having a limited action on said valve, and said valve being limited in its movement by said bushing.

9. A drain-valve device comprising, in combination, a casing adapted for communication with a fluid container to be drained and having a drain port, and two valve seats between said communication and port, a valve arranged between said two valve seats responsive to fluid pressure and unresponsive to liquid for closing said ports in alternation as fluid under pressure is admitted through the opposite port, and auxiliary fluid pressure actuated means for moving said valve in one direction.

10. In a valve device of the character described, in combination, a casing having an opening to atmosphere and a port communi-

cating with a container, a pair of opposed valve seats in said casing in communication with said opening and port and defining a valve chamber, provided with a pocket arranged considerably below both of said seats, 5 a valve in said chamber responsive to fluid pressure to engage either of said seats, but unresponsive to liquid, and fluid pressure operated means for unseating said valve.

10 11. In a valve device of the character described, in combination, a casing having an opening to atmosphere and a port communicating with a container, a pair of opposed valve seats in said casing in communication with said opening and port and defining a 15 valve chamber, provided with a pocket arranged considerably below both of said seats, a valve in said chamber responsive to fluid pressure to engage either of said seats, but unresponsive to liquid, and means operating 20 independently of the valve for unseating same at times.

In testimony whereof I have hereunto signed my name.

AUGUSTINE R. AYERS.