March 14, 1933. M. R. FEELEY ET AL 1,901,805

BELLOWS OPERATED SAFETY CYLINDER COCK

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Fig. 3.

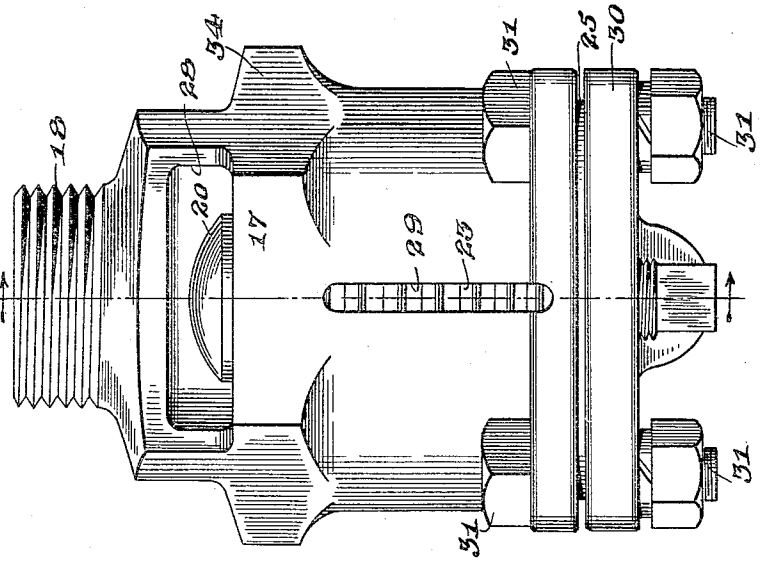



Fig. 2.

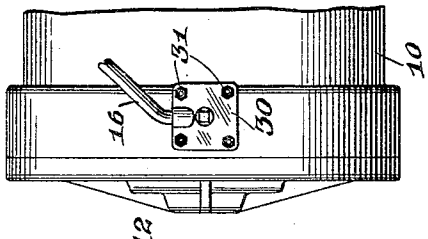
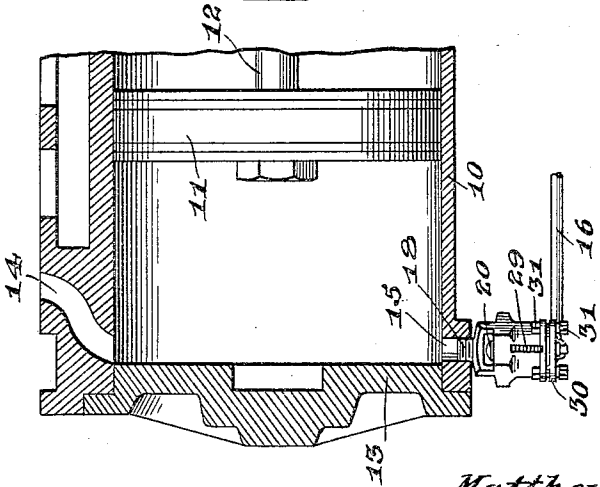



Fig. 1.




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BELLOWS OPERATED SAFETY CYLINDER COCK

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Fig. 5.

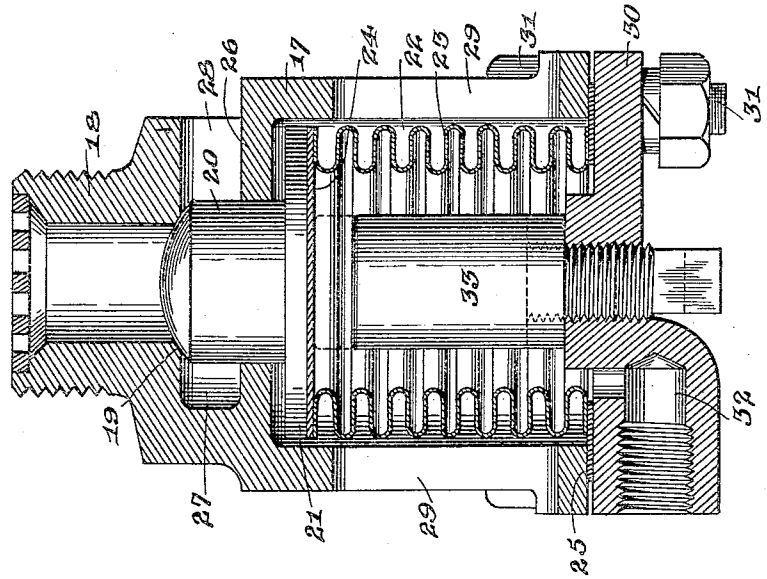
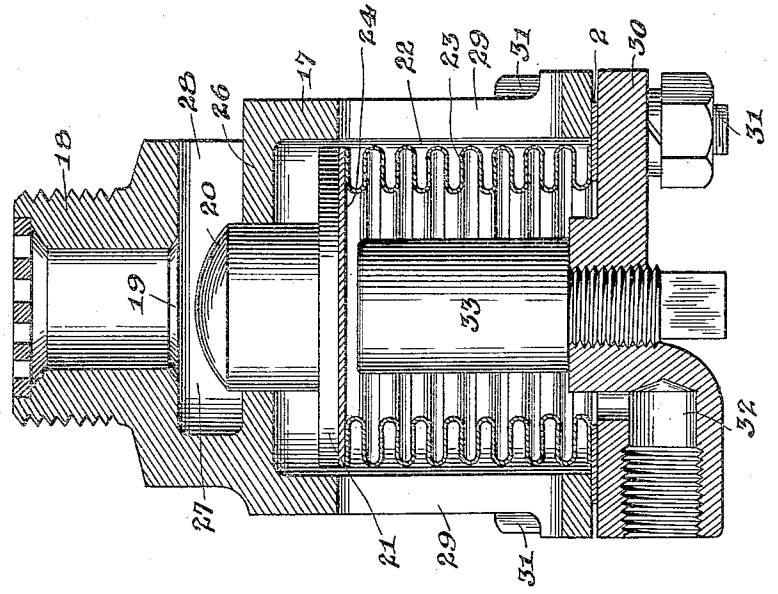



Fig. 4.




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# UNITED STATES PATENT OFFICE

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## BELLOWS OPERATED SAFETY CYLINDER COCK

Application filed April 8, 1930. Serial No. 444,489.

The present invention relates to improvements in safety cylinder cocks, and has for an object to provide for the automatic release and evacuation of the water trapped in the cylinder whereby to prevent the blowing out of the cylinder head. This water, which is non-compressible, is forced by the piston against the cylinder head, and when this water accumulates in quantity, the action is apt to blow out the cylinder head.

Another object of the invention is to provide a device which will be entirely automatic in action and arranged to release any excess pressure over full boiler pressure in the cylinders without requiring the attention of the engineer or the operation of any manual means.

A further object of the invention is to provide for the conservation of the medium, usually air, for retaining the valve yieldably in closed position. The air is utilized for many other purposes, and it is extremely necessary to avoid any undue loss or escape of the air pressure.

A still further object of the invention is to provide a cylinder cock which will automatically open when pressure in the cylinder becomes greater than the boiler pressure, due to high compression or water pocketed in the cylinder, and which will prevent the blowing out of the cylinder head, damaging of the cylinder, breaking cylinder packing, bending piston rod, and the like.

The improved cylinder cock is adapted to remain closed when drifting, and prevent air or foreign substances, such as gravel, cinders and the like, from the right of way being sucked into the cylinders through the cylinder cocks.

The improved cylinder cock is also adapted to automatically open when the engine is placed in the roundhouse or on a storage track and prevent any accumulation of pressure in the cylinder.

With the foregoing, and other objects in view, the invention will be more fully described hereinafter, and will be more particularly pointed out in the claims appended hereto.

In the drawings, wherein like numerals refer to like or corresponding parts throughout the several views.

Figure 1 is a vertical section of one end of a locomotive cylinder, showing the improved cylinder cock placed therein.

Figure 2 is a bottom plan view of the end of the cylinder, showing the valve or cock in position and connected to an air line.

Figure 3 is a detail side elevation of a cylinder cock constructed according to the present invention.

Figure 4 is a vertical central section taken through the same substantially on the line 4—4 of Figure 3, and showing the parts in open or relaxed position, and

Figure 5 is a similar view showing the parts in closed or expanded position.

Referring now more particularly to the drawings, and first to Figures 1 and 2, 10 designates a locomotive cylinder, 11 a piston fitted to reciprocate in the cylinder and 12 a piston rod. The cylinder 10 is provided with a cylinder head 13 and with a combined steam inlet and exhaust port 14.

When water accumulates in the cylinder 10, it cannot rise like steam and escape through the exhaust port 14. In fact, no satisfactory egress is had for this water and it is impracticable for the engineer to sense at all times the dangerous accumulation of water in the locomotive cylinder 10. When this water collects in quantity, it will blow out the cylinder head 13, as the water is not compressible. Hence, when the piston 11 moves toward the head 13 it will force the water before it, pushing out the cylinder head 13 if the water exists in sufficient volume.

The purpose of the present invention is to automatically release this water when approaching a dangerous mass and pressure, and for this purpose the improved automatically operated cylinder cock of this invention is provided, the cock being placed in the bottom port 15 of the cylinder 10.

It is of course understood that each cylinder of the engine has a bottom port 15 at each end thereof and that a safety cylinder cock constructed according to the present invention is located at each of said ports, and

each cylinder cock is coupled to a branch air pressure pipe 16 for communicating a source of air supply under pressure to the cylinder cock.

The detail construction of the safety cylinder cock is shown in Figures 3, 4 and 5, to which reference is now made.

The cylinder cock is provided with a body portion in the form of a casing or shell 17 of a generally cylindrical form and having a contracted hollow neck 18 at its upper end provided with external pipe threads to screw into the bottom opening or port 15 of the locomotive cylinder 10. At the base of the hollow neck 18 and interiorly of the casing 17 is a seat 19, preferably of spherical configuration and which opens downwardly and may be conveniently and accurately ground for the tight fitting thereagainst of the spherical valve 20 having an enlarged supporting disc 21 on its lower end. The enlarged disc 21 is mounted to reciprocate in the cylinder 22 of the casing 17 above a cylindrical bellows 23 which is loosely fitted in the lower end portion of the cylinder 22. The bellows 23 is provided at its upper end with a closure plate 24 adapted to seat against the under side of the disc 21 for raising the latter when the bellows 23 expands.

The lower end of the bellows 23 is soldered, welded, or otherwise suitably secured to a combined anchoring and supporting ring 25 adapted to seat at its outer edge portion against the lower end of the casing or shell 17 and which has a central opening of a diameter equal substantially to that of the interior of the bellows 23. The valve 20 is in the form of a substantially cylindrical stem which rises from the disc 21 and slides through an angular valve guide 26 formed in the casing or shell 17 and which comprises the top wall of the cylinder 22.

The space above the valve guide 26 is of larger diameter and width than the seat 19 against which the valve 20 is adapted to engage and into which the opening through the reduced neck 18 is adapted to discharge. This enlarged chamber, indicated at 27, comprises an exhaust receiving chamber and, at one side of the casing or shell 17 above the valve guide or wall 26, is provided with a relatively wide exhaust opening 28 which discharges horizontally from one side of the shell 17 to direct the exhaust water and steam from the cylinder 10 outwardly in a horizontal direction rather than downwardly against the road bed.

The valve 20 is provided with a sliding fit through the valve guide or wall 26 for two purposes, first to cause the valve 20 to move in a true axial line and to seat accurately against the valve seat 19, and secondly to prevent the passage, as much as possible, of the water and steam downwardly from the chamber 27 into the upper part of the cylinder 22.

For the purpose of freely venting the cylinder 22 so that any steam or water seeping through the valve guide 26 may readily escape, the shell 17 is provided in one or more sides with vertically disposed relatively narrow slots 29 which also serve to vent the cylinder 22 upon the expansion of the bellows 23, and to also admit of the free contraction of the bellows under conditions which will be hereinafter set forth. By providing a sealed bellows 23 it is apparent that no piston or piston packing is required in the cylinder 22, and also that no lower valve or valve seat may be required, and also that there will be a greater conservation of the air or other fluid which is used in the bellows 23 for the expansion of the same.

The shell 17 is closed at the lower end of the cylinder 22 by a bottom cap 30 which is suitably and detachably secured to the lower end of the shell by cap bolts 31 or the like equipped with the usual lock washers and binding nuts, and which are adapted to secure the cap 30 upwardly against the bottom of the shell 17 and against the base flange or ring 25 of the bellows 23. The bellows 23 is thus securely anchored between the lower end of the shell 17 and the cap 30 and the bellows is sealed against the bottom of the cap 30 and also sealed against the lower end of the shell 17.

The cap 30 is provided at one side with a lateral port 32 which at its outer end is internally threaded for the reception of an air pressure branch pipe 16, as shown in Figure 1 and in Figure 2, and which extends inwardly toward the central portion of the cap 30 and opens upwardly as shown to advantage in Figures 4 and 5 and intercommunicates with the interior of the bellows 23. Threaded through the central portion of the cap 30 and extending upwardly into the bellows 23 is a cap stop screw 33 having an angularly spaced lower end exposed below the cap 30 and by means of which the screw 33 may be turned, and having an enlarged and shouldered upper end extending co-axially through the bellows 23 and cylinder 22 and arranged to engage at its upper end against the under side of the disc or plate 24 for limiting the downward movement thereof when the bellows 23 contracts.

In Figures 4 and 5 the cap screw 33 is disclosed in full line as retracted to its fullest extent and in normal position so that the bellows 23 may freely collapse so as to open the valve 20, while Figure 5 shows in dotted lines the position of the cap screw 33 when the latter is raised to hold the valve 20 in closed position, such as when there is a failure of the air or other fluid pressure at the port 32, or upon breakage of the bellows

23 so as to hold the cylinder cock closed and inoperative in case of emergency.

As best shown in Figure 3, the casing 17 is provided exteriorly with an angularly faced portion 34, which may be hexagonal, to receive a wrench or other tool to enable the entire assembly to be screwed into the bottom opening 15 in the locomotive cylinder 10.

The operation of the device is as follows:— The engineer may in the usual manner manipulate his air control so as to supply compressed air to the branch pipe 16, port 32 and to the interior of the bellows 23. This is the normal operating condition of the device. The compressed air, although not at so great a pressure as obtained in the locomotive cylinder, nevertheless, in acting against the larger area of the plate 24 and disc 21 of the differential piston construction embodying the disc 21 and the valve 20, will keep the valve 20 in the upper position such as shown in full lines in Figure 5.

As soon as water accumulates in dangerous quantities in the locomotive cylinder 10, the normal pressure in the locomotive cylinder will be exceeded, thus destroying the balance of the differential valve structure and allowing the excessive cylinder pressure, acting on the upper face of the valve 20, to force the latter downwardly. This opens the valve 20 and the water and steam will escape downwardly into the enlarged chamber 27; thence outwardly in a horizontally spread stream through the wide exhaust or outlet port 28. The pressure beneath the piston valve or disc 21 will automatically close the valve 20 as soon as the pressure in the cylinder falls to normal.

Should any of the steam or water escape through the valve guide 26 about the cylindrical stem or body portion of the valve 20, the steam or water will be deflected outwardly from the cylinder 22 through the lateral slots 29, and the water and steam cannot enter the sealed bellows 23. It will be understood that the valve 20 is for the most part in the closed position, and it is only opened momentarily to provide for the escape of water from the locomotive cylinder, so that there will be little wear upon the parts and but little occasion for seepage of steam or water into the cylinder 22 and about the bellows and other parts located therein.

Should the engineer at any time wish to open the cylinder cock, he has but to vent the air supply to the branch air pipe 16; thus releasing the pressure in the bellows 23 and the latter normally tends to contract into the position shown substantially in Figure 4, and allowing the valve 20 to fall by gravity and the pressure in the locomotive cylinder.

In case of breakage in the air line 16, the cylinder cock affected thereby may be secured in the upper closed position by screwing up the cap stop screw 33 into the position shown in dotted lines in Figure 5. This may be easily accomplished by the application of a wrench or the like to the lower exposed angularly spaced end of the cap stop screw 33. The stop screw 33 will be run up tightly against the bottom of the disc 24, thus holding the valve 20 closed until the destination is reached and opportunity afforded for the repair of the broken air pipe. If the engineer forgets to close the cab valve controlling air to the cylinder cocks, the air gradually leaks off and the cocks are thus always open. Thus when the engine is in the roundhouse, in a terminal and on a siding the air pump is shut off and the pressure in the port 32 falls.

It is obvious that various changes and modifications may be made in the details of construction and design of the above specifically described embodiment of this invention without departing from the spirit thereof, such changes and modifications being restricted only by the scope of the following claims.

What is claimed is:—

1. An improved cylinder cock, comprising a casing having a reduced threaded neck for engagement in the bottom port of a locomotive cylinder and provided with a downwardly facing seat at the base of said neck and an enlarged exhaust chamber beneath said seat and opening horizontally through the side of the casing, said casing being hollow at its lower end to provide a cylinder and with a top wall between the cylinder and said enlarged exhaust chamber, said casing having slots in its sides for venting the cylinder, a valve slidably fitted through said top wall in axial alignment with the seat and having an enlarged base disc freely movable in the cylinder, a bellows closed at its upper end located in the cylinder against the under side of said disc and having a base ring at its lower end overlapping the lower end of the casing, a cap plate secured against the lower end of the casing for closing the cylinder and engaging said base ring of the bellows for binding the ring between the casing and the cap plate to seal the bellows thereagainst and anchor the bellows in the cylinder, said cap plate having at one side an air supply port leading to the interior of the bellows for supplying pressure thereto to expand the bellows and raise said valve to its seat, and a cap stop screw threaded through said cap plate and extending upwardly into the bellows for limiting the contraction thereof and adapted to be adjusted for engagement against the upper end of the bellows to maintain the valve to its seat.

2. An improved cylinder cock, comprising a casing adapted for attachment at its upper end to the bottom port of a locomotive cylinder, said casing having an upper restricted opening with a downwardly facing seat at

the base of the opening and an enlarged exhaust chamber beneath said seat opening laterally through the casing, said casing having a cylinder in its lower end with a top wall dividing the cylinder from the exhaust chamber and opening through the bottom of the casing, said casing having slots in its sides for venting the cylinder, a valve slidably fitted upwardly through said wall in line with the seat and having an enlarged base portion beneath the wall, a bellows extending upwardly in said cylinder of the casing and engaging at its upper end against said enlarged base portion of the valve, means for securing the lower end of the bellows to the lower end of the casing, and means for supplying pressure to the interior of said bellows for normally expanding the same and maintaining said valve against the seat.

3. An improved cylinder cock, comprising a casing adapted to be vertically disposed having a reduced threaded upper end for engagement in one end of a cylinder, said casing having a downwardly opening valve seat near its upper end with an exhaust chamber therebetween and opening through the side of the casing and having a partition wall spaced below the valve seat, a valve engaged upwardly through said partition wall to engage the seat and having an enlarged base beneath the wall, said casing having a cylinder portion at its lower end opening through the lower end of the casing and having lateral slots opening through the sides of the casing, a bellows extending upwardly through the lower end of the casing into the cylinder and engaging the base of said valve at its upper end, a closure plate for the lower end of the casing, means for anchoring the lower end of the bellows between said plate and the lower end of the casing, and pressure supply means connected to the plate and opening into the interior of the bellows for expanding the same and raising said valve to its seat.

In testimony whereof we affix our signatures.

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