Nov. 14, 1933. A. R. AYERS 1,935,285

LOCOMOTIVE CYLINDER COCK

Filed March 15, 1929

Fig. 1

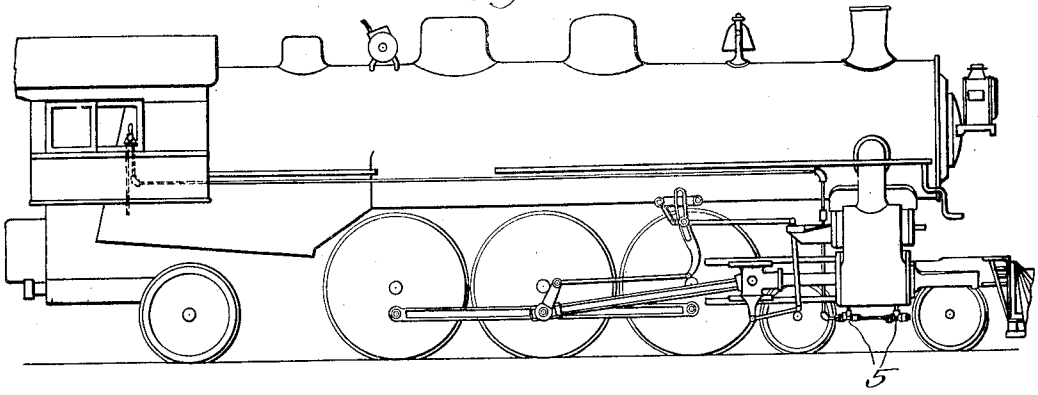


Fig. 2

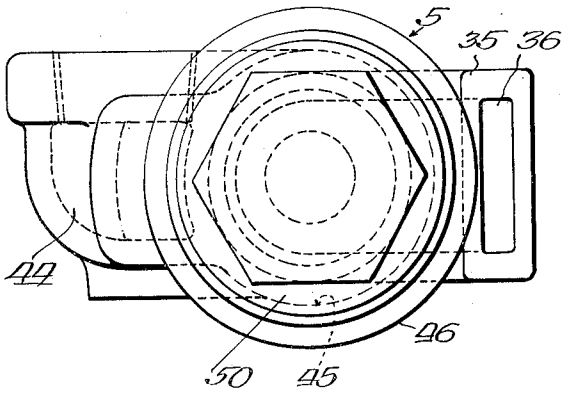


Fig. 4

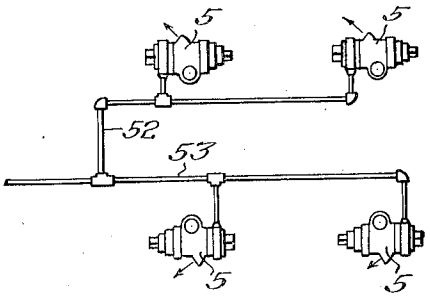
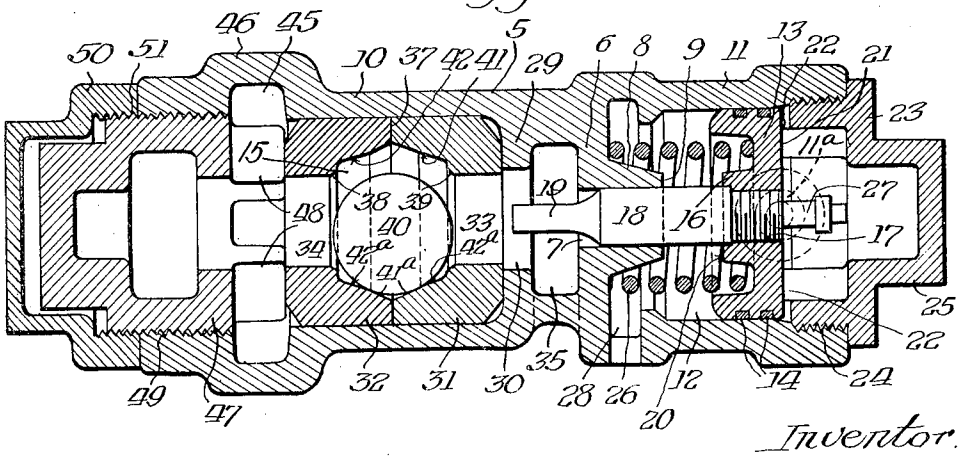


Fig. 3



Witness:

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LOCOMOTIVE CYLINDER COCK

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3 Claims. (Cl. 121—134)

This invention relates broadly to valves and more particularly to improvements in steam engine cylinder drain cocks. The device of this invention including an improved means for operating the valve from a remote point by the employment of fluid under pressure.

While this invention is illustrated and described as employed as a cylinder drain cock, it will be understood that the advantages thereof are susceptible of incorporation in valves for other purposes and that the invention, therefore, finds a wide field of utility.

The principal objects and advantages of this invention reside in the provision of an improved fluid pressure operated cylinder cock for locomotive engines and the like; the provision of an improved cylinder or drain cock which includes an improved valve and valve seat construction; the provision of an improved cylinder drain cock which includes an improved valve and valve seat construction together with an improved means for actuating the valve and for moving the same from its seat; the provision in a cylinder drain cock of an improved arrangement of the valve and valve seats together with an improved piston and cylinder construction formed as a unit therewith for moving the valve relatively to its seat and including means for facilitating removal of the piston when necessary for repairs and the like; the provision of an improved cylinder drain cock including a casing which contains the valve seats, valve, retaining means for said valve seats, and the fluid pressure operated means for actuating the valve or as a unit structure capable of convenient application to an engine cylinder and which is of sturdy construction and readily open for the purpose of inspection for repair, replacement, or repair or cleaning of parts.

This invention furthermore includes an improved arrangement of valve seats and valve for cylinder drain cocks wherein when the engine is drifting one of the valve seats is closed to prevent the entrance of air and foreign substances into the cylinder, and a structure wherein the valve seats are constructed so that a predetermined pressure or suction must be established before the valve will seat in either position. The invention further contemplates a construction of the valve seats so that the valve member will not close under steam pressure from a leaking throttle, but which will readily close when steam is admitted to the cylinder for moving the engine.

The foregoing and such other objects and advantages as may appear or be pointed out as this description proceeds are attained in the structural embodiment illustrated in the accompanying drawing in which:

Figure 1 is an elevational view illustrating application of my invention to a locomotive;

Figure 2 is an enlarged end elevational view of the cylinder cock;

Figure 3 is an enlarged longitudinal vertical sectional view of the cylinder cock shown in Figure 2;

Figure 4 is a schematic elevational view showing application of the device to a locomotive.

Referring now more particularly to the drawing and first to Figures 2 and 3, I provide a casing 5 which is of a generally elongated and cylindrical shape provided with a transverse partition 6 adjacent to one end thereof, said partition having an axial opening 7 therein reinforced by a flange 8 bordering said opening. The outer end face 9 of the flange 8 is preferably a ground surface for a purpose which will presently appear.

The partition 6 divides the casing 5 into two parts 10 and 11 which may be termed compartments, the compartment portion 10 serving as a valve housing, and the compartment portion 11 having a cylindrical inner surface 12 forming a cylinder in which a piston 13 may reciprocate, said piston having conventional packing 14.

The piston is provided with a hub portion 16 internally threaded as at 17 to receive the threaded end of the piston rod 18, which latter is slidable in the axial opening 7 and is provided with a reduced extension 19 which projects into the compartment portion 10 and into the valve chamber 15 for actuating the valve, as will presently be described. The outer end surface 20 of the hub 16 is preferably a ground surface so that the same when contacting with the surface 9 will not only form a stop for the movement of piston 13 but will also form a joint and prevent oil, water and other foreign matter from blowing into the cylinder in which piston 13 operates and which foreign matter would interfere with the operation of said piston. Similarly, the outer surfaces 21 of piston 13 may be a ground surface contacting with a plurality of inwardly extending lugs 22 carried by a closing cap 23 threaded into the open end of the compartment portion 11, as indicated at 24. The outer end 25 of the cap 23 is square or hexagonal shape, as desired, to facilitate removal.

A helical spring 26 surrounds the extension 8 and the piston rod 18 and hub 16 and tends to move the piston 13 toward the outer end of the

casing, that is, into the position shown in Figure 3.

In order to facilitate removal of the piston and piston rod, I provide an axial lug or projection 27 on the piston rod so that a tool such as a pair of pliers or the like may be applied theretofore pulling the piston out of the cylinder. The space between the piston and the compartment 6 is open to atmosphere through an aperture 28.

The portion 10 of the casing is internally provided with an annular flange 29 affording an opening 30 through which the extension 19 may project and said flange 29 also forming an abutment for one of the valve seat members 31, a second valve seat member 32 being arranged in abutment with the member 31 and these valve seat members having axial openings 33 and 34 respectively to permit passage of fluid when the valve is off its seat. The passageway or opening 33 communicates with the drain outlet 35 between the partition 6 and the annular flange 29, the outlet 35 extending to atmosphere as indicated at 36 in Figure 1.

The valve seat members 31 and 32 are substantially identical in construction and are in abutment as indicated at 37, said valve seat members being provided with valve seats 38 and 39 for a ball valve member 40. The surfaces of the seats 38 and 39 are relatively small so that sticking of the valve on these seats is rendered impossible, though at the same time a firm seating and fluid-tight closing will take place when the valve is on one or the other of the seats. To facilitate engagement of the valve with one or the other of the seats, and to control the pressure or suction at which the valve will seat, as the case may be and as will hereinafter appear, the internal surfaces of the valve seat members between their abutting ends and the valve seats 38 and 39 are conical shaped, as indicated at 41 and 42, thereby forming risers up which the ball valve will readily move into engagement with one or the other of the seats. It will be observed that these risers have a double taper, that is, two conical surfaces relatively angularly related as indicated at 41*a*, 41*a* and 42*a*, 42*a*, the surfaces 41*a* being at a greater angularity than surfaces 42*a* so as to form a depression in which the ball valve 40 may lie when off the seats.

The casing portion 10 is provided with a lateral extension 44 which may be connected to a locomotive engine cylinder, and the passageway in the extension 44 communicates with an annular passageway 45 provided in an enlargement 46 of the casing, said passageway 45 communicating with the opening 34 in the valve seat member 32.

The valve seat members are retained in position and in relative abutment by the provision of a closing plug 47, which latter is provided on its inner end with a plurality of radial fins 48 which abut the adjacent surface with a valve seat member 32, said plug being threaded into the adjacent open end of the casing 5 as indicated at 49. The plug 47 is locked in position by the provision of a locking cap 50 which is internally threaded for engagement, as at 51, with the projecting part of the plug 47.

In the usual practice the cylinder cock is applied to the under portion of the locomotive cylinder, and the arrangement may be similar to that shown schematically in Fig. 4, wherein the cylinder cocks are indicated as at 5, 5, and fluid under pressure is supplied thereto through conduits 52, 53 controlled from the cab of the locomotive.

It will be observed that by the angularity of the surfaces 41*a* or 42*a*, or both, the valve may be responsive to a greater or less suction or pressure, or both, as desired to suit the particular type of engine on which the cylinder drain cock is to be employed.

The purpose of the portions 41*a* provided at a greater angularity than the risers 41 and 42 is to provide in effect a circumferential groove between the valve seats, in the lower part of which the ball 40 is adapted to lie when the engine is at rest. Thus when being moved out of this groove not only the inertia of the ball must be overcome, but also the retention of the ball by the groove itself, which latter serves to prevent the ball from being moved by steam from a leaking throttle. Locomotive throttle valves occasionally leak steam which, if confined in the cylinder, might build up sufficient pressure to move the engine. In the provision of the present invention, the ball seated in the groove formed by the surfaces 41*a* affords sufficient retaining means for the ball in its open position to prevent the ball from seating on the exhaust opening due to leaking steam. It is thus practically impossible for a locomotive equipped with the cylinder cock of this invention to accidentally move due to a slightly leaking throttle. It is, of course, essential that the automatic cylinder cock ball member 40 shall close almost instantly when steam is admitted for moving the engine. In other forms of cylinder cocks known to me, it was found that if the shape of the seat permitted the ball to seat readily enough to avoid a "spitting" action when the throttle was opened to start the engine it would also cause the ball to seat under a very slight throttle leakage, which, in some cases, would cause the engine to move. The double taper seat of this invention and, particularly the groove formed by the surfaces 41*a* provides, in effect, retaining shoulders which, while not materially interfering with the proper closing of the ball when steam is admitted to start the engine, will, however, prevent the ball from seating due to a leaking throttle. The intermediate tapering, that is, the surfaces 42*a* have the effect of allowing the ball to roll to its seat easily, after once being dislodged from the groove formed by surfaces 41*a* and thus avoid damage to the valve seat itself through a pounding action which resulted in the earlier forms of cylinder cocks known to me, and particularly, wherein the ball had a considerable abrupt lift. I thus provide a centralizing groove to hold the ball away from either seat, thereby allowing a free flow of liquid through the valve when in open position. The device also makes it possible to proportion the angle of the groove formed by the surfaces 41*a* to control, within desirable reasonable limits, the pressure required to seat the valve. The provision of the surfaces 42*a* at a slighter angle than the surfaces 41*a* eliminates the detrimental pounding action of the valve on its seat and yet serves to aid the valve toward its seat under steam pressure for moving the engine. The casing of the device may be of universal application, and the valve seat members 31 and 32 may be substituted for those shown having different angularities to the surfaces 41*a* and 42*a* to suit the particular locomotive on which the device is to be used.

To change a particular set of cylinder drain cocks on an engine, this may be done without removing the entire casing, it being required only

to remove cap 50, plug 47, and substitute a different set of valve seats, and return the plug and cap into proper position.

In the operation of this device, water of condensation collecting in the locomotive cylinder and with no steam pressure on will gravitate to the valve chamber formed between the two valve seat members and pass through the openings 33 and 34 into the exhaust outlet 35. When the locomotive is running with no steam pressure on, a suction develops in the cylinders and this will act to cause the ball 40 to seat on the valve seat 38 and thus prevent the introduction of dust and other foreign matter into the cylinders.

When the locomotive is started after being at rest for some time, admission of steam to the cylinders builds up pressure blowing valve 40 against the seat 39, thus closing the valve. In the event that it is desired to move the valve from its seat 39 at any time when the locomotive is running with steam pressure on the cylinders, air is admitted from a source of supply through pipes 52 and 53 at the outer end of the cylindrical portion 11 through opening 11*a* to move the piston to the left, as viewed in Figure 3, bringing the extension 19 into engagement with tbe ball valve and thus forcing it off the seat 39 and permitting a blowing of the cylinders. This may also be done in the event that the locomotive has been standing for some time and, due to cold weather, the ball may become frozen on the seat 39 or in the centralizing groove. The extension 19 will then serve to knock the ball loose. If the air is exhausted from the cylinder portion 11, the helical spring 26 will return the piston to the outer end of its stroke.

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

1. In a cylinder cock for steam engines, a casing having communication with the cylinder and provided with an exhaust port, said casing having a compartment open at one end, a pair of valve seat members disposed in said compartment with their seat portions opposed to form a valve chamber, a valve in said chamber, said seat members having internal multiple conical surfaces formed of areas of different pitch, the adjacent portions of such surfaces serving to form a groove to prevent seating of the valve due to flow of leaking steam, and the remaining portions of said surfaces serving to facilitate seating of the valve upon flow of steam under normal pressure conditions.

2. In a device of the character described in combination with a steam engine having a throttle for admitting steam to the cylinder thereof, a cylinder cock for said cylinder including a casing having communication with the cylinder and provided with an exhaust port, and a pair of opposed valve seat members arranged between said exhaust port and said cylinder and provided with valve seats, said seat members having each conical risers, each of the surfaces of said risers being internally tapered annularly in two planes, said seat members being in abutment with the surfaces of said risers oppositely disposed to each other to form a circumferential retaining groove therebetween, a ball valve member between said seats adapted to engage said groove at points spaced apart in the direction of said seats and said valve being movable from said groove in response to the fluid under predetermined pressure to roll upon either of said risers with a single point of contact thereon, said valve member being held against movement and by the flow of liquid or of fluid pressure from a cylinder due to a slightly leaking throttle by the angularity of said conical surfaces forming said groove.

3. In a cylinder drain valve a casing having an intermediate portion dividing the same into two compartments, a connection for fluid to one of said compartments, a valve member therein, a pair of opposed valve seat members having seats for said valve and forming a chamber for the valve, said valve seat members having each a plurality of internal angularly related frusto-conical surfaces, said valve seat members being in abutment so that the steeper of said frusto-conical surfaces are adjacent to each other to form a retaining groove, said valve member being disposed between said valve seat members and arranged, when unseated, to have contact at only two points on the steeper of said conical portions spaced in the direction of said seats, and the other of said conical portions serving to facilitate seating of the valve on either of said seats.

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