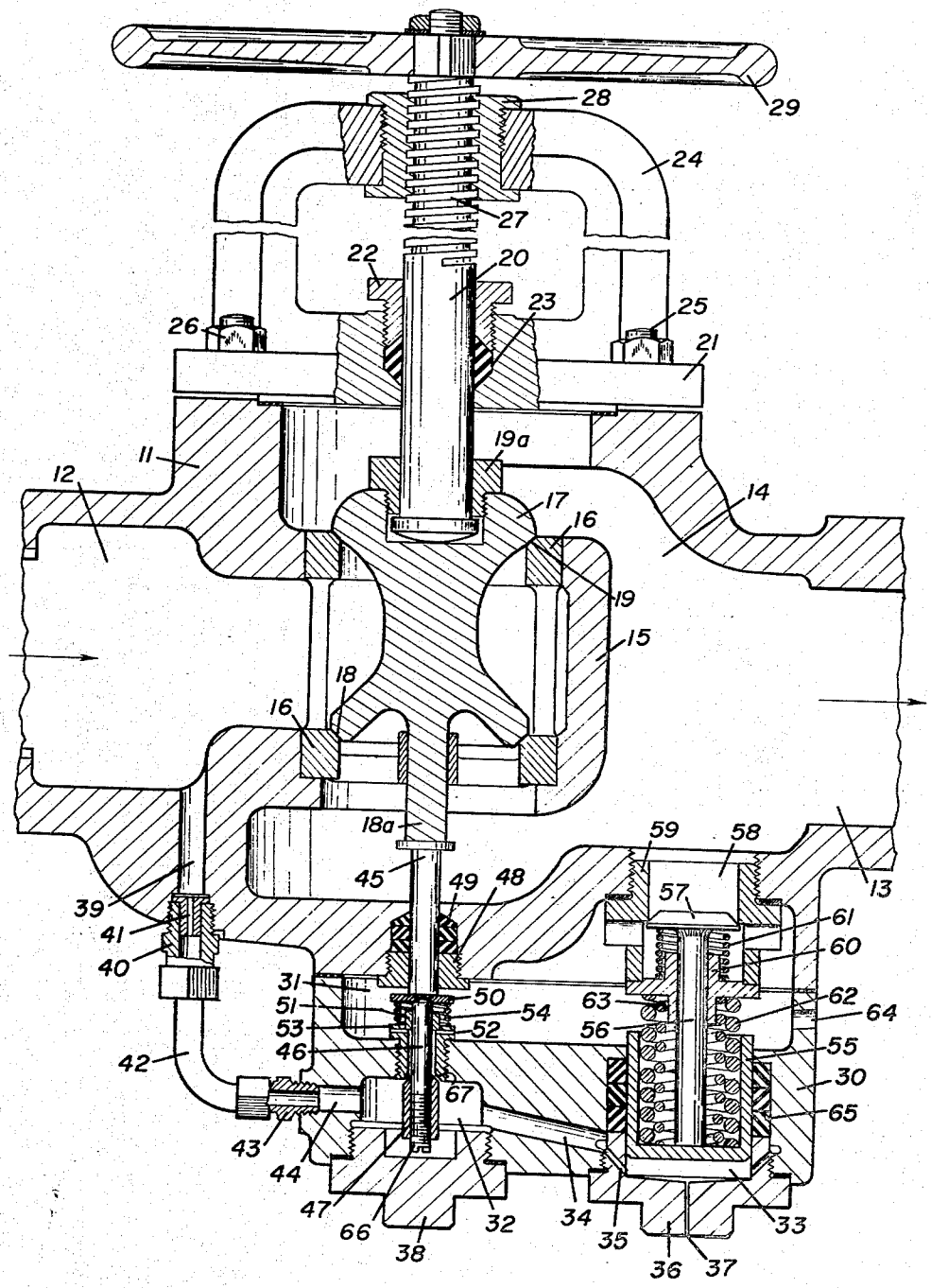
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VALVE APPARATUS FOR STEAM CONTROL VALVES

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VALVE APPARATUS FOR STEAM CONTROL VALVES

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The present invention is directed to an automatic pump or vent valve for a steam control valve. More particularly, the invention is directed to apparatus for use with a dual-seated steam control valve. In its more particular aspects, the invention is directed to a combination of a pilot valve and a poppet valve.

The present invention may be briefly described as a valve apparatus for a steam control valve which comprises a housing attached to a steam control valve and defining therewith a first chamber. The housing is provided with an exhaust port in a wall thereof and has a second chamber and a piston cylinder spatially removed from the second chamber. A passageway in the housing communicates the second chamber with the piston cylinder, the latter of which is vented to the atmosphere. Arranged in the housing and particularly in the second chamber is a pilot valve communicating when open the second chamber with the first chamber. An actuating button is arranged in the steam control valve and is adapted to be actuated thereby, the actuating button protruding into the first chamber and being attached to the pilot valve. A fluid connection means, such as a conduit, connects the second chamber with an inlet to the steam control valve. A poppet valve is arranged in the exhaust port of the steam control valve and communicates the first chamber with the steam control valve. Arranged in the piston cylinder is a piston which is adapted normally to hold the poppet valve in a closed position. The piston is normally urged toward the piston head or in a downward position by first biasing means and the poppet valve is normally urged in a closed position by a second biasing means on movement of the piston downwardly.

The present invention will be further described by reference to the drawing in which the single figure is a sectional view of a steam control valve with the improved valve of the present invention attached thereto.

Referring now to the drawing, numeral 11 designates a dual-seated steam control valve provided with an inlet 12 and an outlet 13. Inlet 12 and outlet 13 communicate by a central passageway 14 in which is arranged a seating cage 15. The inlet 12, for example, may be connected to a steam pipe leading to steam generation equipment and the outlet 13 may be connected to a steam engine or a steam pump and the like.

The cage 15 is provided with valve seats 16 and has arranged therein a valve seating member 17 provided with seating surfaces 18 and 19. The seating member 17 is provided with an ex-

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tension member 18a which serves to actuate a pilot valve actuating button as will be described. The seating member 17 is attached by attaching means 19a to a valve stem 20 which extends through a cover plate 21 and a packing gland 22 provided with packing 23 and valve bonnet 24. The cover plate 21 is attached to the valve housing 11 by means of bolts 25 and nuts 26. The valve stem 20 is provided with threads 27 which extend through an internally threaded sleeve 28 in bonnet 24. The valve stem 20 is provided with means such as a lever arm or hand wheel 29 for rotating the valve stem 20 for lifting and lowering the seating member 17.

The lower portion of the valve housing 11 has attached to it a housing 30 which defines with a wall of the valve 11 a first chamber 31. The housing 30 also is provided with a second chamber 32 and a piston cylinder 33. The piston cylinder 33 and the second chamber 32 communicate by a passageway 34 and orifice 35 in a cap nut 36 which serves to close the piston cylinder 33. The cap 36 is provided with a vent 37.

The second chamber 32 is also enclosed by a cap nut 38. The second chamber 32 communicates with the inlet 12 by way of passageway 39 in the valve 11 to which is threadably connected a connection 40 which is provided with an orifice member 41. The connection 40 connects to a conduit 42 which may be a copper tubing which, in turn, connects by way of a connection means 43 with a passageway 44 in the housing 30 which communicates with the chamber 32.

Protruding into the central passageway 14 is an actuating button 45 which engages with a valve stem 46 arranged in the first chamber 31 and, in turn, connecting to the valve member 47 in chamber 32. The actuating button 45 passes through a packing gland 48 threaded into the valve housing 11 which seals the actuating button 45 by packing 49 which is held in place with the packing gland 48.

The valve stem 46 is provided with a plate or shoulder 50 and the valve stem 46 is slidably arranged in a sleeve member 51 which is provided with a passageway 52 which serves to communicate the chamber 31 with chamber 32 on opening of the valve 47 as will be described.

The sleeve 51 has an outwardly projecting shoulder 53 bearing against a lower end of a helical coil spring 54. The plate or shoulder 50 acts as a restraining means for the upper end of the coil spring 54.

Arranged in the piston cylinder 33 is a piston 55. The piston 55 is provided with a valve stem

56 to which is attached a poppet valve member 57. The poppet valve member 57 is arranged in an exhaust port 58 of the valve 11 and the exhaust port 58 is provided with an annular seating member 59 which is threadably engaged with the valve 11. The annular seating member 59 encloses the poppet valve 57 and is provided with an upwardly projecting inner sleeve 60 which serves to limit the downward travel of the poppet valve 57. Surrounding the sleeve 60 and bearing against the annular member 59 and against the poppet valve member 57 is a helical coil spring 61. Springs 62 and 63 bear against the lower outer surface of the annular member 59 and against an inner surface of the piston 55; helical coil springs 62 and 63 normally serve to urge the piston 55 downwardly.

The housing 30 defines an exhaust port 64 through which the exhaust steam may be vented.

The piston 55 is sealed in the cylinder 33 by means of steam packing 65.

It will be noted that the valve stem may be adjusted by the slotted screw member 66, cap 38 being removed for this purpose.

The valve 47 is designed to seat on seat or member 67.

The present invention operates in the following manner:

When the extension member 18a is lowered by the valve stem 20 being rotated to close the valve 11 by the seating member 17 seating on surfaces 16, the member 18a strikes the actuating button 45 and causes the valve 47 to be unseated. Meanwhile steam is flowing into the inlet 12 and into central passageway 14. Since dual-seated valves have some leakage there is steam pressure being exerted against the poppet valve 57. Also steam pressure is being exerted through the passageway 39, the conduit 42, passageway 44, chamber 32, passageway 34 and through orifice 35 against the piston 55 which holds the valve stem 56 and valve 57 upwardly in seating engagement with annular seating member 59. As the actuating member 45, however, is moved downwardly the valve 47 moves off of the seat 67 and causes steam to pass through the passageway 52 into the chamber 31 and through the exhaust port 64. This causes equalization of pressure on both sides of the poppet valve 57 and the piston 55 is biased downwardly by springs 62 and 63 leaving only the spring 61 to hold the poppet valve 57 in a closed position. Thus a small pressure build up in central passageway 14 due to leakage of steam past the seating surfaces 18 and 19 will allow the pressure on poppet valve 57 to overcome the spring 61 and to cause the exhaust from passageway 14 into chamber 31 to pass to exhaust port 64.

In my apparatus it is desirable to have the orifice 41 larger than the vent 37. For example, the orifice 41 may be 0.04 inch in diameter, whereas the vent 37 may be 0.03 inch in diameter. Thus a small amount of steam is bled out through the vent 37 but pressure may build up against the piston 55 and hold the valve 57 in a closed position. It is to be noted that since the pressure in central passageway 14 may be greater than in piston cylinder 33 due to the venting of a small amount of steam through vent 37 the area of the piston 55 is greater than the area of poppet valve 57 allowing a lower pressure of steam than the pressure of steam in central passageway 14 to hold the poppet valve 57 closed.

It is also to be noted that in the travel of the extension member 18a the device of my invention is active only during the last few thousandth

inch of travel (0.005 inch). This distance may be adjusted by taking up on the set screw 66. Thus the forces resisting the actuating button 45 may not amount to over 40 or 50 pounds total.

One advantage of the valve of the present invention is that the poppet valve pops open all the way. Any tendency of the steam engine connected to the valve to coast due to leakage into the steam chest is arrested by the fact that the valve stem 56 is forced back by the springs 61 and 62 and by a suction created in the central passageway 14 by passage of steam to the outlet 13 so that engine braking may be realized as if no dump valve at all were used allowing the apparatus of the present invention to serve a dual purpose.

By virtue of the orifice 41 being greater than vent 37, for example 0.04 and 0.03 inch steam pressure builds up below the piston 55 to overcome the springs 62 and 63 as well as the unit steam pressure delivered multiplied by the area of the poppet valve 57, which is one square inch, thus holding the valve closed.

As a specific example of a valve in accordance with the present invention, the springs 62 and 63 may have a total compression of about 200 pounds. The piston 55 may have an area of 1¾ square inches; therefore, the springs 62 and 63 will move the piston and permit opening of the valve 57 at any condition in the valve 11 less than 100 pounds per square inch gauge. With the orifice 41 and 37 having diameters of 0.04 and 0.03 inch, respectively, and a travel of 0.005 inch on valve 47 the pressure maintained may be about 50 pounds per square inch gauge.

The present invention has numerous advantages. In dual-seated steam control valves, such as employed in oil well steam drilling rigs, it is not only desirable but imperative at times to stop the steam engine completely. Since the dual-seated valves have a tendency to leak, the steam engine may suddenly move due to accumulation in its steam chest due to steam leakage past the control valve seats. Thus tongs, rotary tables and spinning chains actuated by the catheads may suddenly be energized causing loss of limb and life of personnel exposed to such hazards. In my invention there is no danger of the steam leakage allowing the engine to be operated since my valve automatically will cause any accumulation of steam leakage past the valve seats to be exhausted.

Valve 57 also serves as a check valve in instances where a rapidly moving lightly loaded engine is stopped quickly. Spring 61 holds valve 57 in light contact so the engine cannot "suck in air" and thus "coast" too long. Spring 61 and valve 57 are so proportioned that a positive pressure of ½ p. s. i. will open valve 57 in spite of the spring 61.

While my apparatus is shown to have coil springs 62 and 63 biasing piston 55 downwardly, I contemplate that the coil springs 62 and 63 may be replaced by a single coil spring. Likewise, while the valve apparatus of the present invention is shown attached to a particular type of dual-seated valve, I contemplate that it may be attached to and form part of any dual-seated valve provided with an extension member, such as extension member 18a to actuate the actuating button 45.

The nature and objects of the present invention having been completely described and illustrated, what I wish to claim as new and useful and to secure by Letters Patent is:

1. Valve apparatus for an engine and pump control steam valve which comprises, in combination, a housing attached to a steam control valve defining with a wall of the steam control valve a first chamber, said housing defining an exhaust port with a wall thereof and said housing being provided with a second chamber and a piston cylinder having a vent in said housing and a passageway communicating the second chamber with the piston cylinder, a pilot valve arranged in said housing communicating when open the second chamber with the first chamber, an actuating button arranged on the steam control valve and adapted to be actuated thereby protruding into the first chamber and operatively connected to said pilot valve, means connecting said second chamber with an inlet to said steam control valve, a poppet valve arranged in an exhaust port of said steam control valve, a piston arranged in said piston cylinder adapted normally to hold said poppet valve in a closed position, first biasing means normally urging said piston downwardly, and second biasing means normally urging said poppet valve into a closed position on movement of said piston downwardly.

2. Valve apparatus for an engine and pump control steam valve which comprises, in combination, a housing attached to a steam control valve defining with a wall of the steam control valve a first chamber, said housing defining an exhaust port with a wall thereof and said housing being provided with a second chamber and a piston cylinder spatially removed from said second chamber having a vent in a wall of said housing and a passageway communicating the second chamber with the piston cylinder, a pilot valve arranged in said housing communicating when open the second chamber with the first chamber, an actuating button arranged on the steam control valve and adapted to be actuated thereby protruding into the first chamber and operatively connected to said pilot valve, a conduit connecting said second chamber with an inlet to said steam control valve, a poppet valve arranged in an exhaust port of said steam control valve, a piston arranged in said piston cylinder adapted normally to hold said poppet valve in a closed position having an effective working area greater than an effective working area of the poppet valve, first biasing means normally urging said piston downwardly, and second biasing means normally urging said poppet valve into a closed position on movement of said piston downwardly.

3. Valve apparatus for an engine and pump control steam valve which comprises, in combination, a housing attached to a steam control valve defining with a wall of the steam control valve a first chamber, said housing defining an exhaust port with a wall thereof and said housing being provided with a second chamber and a piston cylinder spatially removed from said second chamber having a vent in a wall of said housing and a passageway communicating the second chamber with the piston cylinder, a pilot valve arranged in said second chamber communicating when open the second chamber with the first chamber, an actuating button arranged on the steam control valve and adapted to be actuated thereby protruding into the first chamber, a valve stem operatively connected to said button and to said pilot valve, a conduit connecting said second chamber with an inlet to said steam control valve defining a restricted passageway having an area of flow greater than an area of flow of the vent in the piston cylinder, a poppet valve arranged in an exhaust port of said steam control valve, a piston arranged in said piston cylinder adapted normally to hold said poppet valve in a closed position having an effective working area greater than an effective working area of the poppet valve, a first coil spring normally urging said piston downwardly, and a second coil spring normally urging said poppet valve into a closed position on movement of said piston downwardly.

4. Valve apparatus for an engine and pump control steam valve which comprises, in combination, a housing attached to a steam control valve defining with a wall of the steam control valve a first chamber, said housing defining an exhaust port with a wall thereof and said housing being provided with a second chamber and a piston cylinder spatially removed from said second chamber and a passageway communicating the second chamber with the piston cylinder, a cap nut connected to said housing to enclose said piston cylinder provided with a vent, a second cap nut connected to said housing to enclose said second chamber, a pilot valve arranged in said second chamber communicating when open the second chamber with the first chamber, an actuating button arranged on the steam control valve and adapted to be actuated thereby protruding into the first chamber, a valve stem operatively connected to said button and to said pilot valve, a conduit connecting said second chamber with an inlet to said steam control valve defining a restricted passageway having an area of flow greater than an area of flow of the vent in the piston cylinder, a poppet valve arranged in an exhaust port of said steam control valve, a piston arranged in said piston cylinder adapted normally to hold said poppet valve in a closed position having an effective working area greater than an effective working area of the poppet valve, a first coil spring normally urging said piston downwardly, and a second coil spring normally urging said poppet valve into a closed position on movement of said piston downwardly.

5. Valve apparatus for an engine and pump control steam valve which comprises, in combination, a housing attached to a steam control valve defining with a wall of the steam control valve a first chamber, said housing defining an exhaust port with a wall thereof and said housing being provided with a second chamber and a piston cylinder spatially removed from said second chamber and a passageway communicating the second chamber with the piston cylinder, a cap nut connected to said housing to enclose said piston cylinder provided with a vent, a second cap nut connected to said housing to enclose said second chamber, a pilot valve arranged in said second chamber communicating when open the second chamber with the first chamber, an actuating button arranged on the steam control valve and adapted to be actuated thereby protruding into the first chamber, a valve stem operatively connected to said button and to said pilot valve, a coil spring surrounding said valve stem normally urging said button upwardly to close said pilot valve, a conduit connecting said second chamber with an inlet to said steam control valve defining a restricted passageway having an area of flow greater than an area of flow of the vent in the piston cylinder, a poppet valve arranged in an exhaust port of said steam control valve, a piston arranged in said piston cylinder adapted normally to hold said poppet valve in a closed position having an effective working area greater than an effective working area of the poppet

valve, a first coil spring normally urging said piston downwardly, and a second coil spring normally urging said poppet valve into a closed position on movement of said piston downwardly.

6. Valve apparatus for an engine and pump control steam valve which comprises, in combination, a housing attached to a steam control valve, said housing being provided with an exhaust port and a piston cylinder having a vent in said housing, a pilot valve arranged in said housing, means fluidly communicating said piston cylinder with an inlet to said steam control valve, said pilot valve communicating when open the fluid communicating means with said housing exhaust port, actuating means arranged on the steam control valve and adapted to be actuated thereby

protruding into the housing and operatively connected to the pilot valve, valve means arranged in an exhaust port of said steam control valve, a piston arranged in said piston cylinder adapted normally to hold said valve means in a closed position, first biasing means normally urging said piston downwardly, and second biasing means normally urging said valve means into a closed position on movement of said piston downwardly.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,291,609	Nichols	Jan. 14, 1919
2,481,265	Van Denberg	Sept. 6, 1949