

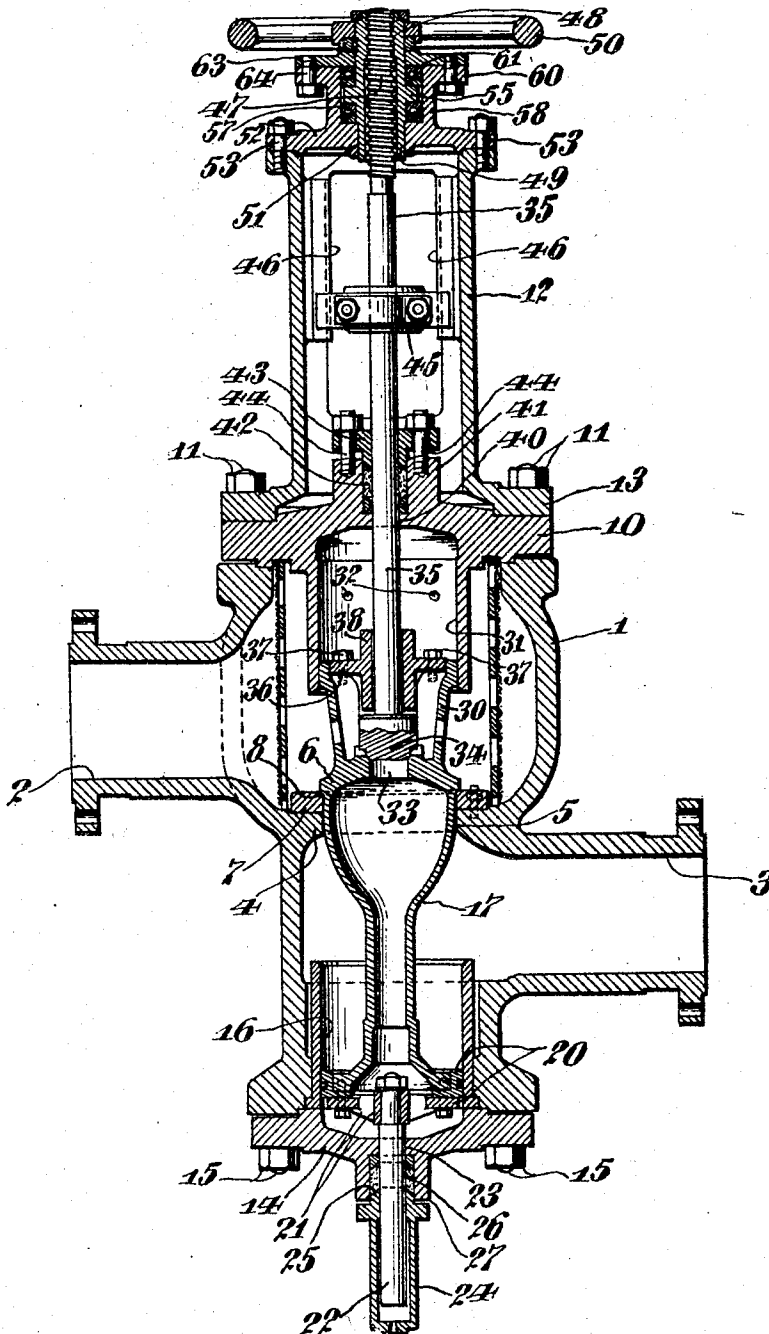
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P. W. KNAUF

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VALVE

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UNITED STATES PATENT OFFICE

PAUL W. KNAUF, OF CYNWYD, PENNSYLVANIA, ASSIGNOR TO SCHUTTE AND KOERTING COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

VALVE

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My invention relates to valves of the type which perhaps may be characterized as heavy duty valves. In valves of this character it is the usual practice to employ pilot valves in association with the main valves to facilitate the opening of the latter from closed position. In the use of valve structures embodying main and pilot valves it is necessary that the latter have a certain amount of play and it frequently happens that the main valves "chatter" when close to their seats during their opening and closing movements.

Such "chattering" is objectionable and hence the purpose of my invention is to provide a construction having means whereby "chattering" or vibrating movements of the main valve relative to the pilot valve shall be prevented.

It also is an object of my invention to provide a construction wherein the pressure exerted by the steam within the valve structure tending to cause longitudinal movement of the main valve with reference to the pilot valve, to which the said main valve is connected in one direction is counterbalanced by an equal pressure in the opposite direction whereby the pilot is held open until seated by final downward movement applied to its stem.

Without further amplification or statement of the objects of the invention I shall now proceed with the detailed description thereof wherein additional objects and advantages will be pointed out or else will become apparent.

In order that the invention may be readily understood and its practical advantages fully appreciated reference should be had to the accompanying drawing wherein I have illustrated a longitudinal sectional view of a valve construction provided with the novel means of my invention.

In the drawing I have shown at 1 a valve casing comprising an inlet 2 and an outlet 3, the inlet and outlet being offset with relation to each other as shown. The inlet has connection with an upper chamber of the valve casing while the outlet has connection with a lower chamber, the two chambers being separated by a partition wall 4 having an open-

ing 5 therethrough which is adapted to be opened and closed by means of a valve 6. The upper side of the partition wall 4 is provided with an annular member 7 the upper inner edge of which constitutes the seat 8 for the said valve. The upper chamber of the valve casing is closed by means of a cover or closing plate 10, the said cover plates being secured to the open upper edge of the casing 1 by means of fastening bolts 11. These bolts 11 also operate to fasten the tubular pedestal 12 in place upon the casing, the said pedestal being provided with a flange or foot portion 13 for that purpose. Such flange or foot portion rests upon the upper side of the outer edge portion of the cover plate 10. The bottom end of the lower chamber of the casing is closed by a cover 14 which is secured by means of fastening bolts 15. The lower part of the lower chamber of the casing is provided with a cylinder 16 which is secured and held in place by means of the cover plate 14 which contacts with the lower end of said cylinder. The said cylinder is open at both ends. The hollow spool or stem 17 which projects downwardly from the valve or longitudinally of the valve casing is provided with a head or piston 20 at its lower end which fits closely within the cylinder 16. The spool is provided in the opening through the piston at its lower end with a cross piece 21 to which is secured a tail piece 22 which projects outwardly through an opening 23 provided in the cover plate 14 and into a tubular extension 24 the inner end of which terminates with a gland portion 25 which engages and is adapted to hold a packing 26 within a chamber provided by a flange portion 27 which projects from the outer side of the cover plate 14. The presence of the packing surrounding the tail rod or piece 22 is for the purpose of rendering the opening 23 steam-tight. The lower end of the tubular extension 24 is provided with an opening from which any liquid which may collect therein may escape. The presence of said opening also exposes the tail rod or piece 22 to the atmosphere.

The valve 6 is provided with an upwardly extending hollow projecting portion 30 the upper end of which is slightly enlarged and

adapted to fit within a hollow tubular portion 31 which projects from the inner under side of the cover plate 10. The portion 31 is provided with openings in the side thereof as indicated at 32. The tubular portion 31 co-operates with the similar portion 16 previously mentioned to guide the valve in its vertical movements within the valve casing.

The valve 6 is provided with a central opening 33 which is adapted to be opened and closed by means of a pilot valve 34 which is connected with and constitutes a head upon the inner lower end of the rod 35, the said rod constituting a stem for the said pilot valve. For connecting the pilot valve 34 and its stem 35 with the valve 6 and its spool 17 I have provided a disc 36 which is secured in the upper end of the hollow portion 30 by fastening devices indicated at 37. The central portion of the disc 36 is provided with an elongated hub 38 having a central opening therethrough through which the rod or pilot valve stem 35 extends. The lower or inner end of the hub 38 is located a short distance from the upper or outer end of the pilot valve 34 so that the said pilot valve is permitted to move through a short distance between its seat upon the top of the valve 6 and the inner or lower end of the said hub. The said rod or pilot valve stem 35 also extends through an opening 40 in the cover plate 10. The outer end of said opening is enlarged as indicated and is surrounded by a tubular flange portion 41. The space within the enlarged portion of said opening surrounding the rod 35 is filled with packing material 42 which is adapted to be compressed and retained in position by a gland member 43 which is held in position by fastening and tightening screw bolts 44. The rod or stem 35 is movable through the opening 40 and is provided at a point within the pedestal 12 with a crosswise extending member 45 which is adapted to engage guides 46 in opposed relation to each other upon the inner side of the hollow pedestal 12. The upper end portion of the rod or stem 35 is screw-threaded as shown at 47 and is in engagement with the screw-threaded portion 48 at the upper end of an elongated nut 49 which is adapted to be rotated by means of a hand wheel 50. Rotation of the said nut may be effected by other means which may be power actuated. The lower end of the nut projects through an opening 51 provided in a plate 52 which closes the upper end of the pedestal 12, the said plate being secured to the pedestal by fastening screw bolts 53. The nut 49 is provided with a lateral annular flange or projection 55 intermediate its ends the lower side of which rests upon the upper side of a ball bearing assembly 57 which is supported upon the upper side of the cover plate 52 at the bottom of a chamber provided by the upwardly extending tubular projection 58. Said projection is

provided at its outer end with the laterally extending flange 60. The nut 49 is retained in position by a second ball bearing assembly 61 which is located upon the upper side of the annular flange or projection 55 and is held in position by means of a fastening or securing plate 63 which is fastened to the flange 60 by means of fastening screw bolts 64. The upper or outer side of the ball bearing ring 61 is practically flush with the upper edge of the tubular projection 58.

The diameters of the rod or pilot valve stem 35 and the tail rod or piece 22 are the same or practically so. In other words, their diameters should be as nearly the same as is commercially practical.

When it is desired to open the valve 6 the hand wheel 50 or other means which may be power actuated, as previously stated, is rotated to turn the nut 49 in a direction to cause outward movement first of the rod 35 and the pilot valve 34 connected therewith. Opening movement of the pilot valve 34 is resisted by the pressure of the steam upon the area of the outer side thereof which surrounds the stem 35. The area of the annular space upon the upper or outer side of the pilot valve which surrounds the rod or stem 35 is quite small as compared with the similar area of the valve 6. It follows, therefore, that while a relatively small force only is necessary to impart initial opening movement to the pilot valve 34 a relatively great or large force would be required to impart initial movement to the valve 6. The pilot valve having been once opened, however, steam flows through the opening 33 and through the tubular valve spool 17 and thence to the under side of the latter and the head thereon. The steam thus being present both above and below the valve the latter may now be moved into open position without the necessity of overcoming any pressure or force other than that due to gravity and to friction between moving parts.

Heretofore there has been difficulty owing to the "chattering" of the main valve between its seat and the pilot valve. By providing the tail piece 22 which, as well as the rod 35, is exposed to the atmosphere such "chattering" is prevented. The pressure exerted by the steam or other fluid pressure after it enters the spool 17 through the opening 33 is exerted equally against the rod 35 and the tail rod or piece 22. It follows, therefore, that when the pilot valve and main valve are moving from an open position of the main valve (the pilot valve being likewise open) the said pilot and main valves move together with the pilot valve remaining open until the main valve contacts with its seat at 8 whereupon the pilot valve continues its movement until it is seated upon the main valve. This final closing movement of the pilot valve is resisted by fluid pressure against an area

equal to the cross-sectional area of the stem 35. During such final movement of the pilot valve the resistance offered by the pressure of the fluid within the valve casing against such movement is such that less effort is required to be applied to the wheel 50 (or other operating means) than is required to unseat the pilot valve when moving the same from closed to open position.

Although performing no function insofar as the present invention is concerned it may be noted that I have provided a screen structure which surrounds the portion of the valve structure which is located in the inlet portion of the valve casing.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A valve structure of the character described comprising a valve casing, a movable valve member located in said casing for closing an opening therethrough, said valve member having a hollow guiding stem and also having an opening therethrough in communication with the opening through the said guiding stem, a valve for closing said opening, said valve having a stem which is exposed to the atmosphere, and a tail rod having connection with the said hollow stem and being exposed to the atmosphere, the diameters of the said tail rod and the stem for the second named valve being approximately equal.

2. A valve structure of the character described comprising a valve casing having an opening therethrough, a movable valve for opening and closing said opening, said valve having a hollow stem projecting therefrom, the opening through said stem being in communication with the opening through the said guiding stem a pilot valve for closing the opening through said movable valve, said pilot valve having a stem exposed to the atmosphere, means for limiting the movement of said pilot valve, and a tail rod connected to the hollow stem of the first named valve and exposed to the atmosphere, the said tail rod and the said pilot valve stem being of substantially the same area in cross section.

3. A valve structure of the character described comprising a valve casing having an opening therethrough, a movable valve member for opening and closing the said opening, said movable valve member having a hollow stem projecting therefrom and also having a relatively small opening located centrally thereof in communication with the opening through the said stem, a pilot valve for closing said relatively small opening, said pilot valve having a stem which projects therefrom and which is exposed to the atmosphere, means for guiding the movements of said stem, and a tail rod having connection with the said hollow stem of the first named valve, the said tail rod being exposed to the atmosphere and the cross sectional areas of the said tail rod and the said pilot valve stem being approximately equal.

4. A valve structure of the character described comprising a valve casing having an opening therethrough, a movable valve member for opening and closing said opening, said valve member being provided with a downwardly extending hollow guiding stem, an upwardly extending guiding portion and a relatively small opening therethrough in communication with the opening through the said stem, a pilot valve for opening and closing said opening, said pilot valve having a stem extending upwardly in a direction opposite that of the said hollow guiding stem of the first named valve, means mounted upon the upwardly extending portion of the said first named valve for guiding the pilot valve stem and for limiting the movements of the said pilot valve, the said pilot valve stem projecting from the said casing and being exposed to the atmosphere, and a tail rod connected to and extending from the lower end of the said hollow guiding stem of the first named valve and projecting from the said casing and being exposed to the atmosphere, the cross sectional areas of the said pilot valve stem and the said tail rod being approximately equal.

In testimony that I claim the foregoing as my invention I have hereunto signed my name this 9th day of January, A. D., 1930.

PAUL W. KNAUF.