Sept. 9, 1924. 1,507,948

E. V. ANDERSON

TRIPLE CUSHIONED VALVE

Original Filed July 6, 1917

FIG.3.

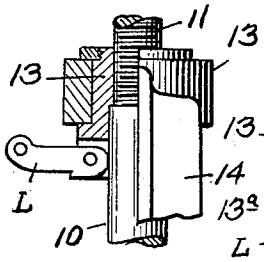


FIG.2.

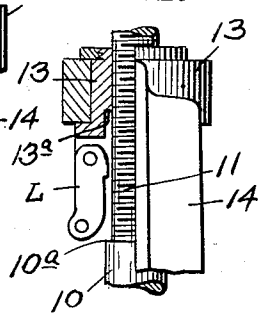


FIG.1.

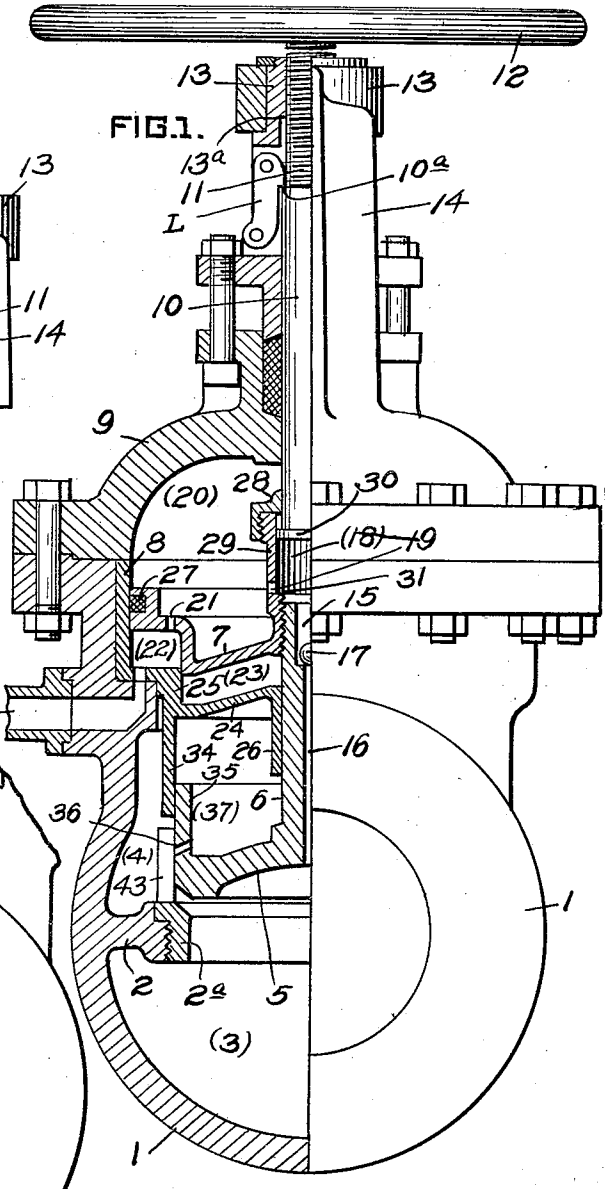
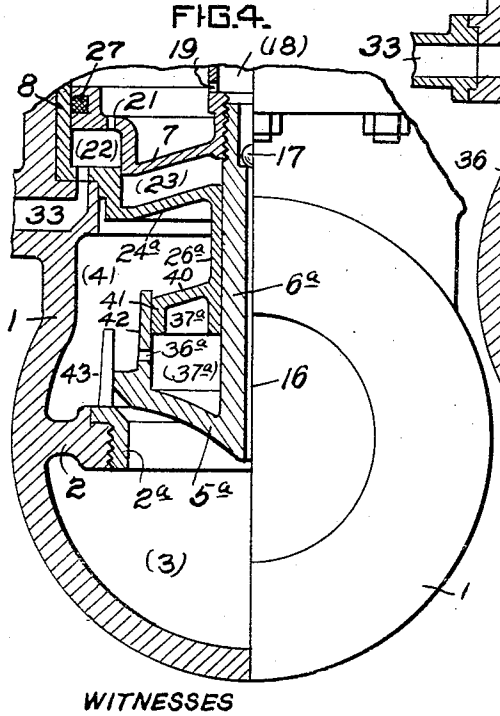


FIG.4.



WITNESSES

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UNITED STATES PATENT OFFICE.

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TRIPLE-CUSHIONED VALVE.

Original application filed July 6, 1917, Serial No. 179,009. Patent No. 1,370,260, dated March 1, 1921. Divided and this application filed April 12, 1920. Serial No. 373,145.

To all whom it may concern:

Be it known that I, EDWARD V. ANDERSON, a resident of Monessen, in the county of Westmoreland and State of Pennsylvania, have invented a new and useful Improvement in Triple-Cushioned Valves, of which the following is a specification.

This invention relates to valve mechanisms for controlling a flow of fluid under pressure, such as steam. More particularly it relates to such a valve adapted to be automatically opened and held normally in that position by pressure of the fluid, but to be automatically closed in case of sudden reduction of pressure on either side of the valve.

The particular improvements of the present invention consists in providing an additional cushioning means for such valve, and in providing means for operating the valve in both directions by hand, means for locking it in either open or closed position, the means for the manual operation and locking in position being capable of adjustment so as not to interfere with the automatic operation of the valve. This will more fully appear in the following specification wherein:

Fig. 1 is a partial side elevation and partial vertical central section of a triple-acting valve suitable for the purposes above set forth, and embodying the particular embodiments constituting this invention; Fig. 2 is a partial vertical section showing portions of the hand operating mechanism when the valve is locked in closed position so that it cannot be automatically operated; Fig. 3 is a view similar to Fig. 2, showing the position of certain parts as when the valve is locked in open position; and Fig. 4 is a partial section similar to Fig. 1, but showing a modified form of the cushioning means.

Valves of the type illustrated are employed on the tops of boilers, in steam mains, and other places where fluid is passed in one direction, under high pressure. Such valves are frequently subjected to a considerable and sudden variation in pressure, as for example where several engines are driven by steam from a single main, and such engines become synchronized. There is a resulting pulse in the supply pipe which tends to throw an automatic valve to its seat, or else cause it to pulsate with the variation in pressure. In order to meet such conditions it is necessary to have the valve very strong, and have it thoroughly cushioned, in order to prevent it from chattering and to prevent it from violently and suddenly opening or closing. Such action will destroy even the strongest valves. The present construction provides a supplementary cushioning chamber arranged in the valve casing on the outlet side of the valve. This comprises a wall enclosing the rear of the valve and moving with it, and a suitable cooperating member carried by the casing and adapted to form a dash-pot or chamber with the said wall. The wall shields the rear side of the valve from the destructive pulsations sometimes found in steam mains and the like, and ensures that the valve will not be hammered by the pulsations of back pressure even under the most severe conditions.

The structure illustrated belongs to the class of triple-acting non-return valves such as that illustrated in my prior Patent #1,209,795, and the general type of valves is well known in the art. By "triple-acting" the art has come to understand a main valve that will close when the source of pressure fails, or when there is a failure of back pressure in the line beyond the valve, and which may also be closed by hand regardless of pressure on either side.

Referring to the drawings, the main casing 1 has a valve seat partition 2 separating the fluid inlet chamber (3) and the outlet chamber (4). The partition has a central opening in which is fitted a valve seat member 2^a, and the opening is closed by a main valve 5 supported on a vertically movable stem 6 which also carries a double piston member 7, adapted to reciprocate in a cylinder 8, fixed in the main casing. The casing is covered by a hood 9 through which projects a screw stem 10 having a threaded portion 11, and a terminal hand wheel 12, the threaded portion engaging a threaded

member 13, carried by a rigid extension 14 of the casing hood 9. This hand wheel is adapted to open and close the main valve manually, in a manner more fully described below. The valve stem 6 which is threaded into the piston member 7 to make rigid connection therewith, has a central bore 15 at the top and a smaller central bore 16 extending from the bore 15 to the bottom of the stem and forming a continuous passage therethrough. In the larger bore is a ball check 17 adapted to prevent the passage of fluid downward through the stem, but to allow it to pass freely upward. By this means pressure can readily pass from the chamber (3) through the stem 6 into a chamber (18) formed by a bore in an upward central extension of the piston member 7, and from that chamber through a port 19 into a chamber (20), bounded by the piston member 7, the cylinder 8, and the hood 9. From this chamber (20) pressure can pass by means of small port 21 to the lower side of piston member 7, into chamber (22), and thence by leakage into chamber (23), formed by the lower side of piston member 7, and partition wall 24 extending inward from a cylindrical portion 25 of the casting forming the cylinder 8, above referred to. This member 24 has a central downward extension 26, having a central bore forming a guide bearing for the valve stem 6. A suitable packing 27 is provided for the reciprocating piston 7 so that the only escape of pressure from the chamber (20) to the chamber (22) is by port 21.

A cap 28 is threaded on the exterior of extension 29 of piston member 7, and this cap extends inwardly beyond the central bore of said extension 29, having a central bore through which the screw stem 10 passes but forming a shoulder adapted to engage a collar 30 on the lower end of the screw stem 10 and to limit the upward travel of such screw stem by such abutment. The collar 30 engages at the lower end of the chamber (18) another shoulder 31, on the extension 29. This construction allows the collar 30 to be moved up and down the length of the chamber (18) without effect on the main valve, but at the ends of such idle movement will operate to either open or close the main valve, as the stem may be moved up or down, in obvious manner.

In the view shown in Fig. 1, the main valve is open, the hand wheel and stem 10 being positioned to permit the main valve to be opened or closed automatically. If the hand wheel be moved upward still farther, it will carry the main valve and hold it there without possibility of its being closed automatically, until the hand wheel is again turned down. If, on the other hand, the hand wheel be turned down until the collar 30 drives the valve into closed position, it will be locked there, not subject to automatic operation, until the hand wheel is again moved up to some such position as that illustrated in Fig. 1.

In Figs. 2 and 3 details are shown of a latch adapted to determine the proper travel of the valve stem for the various positions described. A latch member L is pivoted to the frame and normally hangs as shown in Fig. 1, with a shoulder across the path of travel of the unthreaded portion of the stem 10, which forms a shoulder 10^a at the junction between it and the portion 11. When the stem is moved up by hand wheel 12 the shoulder 10^a will be caught by the latch at the point indicated in Fig. 1, and further upward travel of the stem prevented. This is the proper position for the hand wheel and stem when it is desired to leave the valve subject to automatic opening and closing. By releasing the latch as shown in Fig. 3, the stem may be turned on up to the position shown in that figure, where the shoulder 10^a will be in abutment with shoulder 13^a on collar 13, and the valve will be locked in open position so that it cannot be closed automatically. The stop for the hand wheel when the main valve is locked in closed position, is of course, when the valve is driven to its seat, and the collar 30 seats on the shoulder 31.

With this explanation of the manual operation of the valve, and the locking of it in open or closed position, it is to be understood that the remainder of the description refers particularly to the automatic operation of the valve.

The operation of valves of this type is well known, and no extended description is considered necessary. High pressure fluid underneath the valve, tends to open it, and so to permit the fluid to pass through the main casing. This pressure also passes upward through the hollow stem by passage 16, and above the piston 7. In normal operation this pressure passes through port 31 into chamber (20) and then by port 21 into chamber (22), and by leakage from that chamber into chamber (23), so that pressure on the two sides of the piston member 7 is normally equalized. In this position the valve is kept open by pressure of fluid beneath the main valve.

From the chamber (22) a port 33 leads through a pilot valve, which is not shown, to the fluid supply main beyond the main valve. A pilot valve suitable for use with this valve is known, as for example that illustrated and described in my prior Patent #1,209,795, or in my Patent No. 1,370,260, of which this case is a division.

It is sufficient to say that such pilot valves are adapted to release pressure from the chamber (22) by means of port 33, when

pressure in the steam main is reduced below a predetermined point. When the back pressure in chamber (22) is removed, the pressure in chamber (20) from the supply side of the main valve, will force the valve down upon its seat, and keep it closed so long as the pilot valve prevents the equalization of pressure in chamber 22.

It will be seen that by this construction the main valve is cushioned in its movement in both directions by the trapped fluid in chambers (22) and (23). In the present construction an additional cushioning chamber is provided by means of a depending cylinder 34, affixed to the partition member 24. A cooperating cylinder 35 is carried on the top of the valve member. A port 36 leads through the cylinder 35, and furnishes a means for escape and entrance of fluid to the chamber (37) formed by the inter-fitting cylinders 34 and 35, and the partition 24 and valve 5. This makes an additional cushioning dash pot, to further prevent the violent opening or closing, or chattering of the main valve. The cylinders 34 and 35 completely protect the rear side of the valve as against the pulsations in the line, and so keep the main valve from being hammered to its seat or destroyed by such excessive conditions as are frequently met with. Its operation and advantages are apparent.

In Fig. 4 a modification is shown in that the extension 26^a of partition member 24^a carries a web 40, which has a peripheral cylindrical flange 41, adapted to cooperate with an upwardly extending cylindrical wall 42 mounted on the upper side of the main valve 5^a. A port 36^a is provided through the wall 42. The valve stem 6^a operates in the extension 26^a, and the remaining parts of the valve are the same as those described in reference to Fig. 1. This also produces a dash pot chamber (37^a), and has a cushioning effect on the movement of the valve similar to that of the dash pot arrangement shown in Fig. 1. Three or more guides 43 are provided on the valve seat member 2^a, to further reinforce and guide the movement of the main valve.

This additional dash pot 37, or 37^a, has the important function of protecting the rear of the valve from sudden changes of pressure that would otherwise exert a sudden and hammer-like blow on the rear of the valve. This is especially true where there is a sudden back pressure, in pulsations. Thus the construction which forms the cushioning chamber 37 serves as an effective cushion, a reinforcing guide-bearing, and as a protective shield for the rear of the valve.

I claim:—

1. A valve mechanism comprising a casing having a passage therethrough, a valve controlling the passage, a stem carrying the valve, a peripheral wall on the rear of the valve adjacent the seating surface of the valve and a slidably interfitting wall fixed in the casing, the two walls forming a cushioning chamber at the rear of the valve.

2. An automatic valve mechanism comprising a casing, a passage therethrough, a valve controlling the passage, a stem carrying the valve, a peripheral wall surrounding the rear side of the valve and its stem and adjacent the seating surface of the valve, and a wall fixed on a partition in the casing slidably interfitting with the wall on the valve, whereby to shield the valve from pulsations on the side having said peripheral wall and to form a cushioning chamber behind the valve.

3. A valve mechanism comprising a casing having a fluid passage therethrough, a valve mounted to control said passage and adapted to seat by movement in a direction opposed to that of normal flow of fluid through the passage, a partitioning member fixed in the valve casing and having a guide opening, the valve being mounted on a stem extending through said guide opening, a cylindrical skirt carried by said partitioning member, a peripheral integral flange extending from the rear side of the valve and slidably interfitting with the said skirt, whereby the rear of the valve is screened from pressure pulsations on the outlet side of the valve.

4. An automatic valve mechanism comprising a casing, a passage therethrough, a valve controlling the passage and adapted to seat against normal flow of fluid therethrough, a guide stem carrying the valve, a partition in the casing forming a bearing for the guide stem, and a dash-pot for cushioning the movement of the valve comprising a cylindrical member carried by and surrounding the rear of the valve, a cooperating member carried by the partition, the two members interfitting to form a screening dash-pot immediately behind the valve.

5. The combination with a valve mechanism having a valve adapted to be automatically opened and closed by variations of pressure on either side thereof, of manually operable means to positively open and close the valve, said means comprising a lost motion connection between the valve stem and the manually operated member and a latch adapted to positively stop the manually operated member in position to leave the valve free to be operated automatically.

6. A valve adapted to control passage of fluid from a source of pressure to an outlet main, said valve comprising a casing having a diaphragm dividing it into an inlet and an outlet chamber, and having a port therethrough, a valve positioned in the outlet

chamber of the casing and adapted to close the port, a valve stem carrying said valve, a wall member closed at one end and fixed in the casing, said closed end having a guide opening for said stem, an integral peripheral flange surrounding the rear of the valve and slidably associated with the other end of said wall member, whereby the rear of the valve is screened from fluid pulsations in the outlet chamber of the valve casing.

In testimony whereof, I have hereunto set my hand.

EDWARD V. ANDERSON.

Witnesses:

J. HOWARD KELLY,

ALFRED TANZER.