July 28, 1925. 1,547,172

P. W. KNAUF

BOILER NONRETURN VALVE

Filed Nov. 17, 1923

Fig. 1.

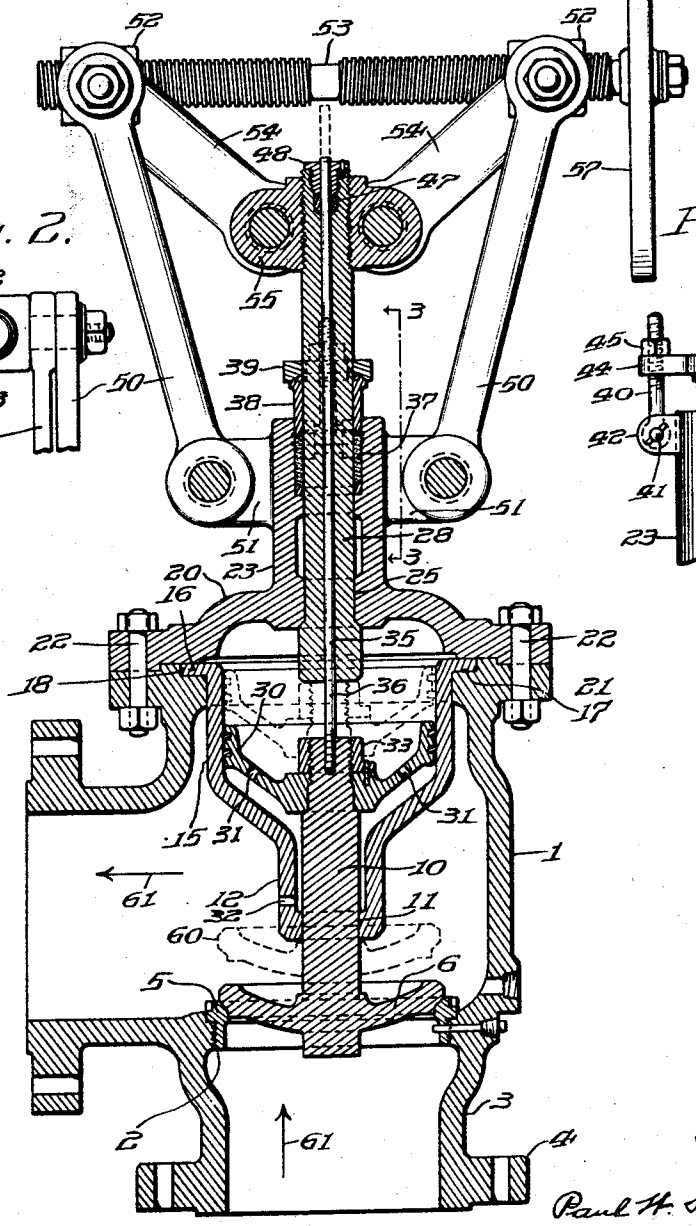


Fig. 2.

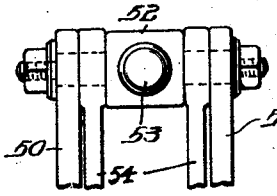
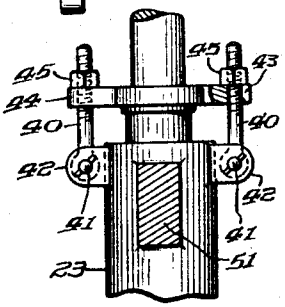


Fig. 3.



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UNITED STATES PATENT OFFICE.

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BOILER NONRETURN VALVE.

Application filed November 17, 1923. Serial No. 675,251.

To all whom it may concern:

Be it known that I, PAUL W. KNAUF, a citizen of the United States, and a resident of Cynwyd, in the county of Montgomery and State of Pennsylvania, have invented an Improvement in Boiler Nonreturn Valves, of which the following is a specification.

In a plant where two or more boilers are employed and in which said boilers are connected to a main steam pipe there should be, and usually is employed non-return or check valves between the main steam pipe and each of the boilers. The purpose of these valves, as is well known, is to prevent, in case of reduced pressure of the steam in any one of the boilers, a back flow of steam from the main steam pipe to such boiler; also in case it should be desired for any cause, the said valves may be fastened and held in closed position.

In traveling from the boiler to the main steam pipe it is necessary that the steam pressure overcome the weight of the non-return valve situated in the steam passageway or conduit. The lifting of the weight of the valve with its spool and other connected parts requires the expenditure of a considerable amount of energy. Various means and devices have been employed for reducing the weight of the valve and its connected parts to be overcome by the steam pressure, but as far as I am aware none of the means or devices heretofore employed have proved entirely satisfactory.

It, therefore, is a general object of the present invention to provide novel means which shall be simple and efficient for relieving the valve of a considerable portion of its weight which but for its presence or the presence of some other means, would have to be overcome or lifted by the pressure or energy of the steam.

A further object of the invention is to provide a novel construction of means whereby the steam itself shall operate to reduce and relieve the valve of a portion of its weight which must be overcome by the pressure of the steam against the same.

A still further object of the invention is to provide novel means having connection with the valve and projecting from the interior of the valve casing to the atmosphere whereby the pressure of the steam operates to reduce the weight of the valve and its connected parts which must be overcome by the steam pressure.

To these and other ends the invention comprehends the construction as hereinafter fully described and as defined in the claims.

In order that the invention may be readily understood and its practical advantages fully appreciated, reference may be had to the accompanying drawing in which I have illustrated one convenient form of mechanical embodiment thereof. However, it will be understood that the invention is susceptible of embodiment in other forms of construction than that shown and that various changes in the details of construction may be made within the scope of the claims without departing from the said invention.

In the drawing:

Fig. 1 is a longitudinal sectional view of a non-return valve structure embodying my invention;

Fig. 2 is a view in side elevation of the upper portion of the said valve structure looking toward the right in Fig. 1;

Fig. 3 is an elevational view taken on the line 3—3 of Fig. 1.

Referring to the drawing, 1 designates a casing to which steam is adapted to be delivered through a port, 2, which port is surrounded by a short pipe extension or flange, 3, provided at its outer edge or end with a lateral flange, 4, which is adapted to be connected with a pipe or conduit (not shown) leading from a boiler. The port, 2, is screw-threaded as indicated and is provided with an annular valve seat member, 5, with the inner beveled edge of which the outer lower edge portion of a non-return valve, 6, is adapted to contact. The said valve, 6, is provided with a stem or spool, 10, which extends upwardly through a support and guide opening, 11, in the reduced lower end portion, 12, of a cylinder, 15. The upper end of said cylinder is provided with an outwardly extending flange, 16, which is seated in a groove, 17, which surrounds an opening in the upper side of the valve case, 1, in opposed relation to the port, 2. The outer edge of the flange, 16, is seated against a vertical shoulder, 18, as indicated. The opening in the upper side of the casing is closed by a cover, 20, the outer edge portion of which rests upon the portion of the said

casing surrounding the said opening and is secured to a flange, 21, by means of nuts and bolts, 22. The cover, 20, is provided with an upwardly extending sleeve like portion, 23, through which and the central portion of the said cover an opening, 25, extends. In the said opening a controllable rod or bar, 28, is movably mounted which bar is adapted to be moved longitudinally within the said opening so as to cause its lower end to contact with the upper end of the stem or spool, 10, and force the latter together with the valve, 6, downwardly so as to cause the latter to be seated against the valve seat ring, 5.

The valve stem is provided at its upper end with a piston, 30, having small openings, 31, therein whereby steam which enters the cylinder through the small openings, 32, may readily pass into the portion of the cylinder, 15, above the said piston, 30. The said piston is secured to the stem or spool, 10, by means of a nut, 33.

The depressing and valve holding bar, 28, is provided with an opening, 35, which extends, in the construction shown, axially therethrough. A rod, 36, connected at its lower end to the upper end of the stem or spool, 10, extends upwardly through the opening, 35. The upper end of said rod is exposed to the atmosphere exteriorly of the valve structure.

For the purpose of preventing the escape of steam from the cylinder, 15, through the opening, 25, I have provided packing material 37, which is adapted to be adjusted and compressed from time to time as may be required by means of a gland member, 38. The latter is adapted to be forced and held downwardly by means of an annular member, 39, which is adapted to be adjusted downwardly and held in adjusted position by means of bolts, 40, which are pivotally connected to pivots, 41, supported in lugs or ears, 42, which project laterally from the upper end portion of the sleeve, 23. These bolts are adapted to engage in notches, 43, provided in lugs, 44, which project from the member, 39. Upon positioning the bolts in the said notches and tightening the nuts, 45, the part, 39, is adjusted and tightened.

The escape of steam through the opening, 35, in the bar 28, is prevented by packing, 47, which is adapted to be adjusted and tightened by a gland nut, 48.

For the purpose of effecting downward and upward movement of the valve depressing and holding bar, 28, I have provided links, 50, which are pivotedly connected at their lower ends to lugs, 51, which extend outwardly and in opposite directions from the sleeve, 23. The upper ends of these links, 50, are connected to nuts, 52, which are in engagement with right and left hand screw threads upon the opposite end portions of a rod, 53, which is rotatable. The said nuts are also connected with the upper ends of toggle levers, 54, the lower ends of which are connected to a crosshead member, 55, which is secured to the upper end portion of the bar, 28, previously referred to. In order that the rod, 53, may be readily rotated, I have provided the hand wheel, 57, upon one end thereof. By rotating the said rod the upper ends of the links, 50, and the toggle levers, 54, are adjusted inwardly or outwardly depending upon the direction of rotation of the said rod. If the nuts, 52, and the upper ends of the links, 50, and toggle levers, 54 should be adjusted inwardly, it is obvious that the bar, 28, would be moved downwardly and if the valve should be in an elevated position, as indicated by the dotted lines at 60, the lower end of the said bar, 28, would contact with the upper end of the stem or spool, 10, and force the same together with the valve, 6, downwardly so as to cause the latter to seat against its seat upon the valve seat ring, 5.

Although the means shown for actuating the bar, 28, for the purpose as stated comprises the links, 50, toggle levers, 54, and rod 53, it will be understood that any other suitable means may be employed for actuating the bar, 28, and for holding it in depressed position and the valve, 6, in closed position in case occasion should arise for holding it in such position.

In the normal operation of the device and when steam is passing through the valve casing in the direction indicated by the arrows at 61, the valve is held in elevated position above its seat, as indicated in dotted lines.

It will be seen therefore that either all or a portion of the weight of the said valve and its connected parts including the stem or spool, the piston, 30, and the rod, 36, must be lifted and held in elevated position by the energy of the steam acting upon the valve, 6.

It will be understood that steam fills the cylinder, 15, both above and below the piston, 30.

The actual weight of the valve and its connected parts is decreased by the product obtained by multiplying the working pressure of the steam per square inch by the cross sectional area of the rod, 36, the upper end of which is exposed to the atmosphere. Assume that the weight of the valve with its stem or spool, piston, etc. is 120 pounds. Assume also that the working pressure of the steam is 400 pounds per square inch and that the cross sectional area of the rod, 36, is .20 of a square inch. The latter area multiplied by 400 gives a product of 80 pounds which when subtracted from 120 pounds, the assumed weight of the valve, spool, etc., leaves 40 pounds which is the net weight of

the valve, spool, etc., which must be overcome by the energy of the steam in lifting the same so that it may flow forward from the boiler to the main steam pipe.

The purpose of non-return valves of the character indicated is well understood and for that reason I have not entered into a detailed and full description of such purpose.

The essential feature of the invention is the provision of means whereby the net weight of the valve, its stem or spool, etc. to be overcome shall be substantially less than the actual weight thereof.

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

1. In a boiler non-return valve structure, the combination of a valve casing having a cylinder within said casing, said cylinder having a reduced and extended lower end portion having an opening therein, a valve for controlling a port leading into said casing, said valve being provided with a stem or spool which projects upwardly through said opening, a piston mounted on the upper end of said stem or spool, which piston is situated within said cylinder, a valve depressing and holding bar extending from the exterior of said casing into the interior thereof which bar is adapted to contact with the said stem or spool, and depress the same, said bar being provided with an axial opening extending therethrough, and a rod having connection with the upper end of said stem or spool and extending through the said last mentioned opening.

2. In a boiler non-return valve structure, the combination of a valve casing, a hollow cylinder situated within said casing, the closed lower end of which cylinder is provided with an opening, a valve situated in said valve casing and provided with a stem or spool which extends upwardly through said opening and is guided thereby, a bar slidably mounted in an opening in the said valve casing in alinement with the said stem or spool, said bar being provided with an axial opening extending therethrough, a rod having connection with the said valve stem and extending upwardly through the opening in said bar, and means for causing longitudinal movements of said bar to depress the said valve and hold the same in closed position.

In testimony that I claim the foregoing as my invention, I have hereunto signed my name this 15th day of November, A. D., 1923.

PAUL W. KNAUF.