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EMERGENCY CLOSING MEANS FOR BOILER NONRETURN VALVES.

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In its broader aspect my invention relates to emergency non-return stop valves for boilers, but more specifically it relates to a novel construction of means for effecting the closing of such valves in the event of an emergency rendering a quick closing of the same necessary.

The general object of the invention is to provide a novel construction of means whereby the pressure of steam from the boiler drum of any one of two or more boilers of a system or from any other suitable source may be caused to actuate a member to close the non-return stop valve.

A further object of the invention is to provide means whereby the non-return stop valve is relieved of the pressure of the closing means whereby the steam in passing from a boiler to a main or head pipe need overcome only the weight of such non-return stop valve and parts connected thereto and rigid therewith.

A still further object of the invention is to provide means whereby the non-return stop valve closing means may be permitted to move downwardly for the purpose of closing the said non-return stop valve independently of mechanical means which may be employed for causing downward movement of the said closing means to effect closing of the said stop valve and to hold the same in closed position.

I shall not at this point undertake to point out the many other advantages incident to my invention, but will proceed with a detailed description thereof, making reference in such description to the accompanying drawing in which is illustrated one convenient form of mechanical embodiment of the invention.

It will be understood, however, that the invention is susceptible of embodiment in other forms of construction than that shown and that changes in the details of construction may be made within the scope of the claims without departing from the same.

In the drawing:

Fig. 1 is a longitudinal vertical sectional view of a boiler non-return stop valve and means embodying my invention for closing the same;

Fig. 2 is a view taken on the line 2—2 of Fig. 1; and

Fig. 3 is a fragmentary sectional eleva-

tional view showing a detail of construction. 55

Referring to the drawing: 1 designates a valve body or casing, 2 an inlet port, and 3 an outlet port. The inlet port is provided with a valve seat ring 4 upon which a valve 5 is adapted to be seated. The valve is shown in the drawing in seated position, but it will be noted that in operation, when steam is flowing forward through the valve structure as indicated by the arrows 6 and 7, the valve 5 is lifted from its seat by the pressure of the steam upon the under side thereof. 60

The valve is provided with a valve stem 10 which extends upwardly through a guide opening 11 in the lower end of a reduced, downwardly projecting portion of a cylinder 12. The said cylinder is secured in and projects inwardly from an opening 13, in the upper side of the valve casing or body 1, into the said casing. The valve stem 10 is provided at its upper end with a piston 14 which is situated and operates in the cylinder 12. The said piston is retained or secured upon the valve stem by means of a retaining nut 15. 70

Steam is admitted to the cylinder 12 through an opening 17 in the reduced inwardly and downwardly extending portion previously referred to and is admitted to the portion of the cylinder above the piston 14 through a small opening 18, so that normally when the apparatus is in operation the pressure upon the opposite sides of the piston is equalized or is the same. 75

A cylinder 25, the lower end of which is closed by a bottom wall 27, is situated above the valve body 1 and is provided with a laterally and outwardly extending flange 26 which rests upon the upper edge of the portion of the valve body which surrounds the said opening 13. The upper end of the cylinder 25 is provided with a cover 29. The said cover rests upon the upper end of the cylinder 25 and is of a diameter greater than that of the exterior diameter of said cylinder so that its edges project beyond the said cylinder. These edges are provided at intervals with holes, two of which only are shown, through which bolts 30 extend. The said bolts also extend through corresponding holes in a flange 31 which extends laterally from the upper portion of the valve body 1. Nuts 32 upon the opposite ends of these 80

bolts operate to clamp and hold the cover 29 upon the top of the cylinder 25 and also operate to clamp and hold the cylinder 25 with its cover 29 to the valve body 1.

The bottom wall 27 of the cylinder 25 is provided with a central opening 35 through which a valve controlling and closing rod 37 extends. The said rod is surrounded by packing 38 within the opening 35 which packing is adapted to be held in place by means of a gland 39 which in turn is secured to the bottom wall 26 by means of screws 40.

The valve control rod 37 is provided with a piston 45 which fits and operates in the cylinder 25.

The top cover 29 of the cylinder 25 is provided with an opening which is surrounded by an extended tubular guiding sleeve 46. The valve control 37 extends upwardly through the said central opening and through the sleeve 46 and terminates a distance above the top of the latter. The said rod is surrounded by packing 47 situated within the upper portion of the guide sleeve 46, which packing is held in place by a gland 48 which in turn is adapted to be held in place and pressed downwardly by means of an annular holding member 49 having outwardly extending notched lugs 50. The guide sleeve 46 is provided adjacent its upper end with lugs or projections 51 to which bolts 52 are hinged. These bolts are adapted to be turned upwardly and seated in the notches in the projections 50. This having been done, the nuts 53 are tightened so as to clamp the annular holding member 49 downwardly upon the upper end of the gland 48 to press the lower end of the same against the packing 47.

Steam is admitted to the cylinder 25 above the piston 45 through a pipe 60 which enters the said cylinder through the cover 29. The steam is supplied through the pipe 60 from any suitable source, as from the drum of the boiler. For the purpose of preventing reverse flow of steam at any time through the pipe 60 from the cylinder 25 a check valve is provided at 61. Steam which enters the cylinder 25 through the pipe 60 flows through an opening 62 through the piston 45 so that the pressure, in the normal operation of the device, on opposite sides of the said piston is equalized or is the same. It may be noted also that some steam is likely to escape from the cylinder 12 through the opening 35 around the valve control rod 37. The entry of such steam, however, does not disturb the equilibrium of the pressure of the steam upon opposite sides of the piston 45.

When the system of boilers is in operation steam flows from one of them through the inlet port 2 and the outlet port 3 of the structure shown, it being understood that a like structure is interposed in the steam sup-

ply line from each boiler of the system. In so doing the valve 5 is raised from its seat upon the valve seat ring 4. The height to which said valve is elevated will depend upon the energy or force of the current of steam and it may be sufficient to cause the stop shoulder 65 at the lower end of the valve stem 10 to contact with the lower end of the reduced portion of the cylinder 12.

As already indicated, pressure of the steam upon opposite sides of the piston 45 is the same. However, the total pressure of steam tending to cause upward movement of the rod 37 and the piston 45 is that exerted upon the under side of said piston plus that exerted upon the lower end of said rod which is exposed to the steam within the cylinder 12. It will be apparent that in view of the fact that the upper end portion of the valve operating and controlling rod 37 extends through the cover 29 and the tubular sleeve 46 and is exposed to the atmosphere, the effective pressure of the steam operating upon the upper outer side of the piston 45 to force the same downwardly is less than the total pressure of steam tending to force or move the rod 37 and piston 45 upwardly by the amount obtained by multiplying the cross sectional area of the rod 37 within the cylinder by the pressure per unit area of the steam within said cylinder. It will be apparent, therefore, that the resultant pressure of the steam upon the rod 37 and piston 45 operates to hold the same in its uppermost position with the inclined or beveled shoulder 70 thereon in contact with the beveled surface 71 surrounding the lower edge of the central opening through the cover 29.

In case of an accident to the steam line intermediate the non-return valve structure and the head line pipe or other destination for the steam or from some other cause, it may become necessary to effect a quick closing of the valve 5. To effect such closing the steam is permitted to escape or is released from the portion of the cylinder 25 underneath or inwardly of the piston 45. The escape of such steam takes place through a release pipe 72 controlled in any suitable manner, as by a valve at 73, which may be operated by means of a handle 74. It will be understood that any suitable means may be employed for quickly opening the pipe 72 for releasing the steam from the cylinder 25 underneath the piston 45. When the steam is thus released the pressure of the steam above the piston 45 upon the latter causes quick and sudden movement of the said piston with the valve control rod 37 downwardly. The lower end of the said rod contacts with the upper end of the valve stem 10 and causes movement of the same together with the valve 5 downwardly until the latter is seated upon the valve ring 4.

The cross sectional area of the piston 45 minus the cross sectional area of the portion of the rod 37 within the cylinder 25 above the said piston is greater than the area of the opening through the ring 4, in consequence of which the pressure of the steam upon the upper side of the piston 45 upon the release of steam from the cylinder 25 underneath the said piston is sufficient to force the valve 5 downwardly against the pressure of steam underneath the said valve. It may be noted here that the pressure of steam within the port 2 and within the cylinder 25 above the piston 45 at such time is the same.

In addition to the emergency means for closing the valve 5 in case of necessity, I have also provided means for closing the same which may be operated manually, as illustrated, or in any other manner which may be suitable.

The cover 29 and the tubular sleeve 46 are provided with oppositely disposed brackets 80 to which the lower ends of two couples of links 81 are pivotally connected. The upper ends of these links are connected to trunnions 82 which project outwardly in opposite directions from nuts 83 which are mounted upon the right and left hand screw threaded end portions of the shaft 84 which is adapted to be rotated by means of a hand wheel 85 or by any other preferred means. The upper ends of toggle lever links 86 are also connected to the trunnions 82 while the lower ends thereof are connected to the opposite ends of pivot bolts 87 which are secured to the opposite ends of a cross-head member 88. Said member has slidable engagement with the upper reduced end portion 90 of the valve operating and controlling rod 37. The valve operating and controlling rod 37 is provided with a shoulder 92 at the lower end of the reduced upper end portion 90 with which the lower side of the cross-head 88 is adapted to contact.

As already stated, the reduced upper end portion 90 of the rod 37 has slidable connection with the cross-head 88. It is apparent, therefore, that in the case of an emergency and when the release pipe 72 has been opened to permit the release of steam from underneath the piston 45 the rod 37 is permitted to move freely downwardly under the influence of the steam pressure in the cylinder 25 above the piston 45, the shoulder 92 at such time moving downwardly from the under side of the cross-head 88 to the position as indicated in dotted lines. In moving downwardly the said rod 37 contacts with the upper end of the stem 10, also as indicated in dotted lines, and forces the same downwardly to close the valve 5 as shown.

It will be apparent also that upon rotation of the shaft 84 in a direction to cause in-

ward movement of the upper ends of links 81 and 86 toward each other, or toward a vertical position the lower ends of the links 86 move downwardly. Such downward movement causes the lower side of the cross-head 88 to contact with the shoulder 92 and force the valve operating and controlling rod 37 downwardly and hold the same in depressed position with the valve 5 either in closed or in any intermediate position as may be desired. The principal purpose, however, of the closing means comprising the links 81 and 86 is to depress and hold the valve 5 in closed position. This may be desirable in order that steam may be shut off from the outlet portion of the structure for the purpose of facilitating repair, as for instance, repairs to piping on the outlet side of the valve.

For covering and protecting the shaft 84 and the nuts 83 thereon I have provided a cover plate 93, as shown.

It will be seen that by my invention I have provided means whereby the non-return stop valve may be quickly closed as in the case of an emergency requiring and demanding quick closure; and also that I have provided means whereby the valve may be closed and held firmly and positively in closed position in case such closing should be desired or necessary.

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

1. In combination, a casing, a non-return stop valve in said casing, means adapted to be actuated by steam pressure toward said valve to close the same, the said means being situated and adapted to move in axial alignment with said valve, and means adapted to permit steam pressure to be applied to said first named means to cause movement thereof in the opposite direction to permit opening movement of the said valve.

2. In combination, a valve casing structure, a boiler non-return valve situated in the said casing, a valve-operating and controlling rod supported in axial alignment with the said valve, means whereby the said rod normally is held at a distance from and out of contact with any portion of the said valve, and means whereby the said rod is adapted to be actuated by the operation of steam pressure for causing longitudinal movement thereof toward the said valve for effecting closing movement of the latter.

3. In combination, a valve casing structure, a non-return valve situated in the said casing and having a stem extending in and transversely of the said casing, a valve operating and controlling rod slidably supported in alignment with the axes of the said valve and valve stem, the said rod projecting from the interior of the said casing structure to the atmosphere, and means whereby the said

rod is adapted to be actuated in a direction toward the said valve by steam pressure.

4. In combination, a valve casing structure, a boiler non-return valve situated in the said casing, a valve operating and controlling rod supported in operative relation with respect to the said valve, means whereby the steam from said boiler operates to hold the said controlling rod in elevated position out of contact with said valve, and means whereby the said rod is adapted to be actuated by the operation of the steam pressure for causing movement thereof toward the said valve for closing the latter.

5. In combination, a valve casing structure, a boiler non-return valve situated in said casing, the said valve having a stem projecting inwardly of said casing, a hollow cylinder situated within the said casing and having an opening in its lower end through which the said stem projects and by which it is guided, a valve operating and controlling rod supported in operative relation to the said valve stem and projecting into the said cylinder, means whereby the pressure of the steam operates to hold the said rod normally in elevated position, and means whereby the said steam pressure is adapted to cause descending movement of the said rod to effect closing movement of the said valve.

6. In combination, a valve casing, a boiler non-return valve situated in said casing, said valve being provided with a stem which extends inwardly of the said casing, a cylinder situated in said casing and projecting inwardly thereof toward the said valve, the inner end thereof being provided with an opening through which the said stem extends and by which it is guided, a cylinder situated above and secured to the said valve casing, which cylinder is provided with a closed bottom which constitutes a closure for the first named cylinder, a cover for the said second named cylinder, the bottom and cover of said second named cylinder being provided with axially alined openings, a valve operating and controlling rod slidably mounted in said openings, a piston situated in the second named cylinder which is connected with the said rod, the pressure of steam upon the end of said rod within the first named cylinder being adapted to retain the said rod normally in elevated position, and means for releasing the said steam from the portion of the second named cylinder inwardly of said piston whereby the pressure of the steam upon the opposite outer side thereof causes movement thereof to effect closure of the said valve.

7. In an emergency closing means for boiler non-return valves, the combination of a valve casing provided with an opening, a hollow cylinder secured to said casing, said cylinder having a bottom which is adapted to close said opening, a cover for

the said cylinder, the said bottom and cover having alined openings therein, a valve operating and controlling rod mounted in said openings, the upper end of said rod projecting from the cylinder and being exposed to the atmosphere, means for supplying steam to the said cylinder, means whereby the pressure of said steam operates to hold the said rod in outward position, and means for releasing the steam pressure from a portion of the said cylinder whereby the pressure of the steam in the remaining portion thereof operates to cause inward movement of the said rod, for the purpose described.

8. In an emergency closing means for boiler non-return valves, the combination of a valve casing, a valve for closing an inlet opening of said casing, the said casing being provided with an opening in opposed relation to the said inlet opening, a cylinder situated exteriorly of and being secured to said casing, said cylinder having a bottom which closes the said second named opening, a cover for the said cylinder, said bottom and cover being provided with alined openings, a valve operating and controlling rod slidably mounted in said openings, the inner end of the said rod projecting into said casing and the steam pressure upon said end operating to hold the said rod in its extreme outward position, a piston mounted in said cylinder and secured to said rod, means for admitting steam to the said cylinder, and means for releasing the pressure of the steam from the portion of the cylinder inwardly of the said piston whereby the steam upon the opposite side thereof operates to cause inward movement of the said rod to effect closure of the said valve.

9. In an emergency closing means for boiler non-return valves, the combination of a valve casing having an inlet port, a non-return valve for controlling the passage of steam through said port, a valve operating and controlling rod projecting into said casing, the outer end portion of the said rod being reduced, the inner end of said reduced portion terminating in a shoulder, a member having an opening through which the said reduced portion extends, the said member being adapted to contact with the said shoulder, means for actuating the said member to force the same inwardly against the said shoulder to cause inward movement of the said rod to close the said valve and hold the same in closed position, an emergency means for causing inward movement of the said rod independently of said member, the said emergency means comprising a cylinder, a piston within the said cylinder which is secured to the said rod, means for supplying steam under pressure to the said cylinder, and means for releasing the steam from the portion of said cylinder

underneath the said piston whereby the pressure of steam upon the top of said piston causes inward movement of the said rod to carry the said shoulder away from the said member and to effect closing of the said valve.

10 In an emergency closing means for boiler non-return valves, the combination of a valve casing having an inlet port, a valve structure for controlling the passage of steam through said port, a hollow cylinder secured to the valve casing in alinement with the said port, both ends of said cylinder being closed, the closures of said ends having central openings therethrough, a valve operating and controlling rod extending through said openings and closing the same, one end of which projects into the said valve casing and the other end of which projects outwardly and is exposed to the atmosphere, means for supplying steam to said cylinder,

a piston situated within the said cylinder and having rigid connection with the said control rod, said piston having an opening therethrough whereby the steam occupies the portions of said cylinder above and below the piston, and means for releasing the steam from the portion of said cylinder below the said piston, the transverse area of the said piston minus the area of the portion of said rod in the said cylinder above the said piston being greater than the area of the inlet opening controlled by the said valve, whereby upon releasing the steam from underneath the said piston the said control rod is forced downwardly by steam pressure and contacts with a portion of the said valve structure to effect closing of the same.

In testimony that I claim the foregoing as my invention, I have hereunto signed my name this 3rd day of December, A. D., 1923.

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